Northampton Community College

Evaluation of the *Pennsylvania's Advanced Training and Hiring* Program

Final Report

September 18, 2018

IMPAQ INTERNATIONAL LLC

SUBMITTED TO

Northampton Community College

ATTENTION

Marco Anglesio
Director, Pennsylvania's Advanced Training and Hiring
Northampton Community College
3835 Green Pond Road
Bethlehem, PA 18020

SUBMITTED BY

IMPAQ International, LLC
10420 Little Patuxent Parkway
Suite 300
Columbia, MD 21044
(443)256-5500
www.impaqint.com

PROJECT

Evaluation of Pennsylvania's Advanced Training and Hiring

AUTHORS

Scott Davis, IMPAQ International
Nicholas Bill, IMPAQ International

Acknowledgements

Table of Contents

List of Exhibits

Executive Summary

In September 2014, a consortium of three community colleges in northeastern Pennsylvania—Northampton Community College (NCC), Lehigh Carbon Community College (LCCC), and Luzerne County Community College (Luzerne)—was awarded a $10 million grant under Round 4 of the U.S. Department of Labor's (DOL) Trade Adjustment Assistance and Community College Career Training (TAACCCT) grant program. TAACCCT is a $1.9 billion federal workforce investment aimed at helping community colleges across the nation increase their capacity to provide education and training programs for in-demand jobs.

The consortium used the TAACCCT grant funding to develop and implement Pennsylvania's Advanced Training and Hiring (PATH) initiative. NCC, located in Bethlehem, Pennsylvania served as the lead institution for the grant and was responsible for PATH's overall administration and performance. While the grant's entire four-year period of performance ran from October 1, 2014 through September 30, 2018, PATH's programmatic period officially ended March 30, 2018. The final six months was limited to reporting performance outcomes and completing the third-party evaluation requirements.

To assess the efficacy of the TAACCCT grant, all grantees were required by DOL to procure a third-party evaluator to design and implement an independent evaluation of their programs. Accordingly, in April 2015, NCC contracted with IMPAQ International, LLC (IMPAQ) to conduct an independent evaluation of PATH. We subsequently worked with the PATH grant leadership team to design and conduct a rigorous evaluation of PATH. Our evaluation included two primary components— (1) an implementation analysis and (2) an impact analysis. In this report, we present the final results from these two key evaluation components.

ES.1 OVERVIEW OF THE PATH PROGRAM

The PATH program had two main goals. The first was to create enhanced occupational training and career pathways in three high-growth[1] industry sectors: advanced

---

[1] DOL considers an industry high-growth/in-demand if it meets one or more of the following criteria: (1) is projected to add substantial numbers of new jobs to the economy; (2) has a significant impact on the economy overall; (3) impacts the growth of other industries; (4) is being transformed by technology and innovation requiring new skill sets for workers; or (5) is a new and emerging business that is projected to grow. Source: https://www.doleta.gov/business/Skill_Competency.cfm

manufacturing, healthcare, and logistics/transportation. The second was to support successful academic and employment outcomes for students by creating three communities of practice (CoPs) across the colleges to research and implement evidence-based approaches in: contextualized remediation, technology-enhanced learning, and strategic employer engagement.

To enhance occupational training and improve career pathways in the three targeted industry sectors, PATH implemented the following strategies:

- Developing new or enhanced programs of study with curricula that meet the current skill needs of local and regional employers;

- Offering programs with stacked and latticed credential options to bridge the gap between lower-level programs that may provide diplomas or certificates and higher-level degree programs;

- Improving the content and quality of career pathways through enhanced articulation agreements with four-year schools; and,

- Purchasing new equipment and revitalizing training infrastructure to align existing programs with industry standards and offer additional hands-on training opportunities for students.

Many of PATH's training enhancements were also intended to build on colleges' training capacity previously developed and supported through earlier rounds of TAACCCT funding.

Forming and Implementing the Three CoPs

Each of the three CoPs included representatives from all three colleges and had a distinct focus. The contextualized remediation (CR) CoP was formed to research, design, and pilot the delivery of a CR model into selected PATH career pathway programs. The technology-enhanced instruction (TEI) CoP's purpose was to identify and implement innovative technology practices to improve the educational process for PATH students and enable the most interactive and efficient training possible. The CR and TEI CoPs continually monitored and evaluated the iterative pilot interventions to identify and incorporate revisions based on lessons learned. The ultimate goal for these two CoPs was to identify and support interventions for subsequent implementation in other college programs. The strategic employer engagement (SEE) CoP had a slightly different charge. Whereas the CR and TEI CoPs focused on implementing classroom-level interventions, the SEE CoP's overarching purpose was to research and apply nationally recognized best practice models for employer

engagement—with the goal of developing comprehensive and customized strategies for engaging regional employers across the three targeted industry sectors.

ES.2 EVALUATION DESIGN

The main objectives of our evaluation's implementation and impact analyses are described below.

Implementation Analysis. The main objectives were to gain an in-depth understanding of how the PATH program was designed and delivered, examine implementation fidelity, and explore program challenges and successes. The implementation analysis research questions focused on the following six topic areas:

1. PATH Programs of Study
2. Communities of Practice
3. PATH Student Services
4. Outreach and Marketing
5. Challenges, Successes, and Lessons Learned
6. Sustainability

To answer research questions in these areas, we relied on four data sources:

- Three rounds of site visits to each PATH college, which included semi-structured interviews with key grant personnel and, for the second and third rounds, focus groups with PATH students;
- Periodic telephone interviews with PATH staff;
- Documentation produced in support of PATH operations; and,
- A brief web survey of PATH students

Impact Analysis. The goal of the impact analysis was to answer the following three research questions:

1. Was the program effective in improving educational achievement?
2. What was the impact of the program on finding and retaining employment?
3. What was the impact of the program on the earnings of participants?

The impact analysis was originally designed to estimate the overall impact of the PATH program on the educational and employment outcomes of participants with a rigorous, quasi-experimental design. To minimize potential selection bias, we intended to use propensity score matching (PSM) methods to select a comparison group among similar students in similar programs but unaffected by the grant. Using two sources of individual-level data—college administrative data on educational outcomes and state administrative data on earnings—we planned to estimate statistical models that compared outcomes for participants to outcomes for the comparison group. This would have enabled us to estimate PATH's causal impact on its participants with a known degree of statistical confidence.

After preparing a Detailed Evaluation Plan for the study, however, several developments required us to revisit the design of the impact analysis. First, we were unable to identify appropriate comparison groups for some PATH programs. In response to this, we decided to omit some PATH programs from the impact analysis, and examine participant outcomes (rather than causal impacts) for the omitted programs. Second, the state agency that maintains administrative data on earnings did not agree to provide our research team with the necessary individual-level earnings data, but only with aggregate outcome measures and only for PATH program participants. In response to this, we only describe labor market outcomes for the PATH program participants. Chapter 5 reiterates the issues we faced and describes our modified design in detail.

ES.3 IMPLEMENTATION ANALYSIS

PATH Programs of Study. Through PATH, the three colleges developed or enhanced 30 credit and non-credit training programs across three industry sectors: 18 in advanced manufacturing, 10 in healthcare, and two in transportation/logistics. One college exclusively offered noncredit programs through PATH. Part of this process at each college involved renovating classroom space and purchasing new equipment.

Communities of Practice. In addition to creating new and enhanced programming in in-demand occupations, a second key element of PATH was the establishment and operation of three CoPs. Two of them—the CR and TEI CoPs—focused on identifying specific interventions to be piloted in PATH programs of study. CoP activities were managed across the consortium but the implementation of the interventions was customized by instructors and project directors at each college. The CR CoP selected and supported the implementation of Reading Apprenticeship (RA); the TEI CoP selected and supported the implementation of the flipped classroom. As part of the implementation process, the PATH management team gathered feedback on the implementation of the interventions to help

guide subsequent improvements. The third CoP (SEE) was focused on improving employer engagement practices among the consortium colleges. Two notable achievements of the SEE CoP included (1) an internal self-assessment by each college to review existing employer engagement practices and the creation of an action plan for improving them, and (2) the purchase of a customer relationship management software platform to improve the coordination of employer engagement activities within the college.

<u>PATH Student Services.</u> Students in PATH programs were offered two key types of support services: general support services and employment-focused services. General support services were provided by dedicated career coaches, who proactively contacted students periodically during their enrollments. Support services included: assessments, career guidance, and referrals to other college departments and services as needed. Employment-focused services included support from dedicated job placement specialists and job developers, who offered students services like resume assistance, help preparing for job interviews, and job search assistance.

<u>Outreach and Marketing.</u> PATH used a multifaceted outreach and marketing strategy to attract students to the program. The program was marketed both at the consortium and individual college level through multiple methods, including traditional media advertising (e.g., radio, newspaper, billboard), social media, presentations at local CareerLink offices, and career fairs. The consortium also created a PATH website, www.pathcareers.org, which promoted PATH, provided detailed information about the programs of study and support services, and explained how to request more information. Beyond working to attract students, PATH managers also worked to attract employers, both to inform the design and operation of the occupational training programs and to identify job opportunities for PATH graduates.

Our observations of PATH operations and the qualitative data we collected via site visits and telephone interviews revealed a number of program successes, challenges, and lessons learned:

<u>Program Successes</u>

- Equipment procurement, facilities renovations, and curricula development were completed on schedule, despite a short timeframe and logistical challenges.
- The one-on-one support from career coaches, job placement specialists, and job developers was highly valued by PATH students.
- Through PATH, the colleges created new credentialing options and improved the rigor of training programs in the targeted industry sectors.

- PATH's successful efforts to embed nationally recognized certifications into the curriculum expanded students' employment opportunities.

- At LCCC, PATH helped to improve the alignment of credit and non-credit programs and resources.

- SEE CoP activities led to institutional changes to improve employer engagement.

- PATH exceeded its performance targets (1,129 actual vs. 497 projected enrollment).

- PATH modeled effective collaboration among the three colleges.

Challenges

- Development of a coordinated, regional strategy for career pathways proved to be a greater challenge than anticipated.

- During the initial pilots, faculty and/or adjuncts or instructors faced significant challenges in implementing the CR intervention, due to combinations of factors.

- The TEI pilots were productive and appear to have made lasting impacts at each college; however, the amount of originally authored content created varied by college.

- Finding practicum and externship opportunities for PATH healthcare students became more challenging as time went on, due to a combination of increasing enrollment and external factors.

- Manufacturing students wanted work-based learning opportunities incorporated into the curriculum, but finding willing employers proved difficult.

Curriculum development was a significant challenge due to a short timeline, the volume of proposed curriculum development activities, and difficulty hiring curriculum developers

Lessons Learned

- Hiring external curriculum developers enabled the colleges to complete most curricula development activities in a timely manner.

- Onsite availability of both CR CoP co-chairs at Luzerne was instrumental to the success of the pilots and their potential to be replicated and sustained.

- The TEI CoP pilots were most successful when instructors were engaged; both the CR and TEI pilots might have achieved broader impacts if PATH funding could have been used to pay adjunct instructors or non-faculty for their involvement.

- PATH staff adapted their outreach strategies to effectively connect with participants and keep them engaged.

- Resume writing and job search assistance were the most frequently requested services; however, PATH staff suggested that participants underused all available services.

- It is important to begin implementation quickly.

- Staff motivation is important for success.

Near the end of the grant operational period, we asked PATH staff about the potential sustainability of different aspects of the program. Our observations about this potential, as perceived by PATH staff, are:

- The TEI and CR initiatives are well-positioned to be sustained and expanded into other programs.

- Two consortium colleges do not have concrete plans to continue the same career coaching offered through PATH; one college is adopting a similar model.

- Although it is unlikely that the three CoPs will be sustained in the same structure, the collaborative relationships developed across faculty and colleges, and the cross-dissemination of information, are likely to continue.

- Progress on the colleges' strategic employer engagement action plans is likely to continue after the grant at some level, but the degree to which these efforts will be sustained depends on institutional leadership.

Although the PATH grant has enabled the three colleges to successfully build on prior TAACCCT-funded efforts, additional work and investments are needed to achieve long-term strategic goals. Staff at the colleges felt that these investments and strategic initiatives should not be viewed as short-term fixes—rather, that the investments made through PATH and an earlier TAACCCT grant represent major steps in a long-term process that will serve as a foundation for future success.

ES.4 PARTICIPATION IN PATH

Over the course of the grant's programmatic period, PATH programs at the three participating colleges enrolled 1,129 students. Of these, the 545 students at NCC accounted for nearly half of the total (48 percent), with LCCC enrolling 412 students (36 percent) and Luzerne enrolling 172 students (15 percent). Almost all PATH students enrolled in programs in either healthcare (60 percent) or advanced manufacturing (38 percent). Only 24 students (2 percent) enrolled in PATH programs in transportation/logistics.

As of June 2018, 599 students had completed their PATH programs of study. All but 24 of those students had earned a recognized credential. One hundred ninety-nine PATH students (18 percent) withdrew from their chosen programs.

Among the 331 students who had neither completed nor withdrew from the program, many had enrolled so recently that not enough time had passed for them to have completed, given the expected length of each PATH program. We determined that, among the 331 students still enrolled in PATH in June 2018, 292 (88 percent) were on schedule to complete on time.

PATH enrollment data enabled us to observe selected characteristics of PATH students. Key patterns include:

- Most PATH students (66 percent) were less than 34 years of age.
- The majority of PATH students (71 percent) were white.
- The proportion of students who were Hispanic (28 percent) was highest at Luzerne (62 percent).
- The majority of PATH students (58 percent) were women.

Using data from the most recent wave of the student survey, we analyzed the patterns of support service usage among PATH students. Our key observations are:

- The most commonly used services across all colleges were: resume building/development (45 percent), job search assistance (39 percent), and information about job fairs (38 percent).
- Most respondents (86 percent) reported having used at least one support service. Twenty-nine percent of respondents reported having used at least four services.
- Seventy-six percent of respondents interacted with their Career Coaches. Forty-four percent of respondents reported interacting with their Career Coaches at least once a month.

ES.5 STUDENT SURVEY

To support the PATH management team and to complement the evaluation, we fielded five waves of a web-based survey of PATH students. It was open to all students ever enrolled in a PATH program as of the date the survey was fielded. Across the five survey waves, 20–24 percent of students invited to take the survey successfully completed it.

The survey included several questions related to student satisfaction with different aspects of the PATH program. Key survey results include:

- Survey respondents were consistently satisfied overall with PATH, with an average satisfaction rating of about a 4 on a 5-point scale.

- Across survey waves, 80–90 percent of survey respondents indicated they would recommend PATH to a friend.

- Survey respondents on average rated their agreement that PATH was helping students reach their goals as around 3.8 on a 5-point scale (the scale ranging from strong disagreement [1] to strong agreement [5]).

- Survey respondents rated their agreement that the PATH program/equipment was aligned with industry standards as 3.9 on the same 5-point scale.

- Aside from some results for a single college (Luzerne) from the first survey wave (which featured only 12 respondents), the survey response data showed little variation either across colleges or across survey waves.

Because the students who responded to our survey may differ from non-respondents in systematic ways, the survey results may not accurately represent the opinions of the broader population of all PATH students. Nevertheless, the results of the PATH student survey collectively suggest that PATH students thought highly of the program in many regards.

One of the key focuses of the evaluation was to estimate the impact of PATH on key education and labor market outcomes for PATH students. The next chapter describes our impact and outcomes analysis in detail.

ES.6 IMPACT AND OUTCOMES ANALYSIS

As one of the two main components of our evaluation, the impact analysis was designed to answer three research questions:

1. Was the program effective in improving educational achievement?

2. What was the impact of the program on finding and retaining employment?

3. What was the impact of the program on the earnings of participants?

To answer these questions, our original design proposed to estimate the impacts of PATH using matching methods, which would compare the outcomes of PATH students to the outcomes of matched comparison groups. The comparison groups would comprise

students from the three colleges that were enrolled in programs as similar to the PATH programs as feasible.

We adjusted our original approach due to two developments. First, we were unable to identify comparison group programs at one of the colleges—LCCC—which offered only noncredit PATH programs. As a result, we omitted LCCC from our impact analyses. Second, we were unable to obtain individual-level employment and earnings data from the state workforce agency. As a consequence, we estimated program impacts for only the educational achievement outcomes. For labor market outcomes, our analyses of employment and earnings outcomes were limited to describing these outcomes among PATH program completers.

Our analyses rely on three data sources:

1. College data on PATH students
2. College data on students who did not participate in PATH but were enrolled in similar programs at PATH colleges (i.e., comparison group students)
3. State aggregate employment and earnings data for PATH students

Using these data, we estimated the impact of PATH on two key educational outcomes (completion and academic progress) and described outcomes for three employment- and earnings-related outcomes (employment, job retention, and earnings) among PATH participants.

Impacts on Completion. The results for program completion indicate that among Luzerne and NCC students, PATH led to a 21 percentage point impact on the likelihood that a student would complete his/her program of study. The impact was equal to 28–31 percentage points for Luzerne students and 9–11 percentage points for NCC students. The impact of PATH also varied by industry sector—students who enrolled in PATH programs in advanced manufacturing were 21–23 percentage points more likely to complete their programs of study than comparison students. Those enrolled in PATH programs in healthcare, in contrast, were 16–17 percentage points *less* likely to complete.

Impacts on Academic Progress. Our results for academic progress show that for PATH students still enrolled at Luzerne and NCC (collectively), participating in PATH led to a 20 percentage point average increase in the likelihood that the student would be making normal academic progress. This impact was primarily driven by students still enrolled at NCC (for whom we estimate an impact of 30–31 percentage points) and for students in advanced manufacturing programs (for whom we estimate an impact of 22–24 percentage

points). In comparison, we estimated that PATH *decreased* the likelihood of making normal academic progress for Luzerne students who were still enrolled (i.e., it *increased* the likelihood that they were behind schedule). However, the Luzerne results vary widely by estimation method, strongly suggesting that the pool of comparison students may feature poor comparison group matches for PATH students.

Employment Outcomes. Employment outcome data for PATH students shows that 62 percent of students who completed a PATH program of study were employed in the first calendar quarter after the quarter of completion. The rate was similar among the three colleges—the rate was 68 percent for Luzerne and NCC students, and 58 percent for LCCC students. Students who completed PATH programs in transportation/logistics were much more likely than students who completed PATH programs in either healthcare or advanced manufacturing to be employed. Among the first group, 90 percent were employed, compared to 68 percent for advanced manufacturing PATH students and 60 percent for healthcare PATH students.

Job Retention Outcomes. Among PATH students employed in the first calendar quarter after completing a PATH program of study, the job retention rate for the second and third quarters after completion was 60 percent. The rate was similar for LCCC (64 percent) and NCC (60 percent)—much higher than among students from Luzerne (42 percent). Retention rates were similar for students who completed programs in either advanced manufacturing (59 percent) or healthcare (60 percent)—both much higher than among students who completed PATH programs in transportation/logistics (44 percent).

Earnings Outcomes. Average earnings in Q4 2017 (the end of the observational period) for PATH students employed in the first calendar quarter after completing a program of study were $7,621 (equal to $30,484 annually). Average earnings varied by college. They were highest among PATH completers from LCCC ($8,169, equal to $32,676 annually); second-highest among Luzerne PATH completers ($7,551, equal to $30,204 annually); and lowest among NCC PATH completers ($6,648, equal to $26,592 annually). Likewise, average earnings varied by industry focus. PATH students who completed programs in advanced manufacturing had the highest average earnings ($9,876, equal to $39,504 annually); followed by those who completed programs in transportation/logistics ($7,929, equal to $31,716 annually). PATH students who completed programs in healthcare had the lowest average earnings ($6,402, equal to $25,608 annually). Average earnings figures also varied according to the timing of program completion. Broadly speaking, average earnings for PATH students who completed earlier in the grant period were higher than for those who completed more recently.

ES.7 DISCUSSION

Overall, PATH was successfully implemented as planned and served many more students than expected. Though the operation of PATH varied somewhat across the three colleges, each was able to deliver new or enhanced programs of study through PATH, augmenting existing programs and integrating the new programs into deliberate career pathways. Once the grant has finished, the PATH programs of study along with the equipment and facility upgrades made possible through PATH will continue to be made available to future cohorts of students, thereby extending the positive influence of PATH beyond the grant period.

Although PATH was implemented successfully and was well-received by the participating institutions, it is less clear what impacts PATH had on the educational and labor market outcomes that were the focus of the impact and outcomes analysis component of the evaluation. First, our impact estimates suggest that PATH was responsible for improving educational achievement measures. However, given the limited nature of the data available for our analyses, the results should be interpreted with some caution. Second, given data limitations, the type of more technically rigorous analysis that might have shed light on PATH's impacts on labor market outcomes was not possible.

Concluding Remarks. One of the motivations for the TAACCCT grant program was to enable community colleges across the country to design and implement evidence-based programs aimed at providing workers with access to new and/or enhanced occupational training programs aligned with local labor market needs. The three colleges that jointly operated PATH successfully fulfilled the promise of the TAACCCT program, working together to strengthen their support of the labor market in northeast Pennsylvania. In the future, other similarly situated groups of community colleges should consider following the PATH model as a way not only to enhance what they offer to their local communities but also to strengthen their existing relationships and work together to better serve both students and businesses. It is our hope that this report will help any colleges considering such a project to understand the PATH experience so that they may replicate PATH's successes, avoid its challenges, and ultimately help students succeed.

1. Introduction

In September 2014, a consortium of three community colleges in Pennsylvania—Northampton Community College (NCC), Lehigh Carbon Community College (LCCC), and Luzerne County Community College (Luzerne)—was awarded a $10 million grant under Round 4 of the U.S. Department of Labor's (DOL) Trade Adjustment Assistance and Community College Career Training (TAACCCT) grant program. NCC, located in Bethlehem, Pennsylvania and lead institution for the grant, was responsible for its overall administration and performance.

TAACCCT funding supported the Pennsylvania's Advanced Training and Hiring (PATH) initiative,[2] which had two key elements. First, PATH was intended to create collaborative teams across the three consortium schools. These teams were to focus on identifying and implementing promising practices in three areas: contextualized remediation, technology-enhanced learning, and strategic employer engagement. Second, PATH was to enhance occupational training in three high-priority industries: advanced manufacturing, healthcare, and logistics/transportation.

One requirement of the TAACCCT grant program was that grantees use a portion of their grants to support independent evaluations of their funded programs. Accordingly, in April 2015, NCC contracted with IMPAQ International, LLC (IMPAQ) to conduct an independent evaluation of PATH. We subsequently worked with the PATH grant leadership team to design a rigorous evaluation that would satisfy the grant requirements by assessing the effectiveness of PATH along several dimensions. This Final Evaluation Report is the culminating written deliverable produced as part of the evaluation. In it, we present the results of the evaluation. The purpose of this report is twofold. First, it describes implementation of PATH in detail, so readers considering implementing a program like PATH may understand how the program operated. Second, it presents the results of the two main components of the evaluation: (1) the implementation analysis, which focuses on answering a set of research questions about key aspects of program implementation; and (2) the impact/outcomes analysis, which focuses on estimating the impact of PATH on two educational outcomes, and on describing select PATH student labor market outcomes.

---

[2] In the original grant application materials, the program was referred to as the Northeast Pennsylvania Community College Consortium for Integrated Learning. It was subsequently renamed PATH.

The report is organized as follows. In the remainder of Section 1, we describe the PATH program, including both the program design and the stakeholders involved in grant operations. We also describe certain contextual features of the geographic region in which PATH operates. Section 1 concludes with an overview of the evaluation design. Section 2 focuses on PATH implementation. It begins by summarizing key milestones of PATH operations and the evaluation. It then discusses our observations of PATH implementation organized into key topic areas, which quantify student participation in PATH, summarize our assessments of the successes achieved through PATH, and discuss the challenges and lessons learned. Section 3 details PATH participation. Section 4 presents the results of a brief survey administered to PATH students five times during the grant period. Section 5 focuses on the impact analysis component of the evaluation. It describes our approach to the impact analysis, explains the challenges we faced and the corresponding adjustments we made, and presents the results of our analyses. Section 6 concludes the report by discussing the evaluation findings from a wider perspective.

1.1 OVERVIEW OF THE PATH PROGRAM

1.1.1 Program Design and Objectives

The PATH program had two main components. The first was creation of three collaborative teams, called communities of practice (CoPs), across the consortium's three schools. The second main component, to be supported by the CoPs' activities, was to enhance occupational training in PATH's chosen three high-priority industries: (1) advanced manufacturing, (2) healthcare, and (3) transportation/logistics. Many enhancements to be implemented as part of PATH were meant to build on capacity already developed and supported by earlier rounds of TAACCCT funding.[3]

PATH, as planned, had six major features:

- Improving the content and quality of career pathways through enhanced articulation agreements with four-year schools

- Involving regional and local employers to ensure training programs aligned with employer demand

- Purchasing new equipment and software to align existing programs with current industry standards

- Creating new courses that offered entry and exit points for select programs of study

---

[3] All three PATH colleges were part of a statewide consortium of community colleges awarded a TAACCCT grant under the first round of the program.

- Offering programs that would provide modular or bridge credentials—intermediate credential bridging the gap between lower-level programs that may provide diplomas or certificates and higher-level degree programs

- Forming and implementing the three CoPs—each of which would include representatives from all three colleges.

The CoPs, an important part of the PATH strategy, each had a distinct focus. The contextualized remediation (CR) CoP was to research, design, and pilot the delivery of a CR model into selected PATH career pathway programs. The technology-enhanced learning (TEI) CoP's purpose was to identify and implement innovative technology practices to enhance the educational process for PATH students and enable the most interactive and efficient training possible. After implementing pilot interventions, the CR and TEI CoPs were to continually monitor the progress of each pilot and to collect, review, and analyze data on student outcomes. The ultimate goal for these two CoPs was to identify and support interventions for subsequent implementation in other college programs. The strategic employer engagement (SEE) CoP was a bit different. Whereas the CR and TEI CoPs focused on implementing classroom-level interventions, the SEE CoP's overarching purpose was to research and apply nationally recognized best practice models for employer engagement—with the goal of developing comprehensive and customized strategies for engaging regional employers across the three targeted industry sectors.

PATH Service Area. The three PATH colleges served a geographic area in the northeastern region of Pennsylvania. Exhibit 1 maps where the areas served by the grant are located within the state: two Metropolitan Statistical Areas (MSAs), covering seven counties and five workforce investment areas (WIAs).[4] The map also shows the locations of the three PATH colleges (including two LCCC campuses where PATH programs operated)[5] as well as Pennsylvania CareerLink offices in the PATH region.

As the map shows, two of the PATH colleges—LCCC and NCC—were located in close proximity to one another in the same MSA (Allentown-Bethlehem-Easton). As a result, the service areas of the two colleges overlapped. Historically, this has led the two colleges to consider each other competitors to an extent, in terms of both the market for new students and relationships with local employers and other stakeholders. Luzerne operates in a different MSA (Scranton-Wilkes-Barre), with labor market conditions and a workforce

---

[4] The five WIAs are Lackawanna County, Lehigh Valley, Luzerne-Schuylkill, Northern Tier, and Pocono County. Warren County, New Jersey—part of the Allentown-Bethlehem-Easton MSA—is excluded from the map.

[5] LCCC also has campuses in Tamaqua, PA (Schuylkill County) and Jim Thorpe, PA (Carbon County). However, the PATH programs of study were not operated in these locations.

Exhibit 1: Map of PATH Geography
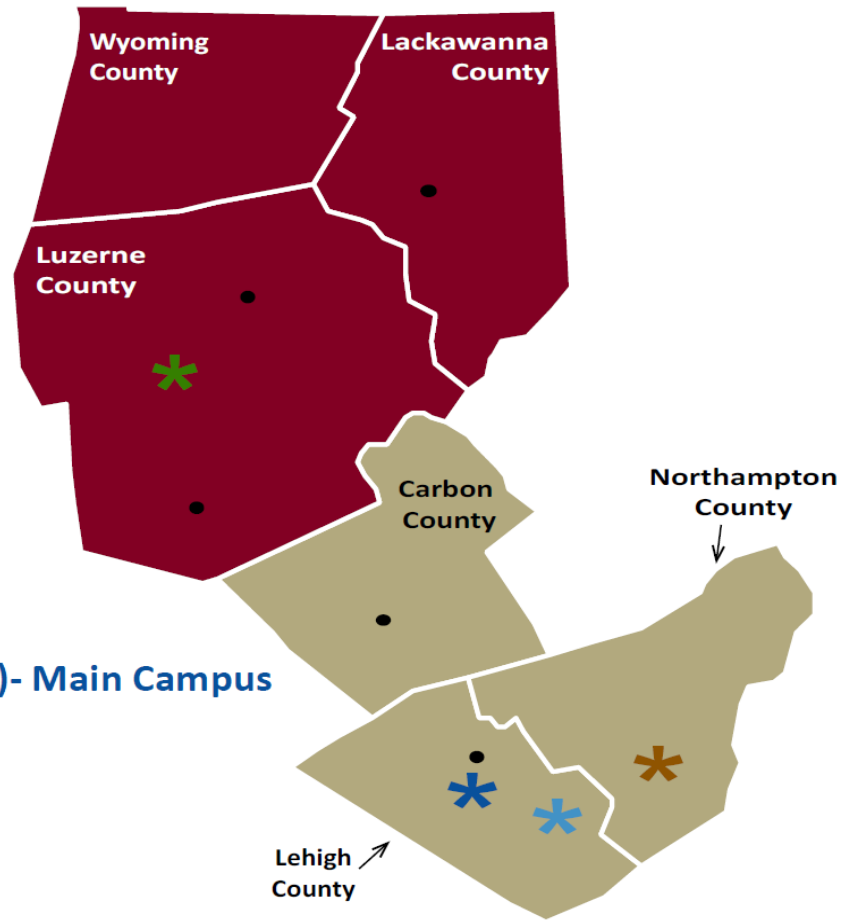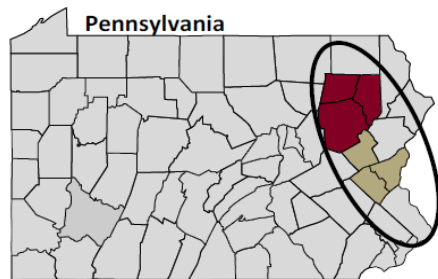
Metropolitan Statistical Areas
Scranton-Wilkes-Barre
Allentown-Bethlehem-Easton

PATH Consortium Colleges
* Luzerne County Community College
* Lehigh Carbon Community College (LCCC)- Main Campus
* LCCC - Allentown Campus
* Northampton Community College

Pennsylvania CareerLink®
• Offices

Note: LCCC also has campuses in Tamaqua, PA (Schuylkill County) and Jim Thorpe, PA (Carbon County). However, the PATH programs of study were not offered at these campuses (with the exception of the Nurse Aide program, which was offered at both the Allentown and Tamaqua campuses).

development context that differs from the other two schools. Historically, Luzerne has not been considered to compete with the other PATH colleges.

1.1.2 Alignment with TAACCCT Core Elements

The solicitation for grant applications under the TAACCCT program identified six core elements that all TAACCCT programs were to feature:[6]

1. **Evidence-based design**—programs were either to feature new, untested strategies that could be evaluated or use existing strategies that had been proven to work.

2. **Career pathways**—programs were to focus on one or more industry sectors and provide a clear sequence of education/training. The related programs within a sequence were to offer workers at different career stages the chance to build their skills and advance in their careers.

3. **Advanced online and technology-enabled learning**—programs were to incorporate internet and/or technology use in their course designs. This was to go beyond offering online courses, to include such include strategies as interactive simulations, digital tutoring, and educational gaming, among others.

4. **Strategic alignment with the workforce system and other stakeholders**—programs were to be aligned with state workforce system strategic plans; and program managers were to engage with local workforce investment boards, local non-profit organizations, employers, and other relevant stakeholders.

5. **Alignment with previously funded TAACCCT projects**—programs were to avoid duplicating programs offered through earlier TAACCCT rounds. Instead, they were to complement existing programs, and encourage applicants to leverage open educational resources (OER) (e.g., instructional resources, curricula) developed through earlier rounds of TAACCCT.

6. **Sector strategies and employer engagement**—grantees were to either develop new or enhance existing industry sector strategies, by engaging employers within a chosen industry sector to help identify workforce skill needs and guide development of appropriate education/training programs.

Exhibit 2 summarizes how the PATH program aligned with each TAACCCT core element.

---

[6] The TAACCCT Round 4 solicitation is available online at https://bit.ly/2eDtanz.

Exhibit 2: Summary of the Alignment between PATH and TAACCCT Core Elements

TAACCCT Core Elements	PATH Features
1. Evidence-based design	▪ PATH programs and support services were based on the Learning Community Model and high-touch, intrusive advising strategies.
2. Career pathways	▪ Within an industry sector, each college offered multiple programs of study designed as sequences offering different levels of depth and terminal credentials.
3. Advanced online and technology-enabled learning	▪ Through the TEI CoP, the colleges implemented the flipped classroom model in selected courses. This model requires students to do some course activities online outside the classroom, either in preparation for class or to reinforce material presented in class.
4. Strategic alignment with the workforce system and other stakeholders	▪ PATH Career Coaches worked in collaboration with staff at local Pennsylvania CareerLink offices. ▪ PATH program staff cultivated relationships with local employers and solicited their input and feedback on program design.
5. Alignment with previously-funded TAACCCT projects	▪ All PATH colleges participated in a Round 1 TAACCCT grant awarded to a consortium of all Pennsylvania community colleges. Some PATH programs expanded program offerings developed through the Round 1 grant.
6. Sector strategies and employer engagement	▪ PATH programs targeted three industries: advanced manufacturing, healthcare, and transportation/logistics. ▪ Within each industry sector, employers provided input to, and feedback on, program design. ▪ The SEE CoP focused on enhancing employer engagement practices within each of the three colleges.

1.1.2 Organizational Structure

Exhibit 3 shows PATH's consortium-level organizational chart. The personnel fall into three groups: (1) PATH fiscal agent staff, (2) PATH-funded college staff, and (3) other college staff and external stakeholders.

Exhibit 3: PATH Organizational Chart
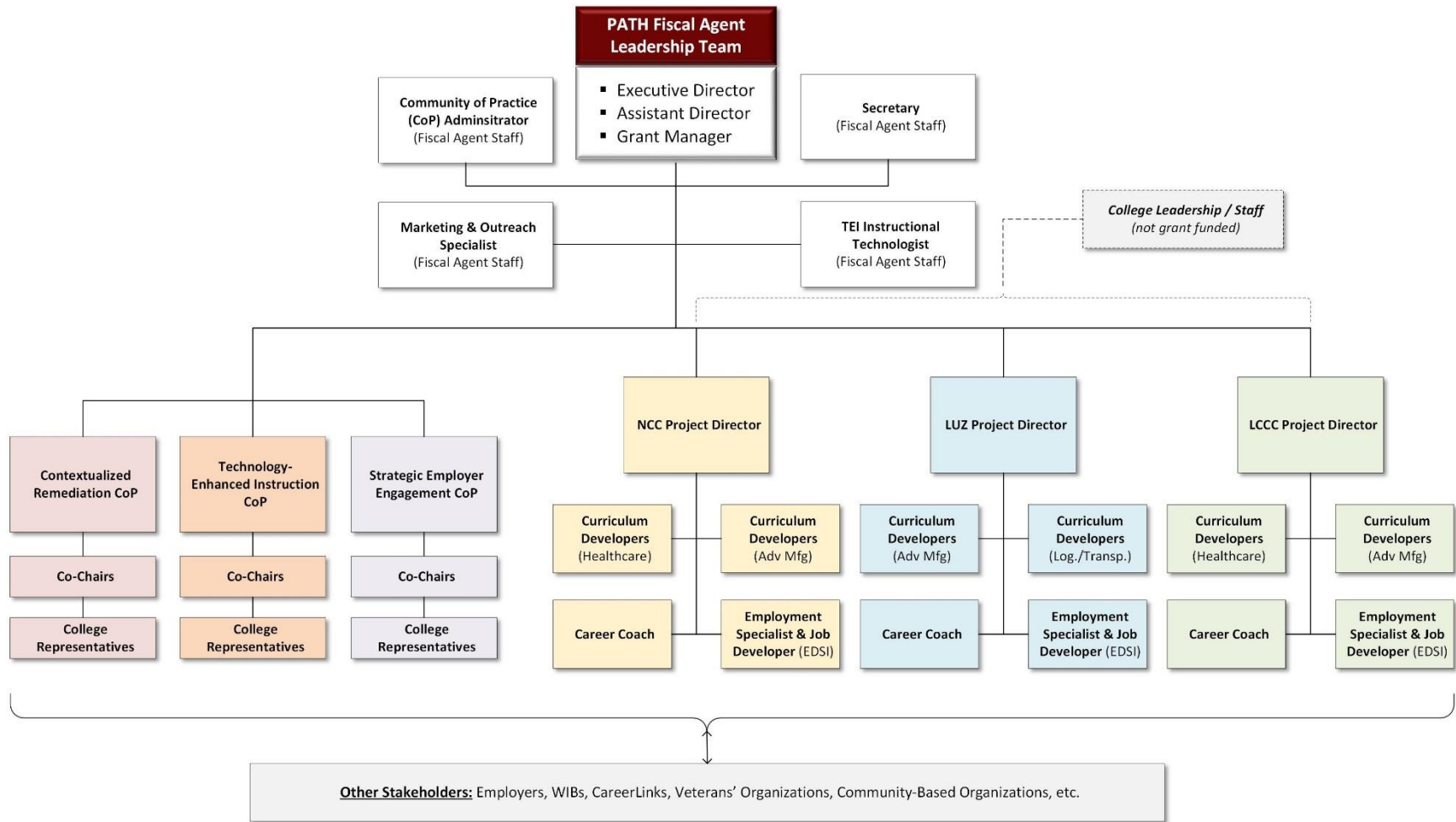
The PATH grant management team, referred to internally as the grant fiscal agent, comprised six people in different capacities:

- **The PATH leadership team**—A group of three: an Executive Director, an Assistant Director, and a Grant Manager.[7] The leadership team provided general oversight for all grant operations. They ensured accountability for successful completion of project milestones/deliverables and were responsible for reporting aggregate progress and outcomes to DOL on a quarterly and annual basis. As needed and applicable, the leadership team provided advice and guidance to colleges on continuous program improvement and potential mid-course corrections. The Assistant Director maintained the program's internal data and acted in the capacity of Institutional Researcher. The Grant Manager oversaw the fiscal management of all PATH grant funds received from DOL across the consortium, and compiled and submitted all financial reports in compliance with DOL requirements.

- **The Instructional Technologist—**The Instructional Technologist (IT) was a consortium-level, part-time grant staff hired to support the TEI CoP and help the individual colleges design, implement, and assess the pilot TEI intervention. One of the main roles of the IT was to participate in all TEI CoP meetings, help co-chairs set the agenda, and keep the project moving forward.

- **The CoP Administrator**—Although the CoP co-chairs, as practitioners, provided guidance to the individual communities and moderated CoP meetings, the CoP Administrator worked with members from each of the three CoPs to set agendas and stay on track with the project timeline. The CoP Administrator also helped moderate each meeting and build relationships among the CoP members, coordinated meeting logistics, provided and disseminated research, and organized and planned training sessions and symposia.

- **The Marketing and Outreach Specialist**—The fiscal agent hired a Marketing and Outreach Specialist in January 2016.[8] This role was to market and advertise the PATH program at the consortium level, but also to provide guidance and assistance to the individual colleges as requested. The Specialist was heavily involved in outreach activities aimed at attracting students, engaging employers, and developing relationships with other important stakeholders (e.g., workforce development boards, CareerLinks, Veterans Affairs, and community-based organizations). The Specialist chosen for the position, who had previous experience

---

[7] PATH Executive Directors transitioned in the first half of 2015, with the new Executive Director starting in June 2015. The transition occurred at an opportune time, as colleges were working independently on program start-up activities and no longer needed significant guidance from the fiscal agent.

[8] An earlier hire for this role was terminated due to unacceptable performance.

engaging employers, was also involved in the SEE CoP. Implementing PATH at the three consortium colleges were PATH-funded college staff:

- **College Project Directors**—Each of the three colleges had a single individual named as PATH Project Director (PD). College PATH PDs oversaw the planning, implementation, and daily operations of all grant-related activities at their respective colleges. They participated in regular meetings with the PATH leadership team and reported the status of implementation, program participation, and outcomes. They monitored progress toward all major project milestones and deliverables, coordinated grant activities with other college leadership/staff, ensured compliance with college and DOL regulations, and managed grant staffing. Although much of the day-to-day implementation of grant activities was delegated to other PATH staff members and college partners, the PDs also directly supported grant activities—specifically marketing, recruitment, and outreach.

- **Curriculum Developers and Instructors**—Each college hired (or funded) expert curriculum developers to create new and revise existing career pathways designated as PATH programs in the three industry sectors. In some cases, curriculum developers were hired as full-time, temporary grant staff. In other cases, full-time college faculty members or adjunct instructors served as curriculum developers, funded through release or overload time. All curriculum developers had extensive industry experience related to the programs of study for which they were responsible. The curriculum developers were also involved in the equipment procurement and facility renovations process, which included deciding which equipment to purchase, identifying vendors and soliciting bids, arranging equipment-related training, and incorporating the new equipment into the curriculum.

- **Career Coaches, Job Placement Specialists, and Job Developers**—To provide the PATH support services offered to students, the grant supported several staff at each college. Career Coaches were responsible for: (1) conducting outreach to prospective students (both current students at the colleges and non-students); (2) conducting the participant intake, orientation, and assessment process; and (3) coordinating a variety of academic, employment, and support services for PATH participants. Career Coaches implemented a case management approach that included "intrusive advising" and regular follow-up with their participants.[9] Part-time Job Placement Specialists were also hired to provide participants with job readiness and placement assistance, such as resume development, interview skills training, job search strategies, and referrals to workshops.

---

[9] Intrusive advising included regularly scheduled follow-up communication (a minimum of three times per semester) between each PATH participant and a Career Coach. The Career Coach initiated the follow-up, and each instance had a specific goal.

Job Developers were procured through a contract with Educational Data Systems, Inc. (EDSI), a privately held company contracted by local workforce investment boards throughout Pennsylvania to provide business services and jobseeker placement services in a number of CareerLink sites. Job development services covered a wide range of activities. Examples include: (1) assistance with resume and cover letter preparation, (2) proactively contacting employers to generate new job leads, (3) sending resumes of good candidates to employers, (4) interacting with employers at job fairs and facilitating direct connections with participants, and (5) bringing employers into the college to speak to students and hold mock interviews. Toward the end of the operational period, the Job Developers also worked to create new employer partnerships for a rotational internship program. Together, the Job Placement Specialists and Job Developers worked to bring employers in to attend career fairs, deliver classroom and workshop presentations, and interview students.

In addition to both the fiscal agent and college staff, other college staff (not funded by the PATH grant) and external stakeholders also contributed to program implementation:

- **College leadership and faculty**—At each college, other personnel not noted earlier were involved in grant operations. Examples include Program Managers who oversaw the grant-impacted programs of study, Vice Presidents (e.g., academic affairs, workforce/community development), and Deans. Leveraged support from career services staff, internal college marketing staff, internship coordinators, non-grant funded instructors, technology support staff, and others helped implement PATH.

- **CoP Members**—Membership in the three CoPs, to varying degrees, included PATH-funded staff members from each college, non-funded college staff members, and fiscal agent staff members. Each CoP was led by two co-chairs with backgrounds and experience related to the CoP strategies. The co-chairs provided overall leadership and direction for that CoP. Individual members participated in ongoing discussions and contributed to research and evaluation activities to help shape development of the pilot CR and TEI interventions, as well as employer engagement strategies. The CoP co-chairs and administrator kept the PATH leadership team apprised of their activities.

- **Employers**—Involvement of regional employers from the targeted industry sectors was critical to the program's success. Employers provided input on the job skills and competencies needed by industry through formal advisory boards, existing WIB-based industry partnerships; and informal relationships with college Deans, Program Managers, and faculty—all of which informed curriculum development. Cultivating relationships with employers was also important for creating hands-on learning (e.g., practicums, internships) and job placement opportunities for students. Employers

also attended job fairs, conducted training workshops and presentations, and provided speakers and mentors to assist students with their career plans.

- **The public workforce system**—The PATH program leveraged strategic partnerships with local Workforce Development Boards (WDBs) and Pennsylvania CareerLink offices to support program activities and objectives. The workforce system helped promote PATH to potential students; recruit and screen potential applicants; offer and coordinate employment, training, and support services to PATH students through WIOA and other partner programs; connect students with employers; and promote efficiency in employer outreach and engagement with support from Business Services Teams.

- **Other stakeholders**—PATH colleges cultivated strategic relationships with many other stakeholder groups, including veterans and community-based organizations. Consortium- and college-level leadership leveraged the services and resources of these organizations for community outreach to target populations, provision of wrap-around support services to participants, and employer engagement.

1.1.3 Local Economic Context

The PATH initiative was intended to offer occupational training that would put students in position to get jobs or advance their careers in industries expected to grow in the region. To put the PATH initiative into some context, we gathered data on relevant labor market trends, focusing on two particular aspects: (1) unemployment rate trends, and (2) employment growth projections by industry. These measures provide a sense of both general labor market conditions in the areas PATH served, as well as the outlook for jobs in the industries PATH targeted.

Trends in Unemployment. Exhibit 4 provides unemployment rates from 2013 to 2017 at county, MSA, state, and national levels. Unemployment rates were highest just before PATH began, when the nation was slowly recovering from the Great Recession. Although the 2013 unemployment rate for Pennsylvania matched the national average (7.4 percent), the two MSAs and five of the six counties PATH served, experienced unemployment rates higher than the national average (Northampton was the exception). As the economy continued to recover, unemployment rates steadily declined each year for each geographic area. Nationally, the rate dropped from 7.4 percent in 2013 to 4.4 percent in 2017, with comparable declines for each PATH MSA and county. By 2018, unemployment rates across the board fell to around 60–65 percent of their 2013 levels.

Exhibit 4: Trends in Unemployment Rates

Area	Unemployment Rate				
	2013	2014	2015	2016	2017
Allentown-Bethlehem-Easton MSA*	**7.8**	**6.1**	**5.4**	**5.2**	**4.9**
Lackawanna county	8.3	6.6	5.8	5.7	5.1
Luzerne county	9.4	7.3	6.5	6.3	5.9
Wyoming county	8.6	6.7	6.1	6.2	5.3
Scranton-Wilkes-Barre MSA	**8.9**	**7.0**	**6.2**	**6.1**	**5.6**
Carbon county	9.3	7.1	6.1	6.0	5.6
Lehigh county	7.8	6.1	5.3	5.3	5.0
Northampton county	7.4	5.9	5.3	5.2	4.9
Pennsylvania	**7.4**	**5.9**	**5.3**	**5.4**	**4.9**
United States	**7.4**	**6.2**	**5.3**	**4.9**	**4.4**

Source: U.S. Department of Labor Bureau of Labor Statistics Local Area Unemployment Statistics
Notes: Figures are annual averages. * Figures include Warren County, New Jersey.

Overall, the trends in unemployment rates were roughly similar in the two PATH MSAs. Unemployment was about 0.8 percentage points higher in the Scranton MSA than in the Allentown MSA in each of the five years through 2017, with the gap narrowing slightly over time. Within the Allentown-Bethlehem-Easton MSA, unemployment was consistently highest in Luzerne County. Within the Scranton-Wilkes-Barre MSA, unemployment was consistently highest in Carbon County.

Employment Growth Projections by Industry. Exhibit 5 summarizes employment projections for each of the three industries targeted by PATH at the MSA, state, and national levels.

Exhibit 5: Employment Growth Projections by Industry

Industry	Region	Employment		Percent Change 2014-2024 (Projected)
		2014 (Actual)	2024 (Projected)	
Healthcare	Allentown-Bethlehem-Easton MSA*	53,940	61,380	13.79%
	Scranton-Wilkes-Barre MSA	42,270	48,680	15.16%
	Pennsylvania	*944,880*	*1,079,180*	*14.21%*
	United States	***18,057,400***	***21,852,200***	***21.02%***
Manufacturing	Allentown-Bethlehem-Easton MSA*	32,120	32,040	-0.25%
	Scranton-Wilkes-Barre MSA	27,450	26,150	-4.74%
	Pennsylvania	*567,190*	*557,150*	*-1.77%*
	United States	***12,188,300***	***11,374,200***	***-6.68%***
Transportation/ Logistics	Allentown-Bethlehem-Easton MSA*	17,790	19,670	10.57%
	Scranton-Wilkes-Barre MSA	17,240	19,280	11.83%
	Pennsylvania	*230,820*	*252,370*	*9.34%*
	United States	***4,640,300***	***4,776,900***	***2.94%***

Source: MSA and Pennsylvania data: Pennsylvania Department of Labor and Industry, Center for Workforce Information and Analysis, *Industry Employment 2014-2024 Long-term Projections*. U.S. data: U.S. Department of Labor, Bureau of Labor Statistics, *Employment by Major Industry Sector (2014 and projected 2024)*.

Notes: Healthcare figures are for two-digit North American Industrial Classification System (NAICS) code 62 (healthcare and social assistance); advanced manufacturing figures are for two-digit NAICS codes 31-33 (manufacturing); transportation/logistics figures are for two-digit NAICS codes 48-49 (transportation and warehousing). * Figures include Warren County, New Jersey.

As shown in the first panel of the exhibit, healthcare employment is expected to increase by 21 percent nationally over the 2014–2024 period, and by about 14 percent in the two MSAs served by PATH. According to the Bureau of Labor Statistics (BLS), the "healthcare and social assistance sector" will account for over a third of the nation's projected job growth over this period.[10] Expected healthcare growth suggests the PATH programs in that industry are well-aligned with future workforce needs of the industry and region.

The second panel of Exhibit 5 summarizes employment projections for the manufacturing industry. Manufacturing as a whole, though broader than the advanced manufacturing

---

[10] See "Industry Employment and Output Projections to 2024." *Monthly Labor Review*, December 2015.

industry targeted by PATH, is the most comparable industry for which employment projections are available. Employment in manufacturing is projected to decrease slightly within the next decade, though less so for Pennsylvania (or either of the two MSAs served by PATH) than for the U.S. overall. Though employment in manufacturing broadly defined is projected to decline, PATH programs specifically target advanced manufacturing, which is more heavily focused than traditional manufacturing on use of the latest technology to improve either manufactured products themselves or the processes used to produce them. BLS projections for advanced manufacturing suggest employment in that sector may grow by 16 percent nationally by 2026.[11]

The last panel of Exhibit 5 focuses on projected employment growth in transportation/logistics. Though employment in that industry category is projected to grow by only 3 percent nationally, projections for Pennsylvania and the two MSAs served by PATH are much higher. Employment in each of the two MSAs, for example, is projected to grow by over 10 percent over the 2014-2024 period.

Collectively, employment projections for the three PATH industries suggest that PATH programs of study were generally well-aligned with expected workforce needs in the region.

1.2 EVALUATION DESIGN

The PATH evaluation consisted of two components: (1) an implementation analysis and (2) an impact analysis.

Implementation Analysis. The main objectives of the implementation analysis were to gain an in-depth understanding of how the PATH program is designed and delivered, examine implementation fidelity, and explore program challenges and successes. The analysis included six steps:

- Document the design, delivery, and outcomes of PATH across the three consortium colleges.

- Explore variation among consortium colleges in program delivery to provide context for the impact evaluation.

- Track implementation progress on an ongoing basis and provide formative evaluation feedback to PATH leadership and the CoPs.

---

[11] Bureau of Labor Statistics, Office of Occupational Statistics and Employment Projections, Employment Projections: 2016-26.

- Record information about implementation challenges encountered, solutions developed, and lessons learned.

- Measure perceived strengths and weaknesses of the program and its value to participants, project staff members, and key stakeholders.

- Identify innovative and promising program implementation strategies that could be sustained by the consortium or replicated in other settings.

One key objective of the implementation analysis was to provide feedback to the PATH team on implementation of the three CoPs during the second year of the grant (i.e., the first year of student enrollment), to enable the PATH team to make any necessary adjustments prior to operations during the third year.

The implementation analysis examined six broad research areas: (1) program context; (2) program design and service delivery; (3) partnerships; (4) program management, funding, and sustainability; (5) program outcomes; and (6) promising practices and lessons learned. To answer research questions in these areas, we relied on four data sources:

- Three rounds of site visits to the three PATH colleges, which included semi-structured interviews with key personnel and, for the second and third rounds, focus groups with PATH students

- Periodic telephone interviews with PATH staff

- Documentation produced in support of PATH operations

- A brief web survey of PATH students

Impact Analysis. The goal of the impact analysis was to answer the three research questions:

1. Was the program effective in improving educational achievement?

2. What was the impact of the program on finding and retaining employment?

3. What was the impact of the program on the earnings of participants?

The impact analysis was originally designed to estimate the overall impact of the PATH program on the educational and employment outcomes of participants with a rigorous, quasi-experimental design. To minimize potential selection bias, we intended to use propensity score matching (PSM) methods to select a comparison group among similar students in similar programs but unaffected by the grant. Using two sources of individual-level data—college administrative data on educational outcomes and state administrative

data on earnings—we planned to estimate statistical models that compared outcomes for participants to outcomes for the comparison group. This would have enabled us to estimate PATH's causal impact on its participants with a known degree of statistical confidence.

After preparing a Detailed Evaluation Plan for the study, however, several developments required us to revisit the design of the impact analysis. First, we were unable to identify appropriate comparison groups for some PATH programs. In response to this, we decided to omit some PATH programs from the impact analysis,[12] and examine participant outcomes (rather than causal impacts) for the omitted programs. Second, the state agency that maintains administrative data on earnings did not agree to provide our research team with the necessary individual-level earnings data, and only with aggregate outcome measures for PATH program participants. In response to this, we decided to omit labor market outcomes from the impact study. For these outcomes, we describe the aggregate labor market outcomes for PATH students only. Chapter 5 reiterates the issues we faced and describes our modified design in detail.

---

[12] As part of this adjustment, we had planned to leverage the staggered rollout of a particular PATH program to use students enrolled in earlier sections of the program—which had not yet been affected by the grant—as a comparison group for later sections of the same program (after some enhancements to the course had been implemented through PATH). However, the phased rollout of PATH was not implemented as planned. Consequently, we were forced to omit that program from the impact analysis as well.

2. Implementation Analysis

This chapter describes our analysis of PATH's implementation in the three participating colleges. Section 2.1 lists the key research questions that guided our data collection and analysis. In Section 2.2 describes the overall progression of the grant, focusing on key milestones during the grant period. Section 2.3 discusses PATH operations in detail, including grant activities in which students were not directly involved, such as the process of curriculum development and the operation of the three CoPs. Section 2.4 highlights the successes achieved and challenges faced by PATH, along with lessons learned that may inform future programs like PATH. Section 2.5 presents our observations regarding the potential sustainability of PATH program features. Section 2.6 summarizes the chapter.

2.1 RESEARCH QUESTIONS

Five categories of key program-wide questions guided our analysis, as listed below.[13]

PATH Programs of Study and Participant Services

1. Which components of the career pathways model were incorporated into PATH's program design, and to what extent?

2. Which specific programs of study were developed under PATH, and why were they selected?

3. What curricula changes, facility renovations, equipment purchases, or other activities were required to develop these programs?

4. How did PATH use online and/or technology-enabled learning strategies to support program implementation, deliver training, and/or provide services to participants?

5. What types of employment, academic, and wrap-around support services were made available to PATH participants? Which were most useful to PATH participants and why?

---

[13] Note that this list is not comprehensive. Our data collection instruments (e.g., interview and focus group protocols) and other evaluation activities included many additional detailed questions tailored to each college, program component, and type of interviewee. Furthermore, we updated, refined, or revised our questions with each new round of data collection.

Outreach and Marketing

1. What outreach and marketing strategies were most effective for attracting participants, employers, and other stakeholders to the program?

2. How were outreach and marketing activities coordinated across the consortium?

Employer Engagement and Stakeholder Alignment

1. What strategies did PATH use to effectively engage employers and industry representatives within the targeted industry sectors?

2. How were employers and industry representatives involved in PATH and what were their contributions?

3. How did PATH coordinate with the public workforce system and other stakeholder entities—such as philanthropic organizations, community-based service providers, and other education institutions—to implement the program?

4. In what ways did PATH engage or align itself with previously-funded TAACCCT projects?

Challenges, Successes and Lessons Learned

1. What challenges did grant staff encounter during the start-up phase or later in the program's implementation? How were they addressed and what lessons were learned?

2. What employment challenges did PATH students experience and what strategies did PATH staff use to overcome them?

3. What challenges did grant staff face when recruiting, engaging and providing services to PATH students?

Sustainability

1. Which components of the program are likely/not likely to be sustained? What types of support and resources are needed to ensure sustainability?

2.2 MILESTONES

The period of performance for the PATH TAACCCT grant ran from October 2014 through September 2018. To efficiently summarize the key aspects of the PATH's implementation over that period, we group key accomplishments into two categories: (1) program milestones and (2) evaluation milestones. For each group, we briefly describe the timing of key activities during the grant period.

Program Milestones. Exhibit 6 shows a timeline of key program milestones. Within a year of the start of the grant period, the PATH management team went through some change, with its Executive Director resigning at the end of March 2015. An Interim Executive Director took over until a permanent replacement began in June 2015. The formal curriculum development process began roughly six months after the start of the grant, in March 2015. By September 2015 students had begun enrolling in PATH programs at all three colleges. For the two colleges that used the grant to improve facilities and purchase equipment, these activities were complete in September 2015 (NCC) and March 2016 (Luzerne). PATH enrolled many more students than originally expected. By January 2016 the program had already enrolled half of its overall goal of 497 students. It achieved its enrollment target only slightly past the halfway mark of the grant period, in August 2016. In August 2017 the program enrolled its 1,000th student. PATH operations officially ended in March 2018.

Exhibit 6: Program Milestones
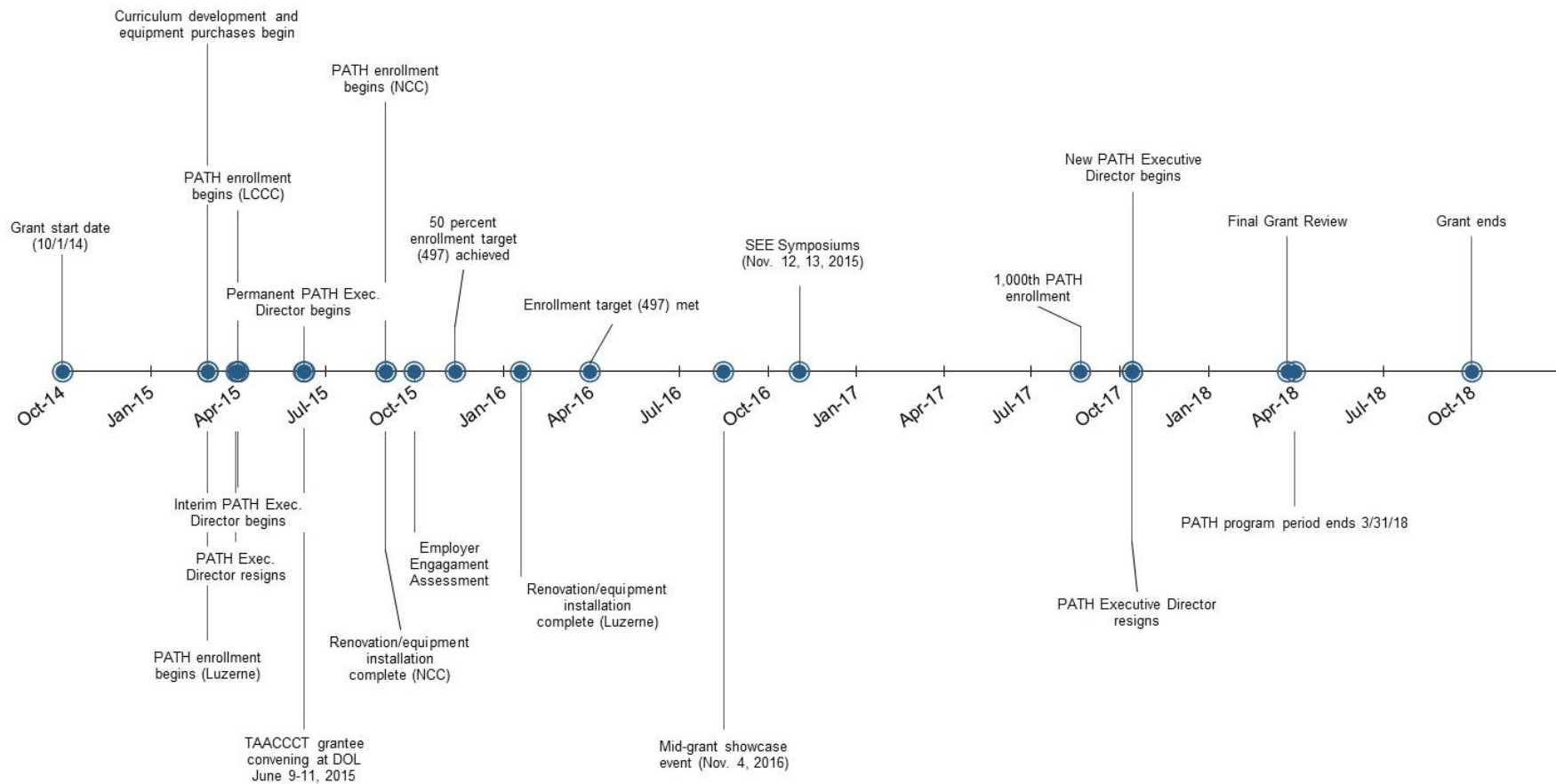
Evaluation Milestones. Exhibit 7 shows a timeline of key evaluation-related milestones. The evaluation started in April 2015, when NCC contracted with IMPAQ to evaluate PATH. Within the first year of the evaluation, we had executed a data sharing agreement with NCC and conducted the first round of both telephone interviews and site visits. The first round of the PATH student survey was fielded in April 2016. Thereafter, we periodically collected data via additional rounds of site visits, telephone interviews, and the survey. In February 2018 we received the most current records from NCC on PATH enrollment, along with aggregate labor market outcome data NCC had received from Pennsylvania's Center for Workforce Information and Analysis (CWIA).

Exhibit 7: Evaluation Milestones
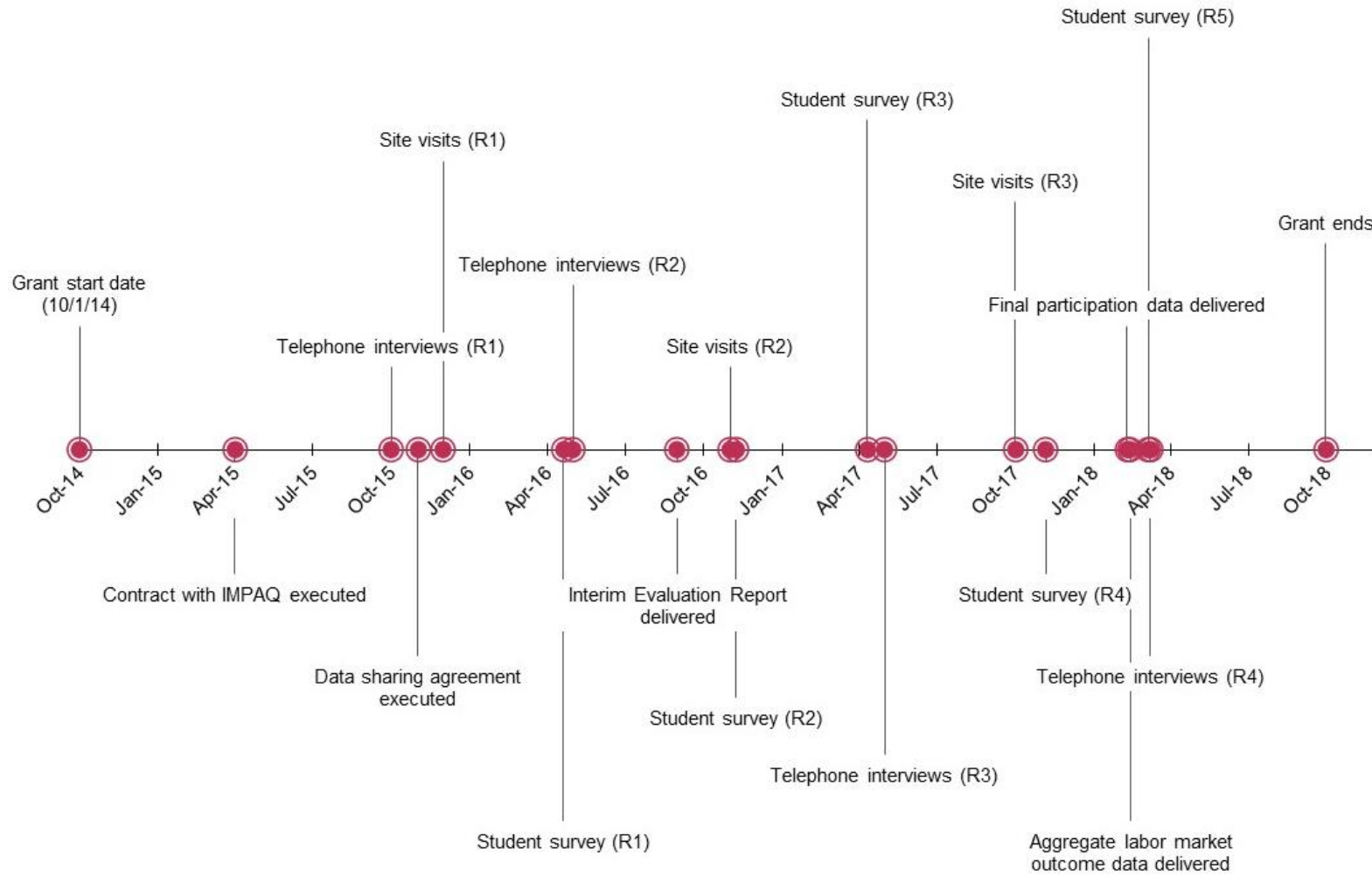
2.3 OPERATIONS

We begin our description of how the major components of PATH were designed and implemented with the PATH programs of study and curriculum development activities performed by each college. Next, we discuss the three CoPs and their related program activities. We then describe the different types of employment and support services available to PATH students, followed by highlights of PATH's key outreach and marketing strategies and activities.

This section focuses on describing the key features of these program components and aspects of their implementation.[14] The results of our implementation analysis are discussed in Section 2.4

2.3.1 PATH Programs of Study

The PATH programs of study were chosen by the colleges because the programs had been identified as not meeting the needs of employers and were in high-growth industry sectors. In developing these programs, each college's main objectives were to: (1) align the curricula with employer needs and industry standards; (2) incorporate industry-recognized credentials and certifications; (3) use up-to-date, cutting edge equipment for hands-on training; and, (4) provide clear pathways to in-demand occupations within the three industry sectors.

Across the consortium, a total of 30 credit and noncredit training programs were successfully developed through PATH.[15] Of the 30 training programs, 18 were in the advanced manufacturing sector, 10 in the healthcare sector, and two in the logistics/transportation sector. Many of these programs existed prior to the grant but were redesigned or enhanced through a combination of curriculum changes, equipment upgrades, and facility renovations. Some new credential programs were also created.

Below, we describe each college's PATH programs in turn.

LCCC. LCCC's curriculum development activities focused on noncredit training programs and certificates of completion, in the healthcare and advanced manufacturing industry sectors. These noncredit programs were designed to meet the immediate needs

> *LCCC launched **11 career pathways**, remodeled and updated **over 1,500 square feet of classroom space**, and **invested $400K in new equipment** purchases.*

---

[14] Additional detail on each PATH component are available in the interim evaluation report.

[15] Noncredit PATH certificate programs were offered only at LCCC, which offered these programs exclusively.

of students and employers and get students the skills and competencies they need to get into the workforce as quickly as possible. The specific training programs developed within each targeted sector, the embedded national standardized certification exams, and expected completion times, are listed in Exhibit 8.[16] Though not shown in the exhibit, LCCC also developed an Introduction to Healthcare Careers course in collaboration with NCC. We describe that course in the context of NCC's programs of study

Exhibit 8: LCCC PATH Programs of Study

Program	National Standardized Certification Exam(s)	Length
Healthcare		
Healthcare Administrative Assistant	Certified Medical Administrative Assistant	3 months (356 hours)
Nurse Aide Diploma	PA Department of Education: Nurse Aide Competency	1-2 months (122 hours)
EKG Technician	NHA – National Health Career Association EKG Technician; Certified CardioTech	1 month (48 hours)
Phlebotomy Technician	American Society of Consultant Pharmacists (ASCP) Phlebotomy Technician (PBT)	2 months (100 hours) *
Pharmacy Technician	PTCB- Pharmacy Technician Certification Board	4 months (125 hours)
Advanced Manufacturing		
Production Technician	None (Certificate of Completion Only)	4-6 months (200 hours)
Mechatronics AMIST Level 1[17]	PMMI certifications**	10 months (439 hours)
Mechatronics AMIST Level 2[18]	PMMI certifications**	12 months (434 hours)
Manufacturing Simulation	None (Certificate of Completion Only)	6 months (65 hours)
Advanced Manufacturing		

---

[16] More information for each program, including a course roadmap, description of skills achieved, certification opportunities, and information about related careers can be found at http://www.pathcareers.org/students. The website includes similar information for programs at the other PATH colleges, too.

[17] AMIST Level 1 Programs Areas include: Pneumatics, Programmable Logic Controls (PLC's) Level 1; PLC's Level 1 with Prerequisites; PLC's Level 1 with Electrical Systems; PLC's Supplement to Industrial Automation Technician; Mechanical Technician Level 1; Mechanical Drive Part 1; Industrial Electrical Technician Level 1- Part 1; and, Industrial Electrical Technician Level 1- Part 2. (Source: pathcareers.org)

[18] AMIST Level 2 Programs Areas include: Advanced PLC's; Automation Technician Level 2; Automation Technician Mobile Unit; Industrial Electrical Technician Level 2 Part 1; Industrial Electrical Technician Level 2 Part 2; Industrial Mechanical Drive Systems Part 1 and 2; Heavy Manufacturing Mechanical Drives; Vibration Analysis; Vibration Analysis & Laser Alignment; Central Lubrication; and, Hydraulics. (Source: pathcareers.org)

Program	National Standardized Certification Exam(s)	Length
FANUC Robotics	None (Certificate of Completion Only)	2 months (40 hours)
CNC Machining	NIMS Measurement, Materials & Safety*** CNC Turning: Setup & Operations CNC Milling: Setup & Operations	102 hours

Source: LCCC PATH materials.
Notes: All programs are noncredit; graduates earn a certificate of completion from LCCC. For some programs, LCCC proctors the corresponding certification exam on-site. For others, exams are offered only at third-party locations (e.g., Nurse Aide certification). * A further 100 hours of on-the-job training is required for a clinical certificate. ** PMMI = The Association for Processing and Packing Technologies. *** NIMS is the National Institute for Metalworking Skills.

Another LCCC objective was to develop credit articulation agreements that would allow completers of the noncredit programs to immediately enter the workforce, later return to LCCC for additional training, and get credit for their work in the completed noncredit courses. LCCC was able to develop options for credit articulation to existing AAS programs for the Healthcare Administrative Assistant and Mechatronics programs.[19]

In addition to developing and enhancing their short-term training options, LCCC used PATH funds to make renovations to a classroom dedicated to the TAACCCT healthcare programs, which is where the Healthcare Administrative Assistant program was held, and the medical office lab. LCCC also purchased a variety of equipment to support their advanced manufacturing programs. For example, Exhibit 9 shows an image of new robotics training equipment that LCCC purchased through PATH. Renovations were also made to the manufacturing lab; the circuit panel was upgraded and electrical and air lines were run throughout the room to support the new equipment that was purchased through the grant.

---

[19] The Healthcare Administrative Assistant programs transfers to three degree programs: Medical Assistant (A.A.S.), for 10 credits; Healthcare Technology Specialist (A.A.S.), for 3 credits; and Medical Billing and Coding (Specialized Diploma), for 3 credits. The Mechatronics AMIST Levels 1 and 2 transfers to three A.A.S. programs: Industrial Automation (INR), for 12 credits; Electrical Technician (ELT), for 12 credits; and Mechanical Technician (MET), for 6 credits.

Exhibit 9: LCCC Robotics Training Equipment Image
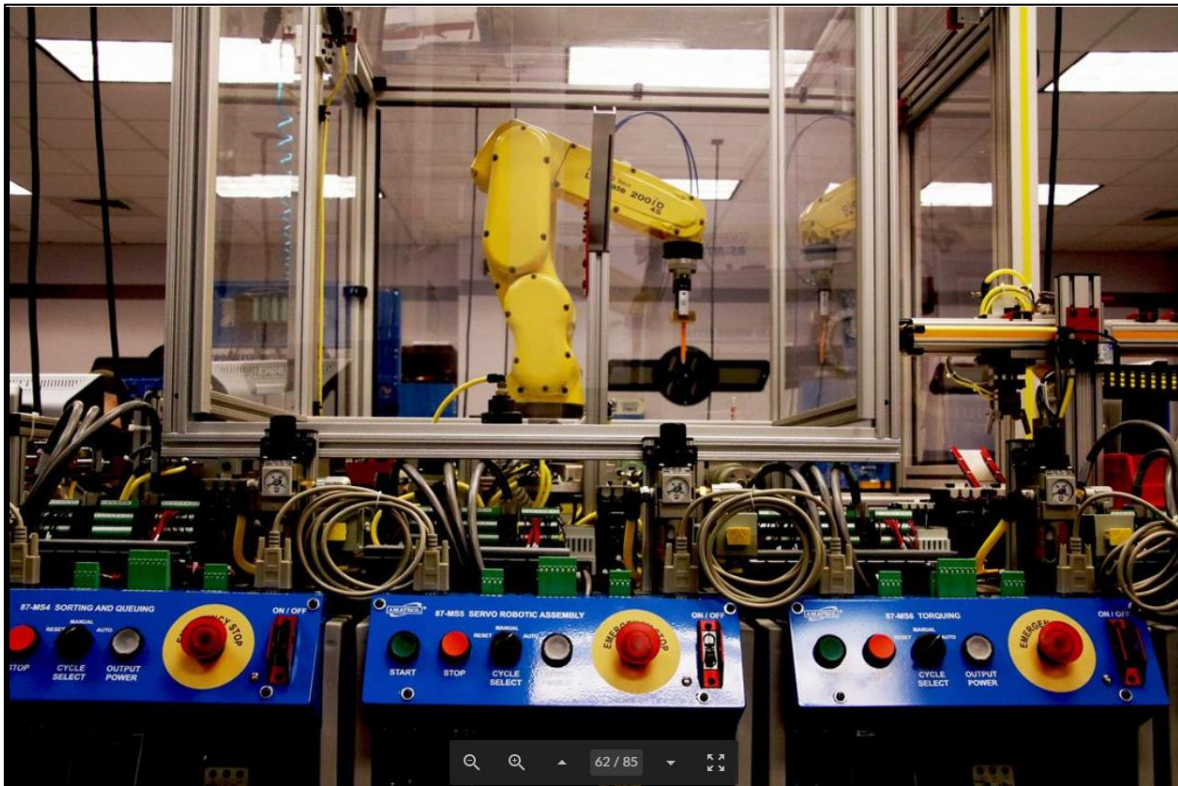
Luzerne. Luzerne's curriculum development activities focused on programs of study within the advanced manufacturing and logistics and transportation industries. These programs are listed in Exhibit 10, along with the credentials and length of training.

Exhibit 10: Luzerne PATH Programs of Study

Program	Credential	Length
Advanced Manufacturing		
Welding Fundamentals	Diploma	1 semester (15 weeks)
Welding (Advanced)	Certificate of Specialization	2 semesters (10 months)
Engineering Design Manufacturing Technology	Associate of Applied Science	8 semesters (24 months)
Logistics and Transportation		
Diesel Truck Technology	Diploma	1 semester (5 months)
Diesel Technology Specialist	Certificate of Specialization	2-3 semesters

Source: Luzerne PATH materials.

Luzerne developed two programs of study within the advanced manufacturing sector—Welding and Engineering Design Manufacturing Technology (EDMT). Prior to the PATH grant, Luzerne offered only one noncredit introductory welding course, which was created under a grant awarded in the first round of TAACCCT. Luzerne revised this course under PATH to become a credit course (Introduction to Welding Processes-WEL 100). Luzerne also created five entirely welding new courses,[20] which—in addition to the credit WEL 100 course—comprised a brand-new welding diploma program.[21]

The new welding diploma program was designed as a one-semester track for full-time students (class attendance for four hours, five days a week). Luzerne also developed an advanced welding certificate of specialization for welding diploma graduates who wanted to continue training, or for incumbent workers who wanted to upgrade their skills. This new certificate program involved development of four entirely new welding courses.[22] To develop the curricula for these courses, Luzerne assembled an advisory team and gathered recommendations from employers and instructors.

For the new EDMT program, Luzerne redesigned nine courses and enhanced eight existing courses through equipment upgrades. Prior to the PATH grant, Luzerne offered two separate certificate programs—one for computer aided design and one for automated manufacturing systems. Luzerne decided to combine the two programs into one EDMT A.A.S. program for the PATH program based on advisory board feedback that smaller employers need graduates with the combined set of skills.

Luzerne also developed two credential programs in the logistics and transportation sector: diesel truck technology (diploma program) and diesel technology specialist (certificate of specialization). The diesel truck technology diploma program existed prior to the grant, but the courses were enhanced with upgraded equipment and tools. Before PATH, the program only had one type of diesel engine available for student training. The new equipment—a diesel engine simulator as shown in Exhibit 11—now allows students to develop broader experiences across different diesel engine types, a skill set that is sought by employers.

---

[20] The new courses created were: (1) WEL-102: Intro to Oxygen and Acetylene Welding; (2) WEL-104: Intro to Shielded Metal Arc Welding; (3) WEL-106: Intro to Gas Metal Arc Welding; (4) WEL-108: Intro to Gas Tungsten Arc Welding; and, (5) MAT-103: Applied Mathematics for Industry.

[21] The new welding diploma program was offered in the Fall 2015 semester. All curriculum development at Luzerne was coordinated by one curriculum developer—with input from the instructors—who was already employed at Luzerne prior to PATH.

[22] The four new courses for Advanced Welding are: (1) WEL-102 Intro to Oxygen and Acetylene Welding (OAW); (2) WEL-104 Intro to Shielded Metal Arc Welding (SMAW); (3) WEL-106 Intro to Gas Metal Arc Welding (GMAW); and, (5) WEL-108 Intro to Gas Tungsten Arc Welding (GTAW).

Exhibit 11: Luzerne New Diesel Engine Simulator Image

The diesel technology specialist certificate of specialization was newly created for PATH, along with three new courses Luzerne created for that certificate. The Applied Math course required for the program had existed previously but was revised to incorporate diesel truck technology–specific learning lessons and examples.

NCC. NCC's programs of study were in the healthcare and advanced manufacturing sectors. NCC developed multiple programs within each sector—from shorter programs leading to a Specialized Diploma, to longer programs leading to an Associate of Applied Science (AAS) degree. NCC's programs, with their associated credentials and training length, are listed in Exhibit 12.

Exhibit 12: NCC PATH Programs of Study

Program	Credential	Length
Healthcare		
Healthcare Billing & Coding	Specialized Diploma	2 Semesters (12 Months)
Healthcare Office Specialist	Certificate	3 Semesters (18 Months)
Healthcare Office Coordinator	Associate of Applied Science	4 Semesters (24 Months)
Medical Assistant	Specialized Diploma	3 Semesters (18 Months)
Advanced Manufacturing		
Instrumentation: Process Control	Specialized Diploma	3 Semesters (18 Months)
Electromechanical	Associate of Applied Science	4 Semesters (24 Months)
Welding Fundamentals	Specialized Diploma	2 Semesters (12 Months)
Welding & Fabrication	Certificate	3 Semesters (18 Months)
Welding Technology	Associate of Applied Science	4 Semesters (24 Months)

Source: NCC PATH materials.
Note: Program lengths assume full-time student status except for Healthcare Billing and Coding, which assumes part-time status.

NCC—Healthcare. Each of the healthcare programs listed in Exhibit 12 existed prior to the PATH grant. However, since NCC determined they were not adequately addressing the current needs of industry, NCC staff worked closely with employers and industry experts to identify the specific skill and knowledge gaps in the curriculum. NCC's curriculum developer also led focus group discussions with industry experts from several local hospital systems to inform the curriculum changes.

As a result of these discussions, NCC redesigned three existing Office Administration (OFAD) courses[23] and created five entirely new OFAD courses.[24] The additional coursework did not replace existing curriculum but made it more rigorous. The curricula for all courses were successfully developed and approved through NCC's curriculum governance process.

---

[23] OFAD 172: Health Insurance Basics, OFAD 240: Medical Office Management, and OFAD 270: Advanced Coding.

[24] OFAD 175: ICD-10-CM/PCS Coding, OFAD 176: CPT Coding Methodology, OFAD 177: Health Information Technology, OFAD 275: Coding & Billing Capstone, and OFAD 276: Capstone Diversity & Culture.

NCC also used PATH grant funds to make cosmetic renovations to the Medical Office classroom, as well as substantial upgrades to the medical office "living lab," which simulates common office processes used in the industry. NCC modeled this lab to match what NCC's healthcare curriculum developer learned through visiting local medical offices.

In addition to the credit courses described above, the curriculum developers from NCC and LCCC worked together to create a noncredit course—Introduction to Healthcare—that was taught on a rotational basis at both campuses and at the CareerLink offices. The course educated individuals interested in careers in healthcare about the different types of career pathways available, and the associated skills and experience required for each. The information presented in the course enabled students to make more informed decisions about career paths for which they were best suited, as well as to clarify potential misperceptions about occupational requirements. The course helped attract a number of individuals from the CareerLink to NCC and LCCC's healthcare programs.

NCC—Advanced Manufacturing. NCC's advanced manufacturing programs consisted of Instrumentation—Process Control, Electromechanical, and Welding. For the Instrumentation—Process Control and Electromechanical programs, NCC created three new courses and redesigned one, all of which were part of the curriculum for both programs. NCC used a combination of guidelines from the International Society of Automation (ISA), new textbooks, and input from industry experts to develop the curriculum.

NCC's other advanced manufacturing programs focused on welding. Prior to the PATH grant, NCC only offered a Welding Specialized Diploma program. The Welding and Fabrication Certificate and Welding Technology AAS programs were entirely new programs developed through PATH. Together, the three programs provide a clear, stackable credential pathway that allows for different training entry and exit points. Moreover, the program names have specific connotations that employers recognize. The diploma program prepares individuals for basic welding jobs, the certificate program allows participants to work as certified welders, and the AAS program prepares students for work as welding inspectors.

NCC created seven new courses to offer these programs. One of the newly created courses (WELD 135) was also added to the Welding Fundamentals Specialized Diploma program, to make it more rigorous and better meet employer needs. The redesign of existing courses entailed updates based on new textbooks and incorporating recent American Welding Society (AWS) guidelines. The redesigned WELD 105 course combined what used to be four short courses for stick welding, and incorporated LiveArc Virtual Welder activities using new equipment procured via the grant.

Input into the curriculum changes was not provided through formal advisory boards, as NCC did not have enough time to put these boards together based on the project timeline. However, the combined experience of the curriculum developers, program managers, and faculty—and their professional contacts—provided the necessary expertise to identify appropriate curriculum changes.

The development of many PATH programs—particularly those in advanced manufacturing (or transportation and logistics at Luzerne)—was completely dependent on new equipment and/or renovations to existing training facilities. For the welding programs at NCC, this included renovations to the welding lab and new equipment such as plasma cutters, both shown in Exhibit 9.

Exhibit 9: NCC Welding Lab Renovations and Equipment Images

2.3.2 Communities of Practice

In this section we describe the design and operations of the three CoPs (CR, TEI, and SEE). For each CoP, we discuss the activities performed at the consortium level (i.e., all members of the CoP) as well as the pilot activities specific to each college. Because the CR and TEI CoPs share similar objectives and implementation processes that are different from those of the SEE CoP, we discuss them together. A separate discussion of SEE follows.

CE and TEI CoPs

Exhibit 10 on the next page depicts the general design and implementation process for the CR and TEI CoPs. The top half of the exhibit summarizes the major activities conducted by the consortium-wide CoPs; the bottom half summarizes pilot implementation steps that occurred at the college level.

Exhibit 10: CR and TEI CoP Design and Implementation Process
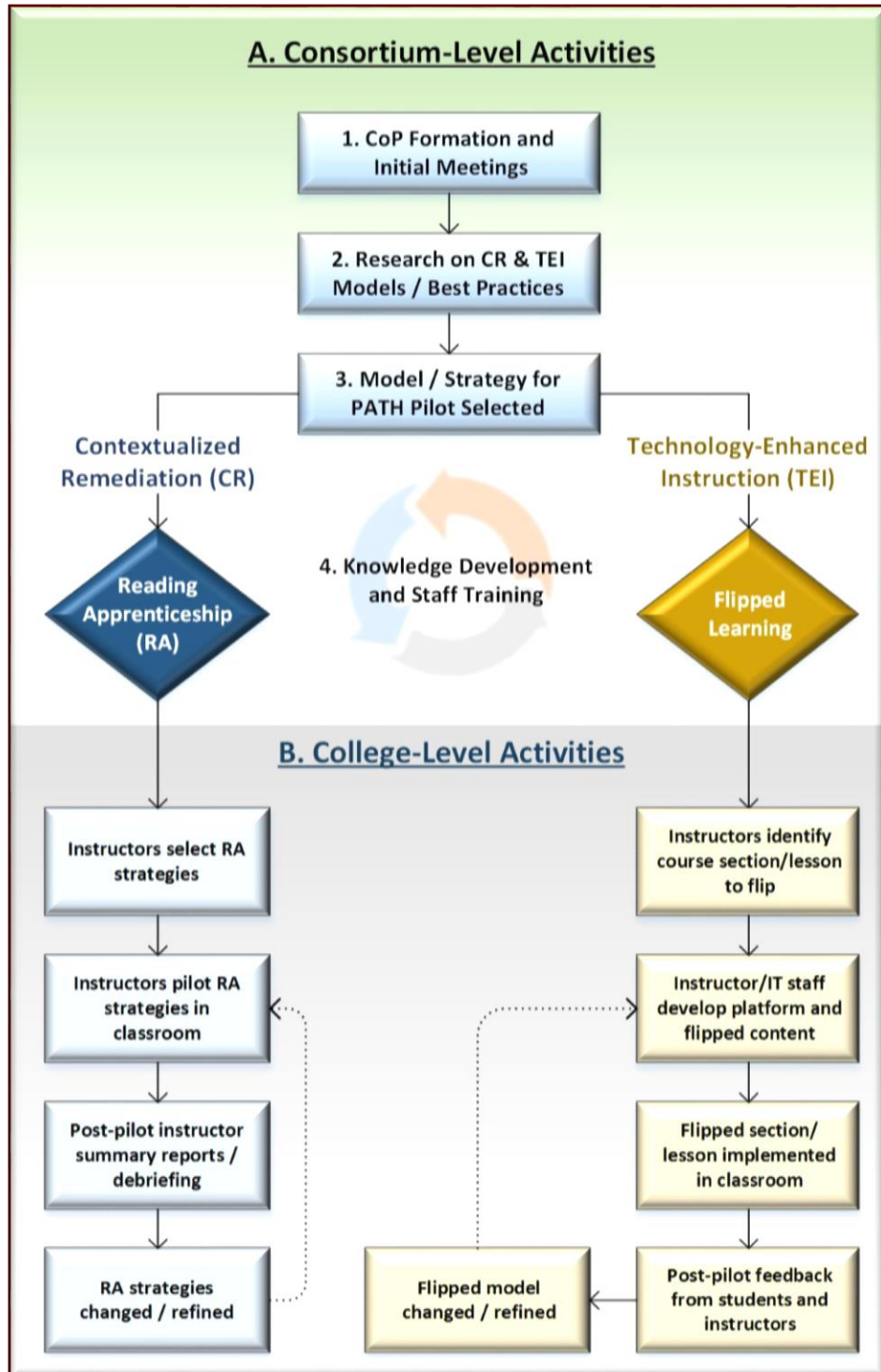
Consortium-Level Activities. At the consortium level, the CR and TEI CoPs completed the following four steps before each college could carry out the related pilot activities:

Step 1—CoP Formation and Initial Meetings. The formation of each CoP began with each college selecting representatives to participate—which included faculty with relevant subject matter expertise, select PATH staff, and other faculty or college leaders directly involved in the implementation process. Each CoP also included two volunteer CoP co-chairs. Both the CR and TEI CoPs were established in Grant Year 1 and started meeting bi-weekly in February and Mach of 2015, respectively.

Step 2—Research on Models and Best Practices. During the initial meetings, CR CoP members conducted a comprehensive review of relevant literature to identify proven CR models, implementation strategies, and best practices. Members then selected promising CR models for further in-depth research and reported back to the full group on their findings. Best practices and models reviewed by CR CoP included, but were not limited to: Reading Apprenticeship, I-Best, Course Redesign, Learning Communities, and Accelerating Opportunity. Several other models were identified but discounted without the group's serious consideration. The TEI CoP's initial meeting activities also involved identifying, reviewing, and assessing best practice models for the use of instructional technologies to expedite and enhance the educational process.

Step 3—Model/Strategy Selection. CR CoP members weighed the advantages and disadvantages of each model studied, discussed its implementation feasibility, and ultimately selected the *Reading Apprenticeship®* (RA) model developed by WestEd's Strategic Literacy Initiative.[25] The TEI CoP selected the *flipped classroom* learning model to be implemented in the selected PATH courses, and researched the technology infrastructure, instructional materials, and resources needed to support flipped classroom activities. In this model, students are provided with materials to review outside the classroom, with class time spent on group discussions or in-class problem solving.[26]

---

[25] https://www.wested.org/project/reading-apprenticeship/

[26] For more detail on the approach and some applications, see https://bit.ly/1H3Beb6.

Step 4—Knowledge Development and Staff Training. Since the CR and TEI models were relatively new and unfamiliar to the college instructors implementing the pilots, upfront

> *PATH sponsored professional development for CR and TEI CoP staff—including a three-day in-person RA training, three TEI summits featuring nationally recognized experts, conferences, and ongoing technical assistance.*

and ongoing training and knowledge development were imperative. PATH sponsored several related training and professional development initiatives, including a three-day in-person session for RA (conducted by a certified RA trainer) and three TEI summits featuring nationally recognized experts.

The fiscal agent instructional technologist also developed TEI implementation guidance and provided ongoing technical support to each college.[27] Knowledge development for RA and the flipped classroom model was a continuous process, with faculty receiving technical assistance from CoP members at their college throughout the pilot process.

College-Level Activities. At the college level, implementation of the CR and TEI interventions followed similar processes, with slight intervention-specific variations.

CR Implementation Steps. To implement the CR intervention, the first step was for college instructors to select a subset of RA strategies and create a classroom implementation plan. Next, the instructors were to implement the selected RA strategies in their PATH courses.[28] The third step was for the instructors to create summary reports to document and evaluate the techniques applied in the classroom. In addition, the instructors and other CoP members participated in collective debrief meetings. During these meetings, instructors discussed how implementation progressed, which CR strategies were used, what worked well and what did not, and plans for implementing the next iteration of the pilot.[29] For the fourth step, the pilot RA strategies and/or implementation plans were refined as necessary and re-implemented as a new pilot. This iterative process continued for each pilot throughout the program performance period.

TEI Implementation Steps. The slight differences in implementation of the TEI intervention were due to differences in the type of intervention. Implementation of the TEI flipped

---

[27] For example, the IT developed (and refined) a *Development and Implementation Guide,* intended as a "self-serve" guide for the colleges, which provided tips on creating course materials and leveraging open source content. The IT also developed a *Flipped Learning Pilot Guide* in conjunction with the TEI CoP to help with the second round of the pilots.

[28] The CR pilots were implemented in Introduction to Welding Processes (NCC), Introduction to Welding (Luzerne), and the Certified Nurse Aid program (LCCC).

[29] Pre and post-Tests for Adult Basic Education (TABE) were also administered to each student in an attempt to gauge any improvement in basic Math and Reading scores.

activities was not intended to be overly prescriptive. The member colleges did not need to use any specific technologies, with each using its own.[30] As a first step in designing the intervention, college faculty reviewed course syllabuses to select areas that were the best fit for the flipped learning activities. Learning objectives were then divided between basic and advanced, with the basic learning activities were flipped. The expectation was that each college would flip one to three lessons in the course; each college successfully met that expectation.[31] The colleges then developed a variety of materials for the online learning platforms and implemented them in the selected course section. Example materials include videos of lectures, slideshows, online textbook resources, and embedded links to external videos.

Prior to the start of the pilot, each college administered a Student Technology Access Survey. The goal of this survey was to assess students' level of access to, and comfort with, techniques for accessing the internet and completing typical tasks on their personal computers. Each college also developed online assessments, so students could test their knowledge after reviewing the pre-class materials. In addition, the TEI CoP developed three rounds of survey instruments—course-start, mid-flip, and course-end— to monitor and evaluate the flipped classroom interventions.

For the course-start survey, instructors and support staff reported on their attitudes toward preparation of flipped lessons, expectations about student receptiveness, anticipated level of support needed, and how complete their materials were at the beginning of the course. For the mid-flip survey, instructors and support staff reported on their experience halfway through the intervention. This reporting included information on perceived student achievements, time and resources expended, challenges, lessons learned, and suggested modifications. For the course-end survey, which was similar to the mid-flip survey, all three stakeholder groups reported their reflections on the intervention as a whole.

Students also completed five rounds of a survey to provide feedback on their experiences with, and attitudes toward, the flipped learning method of instruction. Feedback collected from these surveys helped inform changes or enhancements to improve subsequent iterations of the pilot.

---

[30] NCC and Luzerne used Blackboard-Learn, a web-based virtual learning environment and course management system. LCCC used CourseSites, a free online learning platform developed by Blackboard.

[31] The TEI intervention is implemented in Introduction to Welding Processes (NCC), Engineering Graphics (Luzerne), and the Medical Terminology section of the Healthcare Technology Specialist certificate program (to become Healthcare Administrative Assistance program) at LCCC.

Implementation Highlights: LCCC. The RA intervention at LCCC was piloted in the Nurse Aide Program by LCCC's Nurse Aide Program Coordinator/Instructor (an adjunct). The first pilot was implemented in the fall, for the class ending November 18, 2015. The instructor selected and implemented the following six RA strategies: (1) Reading Aloud, (2) Student Presentations, (3) Small group discussions, (4) Creating Word Groups, (5) a one-minute paper, and (6) Role Play.

LCCC's flipped classroom pilot was implemented in the Medical Terminology section of the HAA program, starting in fall 2015 and running 10–11 weeks. The instructor of this HAA section developed eight originally authored OER PowerPoint presentations, and then worked with the HAA computer instructor to turn them into voice-over videos and post them online to CourseSites (the free version of Blackboard) for students to access. These eight OER videos, which were also uploaded to You Tube (links provided), are listed below.

- <u>Video 1:</u> Pre-fixes, Root, Suffixes (https://youtu.be/j5F5V3_P_ms)
- <u>Video 2:</u> Medical Specialties (https://youtu.be/-suriXrykgM)
- <u>Video 3:</u> Medical Symptoms and Procedures (https://www.youtube.com/watch?v=UZDhDKO7Icc)
- <u>Video 4:</u> Medical Symptoms and Procedures (https://www.youtube.com/watch?v=wv9gtdNtyFY)
- <u>Video 5:</u> Integumentary System (https://youtu.be/jc0etJ-fIrk)
- <u>Video 6:</u> Respiratory System (https://youtu.be/NqTIMIPv9Js)
- <u>Video 7:</u> Cardiovascular System (https://youtu.be/whnByjo4rvY)
- <u>Video 8:</u> The Urinary System (https://youtu.be/ByXAy2vznHM)

Students were asked to watch these videos in advance of the corresponding class, which included quizzes (using Quizlet) that enabled students to test their knowledge after viewing each video. In addition to the eight created specifically for the pilots, the instructor found other open source videos (with links provided to students on CourseSites) as additional learning resources. In all, a total of 19 videos were added to CourseSites.

Implementation Highlights: Luzerne. The RA intervention at Luzerne was piloted in the Introduction to Welding course (WEL-100) for the new welding fundamentals diploma program. The pilots ran from the spring 2016 semester through the fall 2017 semester. The

RA strategies were not implemented in the fall 2015 semester as originally planned, because the instructor did not feel sufficiently prepared to begin the teaching.[32]

One of the co-chairs, an adult literacy expert, met with the instructors weekly during the first two semesters, to discuss implementation progress and any challenges the instructors were facing. This group also met for debriefs at the end of each semester

> *At Luzerne, regular onsite support provided by the CR CoP Co-Chair helped generate buy-in and engagement from the instructors.*

to discuss what worked well, what did not, and how the strategies could be adapted or improved for subsequent pilot iterations. From the perspective of the instructors, the co-chairs' guidance and support throughout each stage of implementation was critical to the success of the pilots.

The RA strategies were implemented in the spring 2016 semester. These included Talking to the Text, Thinking Aloud, and writing about past reading history. The welding instructor for that period found the most value from the personal reading history activities, which provided insight into the students' learning styles. These same strategies were implemented in the fall 2016 semester. In fall 2017, a different welding instructor implemented two RA strategies in the welding course—Developing Reader Fluency and Stamina and Developing Metacognition.

The flipped classroom pilot was implemented in the EDMT-112 course (3-Dimensional Modeling) by the instructor, with support from Luzerne's Instructional Designer. The first flipped classroom pilot, implemented in the fall 2016 semester, included two flipped lessons (or modules) for Engineering AutoCad Command that were explained through online tutorials. As summarized in the instructor report, the pre-class activities consisted of lecture-led instructions on techniques for creating mechanical parts. From this lecture, students were asked to reference textbook problems and theory before class. Students were also given projects to work on outside the classroom and participated in the learning modules created on the course management software (LEARN). For the post-class activities, students were asked to work on Projects, an extension of the laboratory. A laboratory may consist of five CAD drawings, for example, in which case students were assigned a post-

---

[32]As a content expert in a hands-on field (welding), implementing a metacognitive approach to improving reading skills was new to that instructor—requiring additional time to fully grasp the concepts behind the approach and how it could be implemented in the context of a welding course.

class project drawing that consisted of comprehensive commands learned from the flipped module, lecture, and laboratory.

Implementation Highlights: NCC. The RA intervention at NCC was piloted in the Introduction to Welding Processes (WELD 105) course[33] for the Welding Fundamentals Specialized Diploma (SD) program over the course of five (5) semesters, beginning in the fall 2015 semester and ending with the fall 2017 semester. The NCC instructor chose to implement additional strategies for each new pilot, implementing a total of 14 different RA strategies by the end of the program, as shown in Exhibit 11.

Exhibit 11: NCC CR Pilot RA Strategies

RA Strategies Implemented	Pilot 1	Pilot 2	Pilot 3	Pilot 4	Pilot 5
	Fall 2015	Spring 2016	Fall 2016	Spring 2017	Fall 2017
Creating a safe classroom environment	✓	✓	✓	✓	✓
Review questions	✓	✓	✓	✓	✓
Defining and understanding key terms	✓	✓	✓	✓	✓
Defining unfamiliar words	✓	✓	✓	✓	✓
Group discussions	✓	✓	✓	✓	✓
Talking to the text		✓	✓	✓	✓
Evaluations (review their own tests)		✓	✓	✓	✓
Think, pair and share		✓	✓	✓	✓
Taking useful notes			✓	✓	✓
Extracting main ideas from textbook sections			✓	✓	✓
Stop and recite from memory			✓	✓	✓
Reading for understanding				✓	✓
Test taking techniques				✓	✓
Reading and reciting textbook sections					✓

Source: PATH program materials.

Upon completion of each pilot, the NCC instructor completed a post-pilot summary report describing how each strategy was used in the classroom, identify which strategies the instructor found useful/not useful, and when relevant, how the next pilot would be revised or enhanced.

---

[33] In this course, students learn the fundamentals of welding and the basic concepts of electrical circuitry as it relates to basic shielded metal arc welding. Students also develop the hand eye coordination that serves as the foundation for all subsequent welding classes.

NCC's flipped classroom pilots were also implemented in the Introduction to Welding Processes course, starting with the fall 2015 semester. Pilots were implemented by the Welding Lab Coordinator with technical support from the Instructional Technologist; each pilot was taught independent of each other in separate sections in all pilot semesters. NCC created flipped classrooms for six (6) sections of the Introduction to Welding Processes course, each of which involved pre-class and post-class activities. The pre-class activities, which were aligned with the class learning objectives, included videos to accompany textbook assignments, slideshows, reading material, and embedded links to videos in Blackboard. Example OER videos created by the NCC instructor included a flame cutting demonstration (with a student knowledge assessment), and welding machine setup and operation.

Students were asked to review these materials in advance of class, with classroom time used to further explain the information and focus on students' questions. For the post-class activities, students were asked questions during class that they had to research at home using the materials posted to Blackboard. According to the instructor, most students took the online pre-class and post-class tasks seriously. Students seemed to understand the benefit of the pre-class activities and demonstrated their prior learning when they performed related tasks in the welding lab.

Although not part of NCC's grant proposal, NCC concurrently implemented flipped classroom approaches in two additional PATH programs: Introduction to Process Control (EMEC 130) and Health Information Management (OFAD 177), the latter being part of the Health Office Coordinator curriculum. In fall 2015, the Instructional Technologist assisted in the design of fully online course for EMEC 130; built interactive learning materials including an OER game to practice Instrumentation Devices and Function Symbols; and started incorporating a new faculty course (FCLT) and Blackboard grade book. For the Health Information Management course, the Instructional Technologist helped aligned the Blackboard course with a new syllabus; established a grade book; recorded a customized Blackboard training video for OFAD faculty; and incorporated polling activities into lessons using Turning Point clickers.

SEE CoP

The SEE CoP had three initial objectives:

1. Identify, review, and analyze nationally recognized best practices of employer engagement at community colleges;

2. Identify current regional approaches to bring employers, education, and workforce

leaders together for effective dialogue and action; and,

3. Design a northeast Pennsylvania strategy for collaboration, with the end goal to promote, recruit, and deliver training in the high priority occupations.

As grant activity evolved, SEE CoP members recognized that, to execute any effective changes with longstanding effects, each college needed to rethink its own overall employer engagement strategy. The SEE CoP, therefore, expanded its initial charge of engaging regional employers around the PATH initiative to include facilitating employer engagement activities at the consortium and college levels.

Exhibit 12 depicts the overall structure and implementation processes of the SEE CoP— divided into consortium- and college-level activities.

Exhibit 12: SEE CoP Design and Implementation Processes
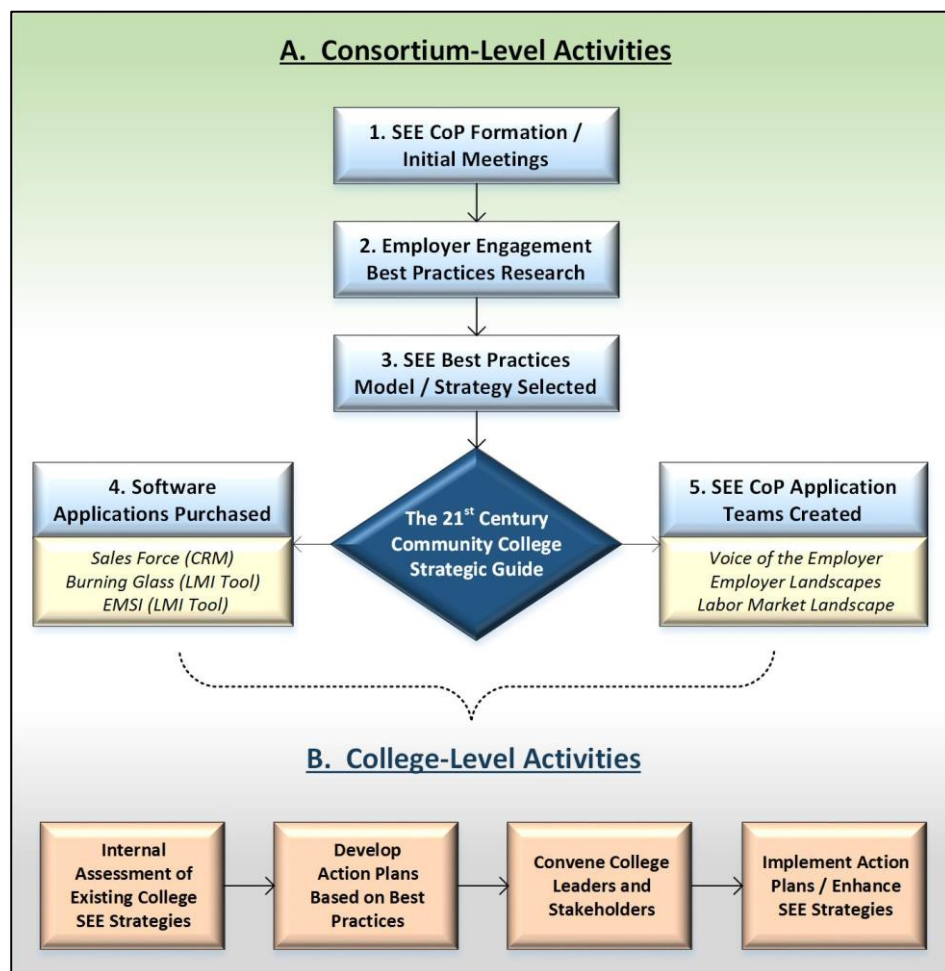
Consortium-Level Activities. The consortium level featured five steps toward implementing the SEE CoP:

Step 1—CoP Formation and Initial Meetings. The SEE CoP was to use Grant Year 1 to engage in learning and gain institutional support for cultural changes with respect to strategic employer engagement. But the goal of creating systemic cultural changes in the way each college engaged employers required consensus within and across the consortium colleges—a process that turned out to involve substantial time and effort. Although the SEE CoP had 16 regularly scheduled meetings in 2015, the extensive amount of time required to develop such changes meant that this was only the beginning of the arduous process required to build momentum.

Step 2—Employer Engagement Best Practices Research. The SEE CoP members were charged with identifying, reviewing, and evaluating nationally recognized best practice models for employer engagement by community colleges. This review was designed to provide a roadmap for the consortium as it began the process of developing a comprehensive strategy for engaging employers in the region, to judge whether the training programs in the three PATH industry sectors would meet employer skill needs.

Step 3—Model/Strategy Selection. After completing their research on best practices, the SEE CoP members chose the "The 21st Century Community College: A Strategic Guide to Maximizing Labor Market Responsiveness"[34] as the foundation to guide PATH's employer engagement strategies.

Step 4—Purchase Software Applications. To improve consistency in employer engagement practices and enable staff who regularly engage employers to make informed decisions, the consortium purchased the customer relationship management system Salesforce in April 2016. Each college used this system to document and coordinate its employer engagement activities with the goal of sharing institutional knowledge of employer relationships across different programs and colleges—to ensure delivery of a consistent message about the PATH programs. The consortium also purchased labor market information analysis platforms from Burning Glass and EMSI, to enable college staff to examine real-time labor market data on job postings and career path offerings.

Step 5—Application Teams. In early 2016, the SEE CoP created three "application teams" to transition the SEE CoP from the research and reflection role it had during its first year of

---

[34] U.S. Department of Education, Office of Vocational and Adult Education, The 21st-Century Community College: A Strategic Guide to Maximizing Labor Market Responsiveness

operation to applied learning activities based on knowledge gained that first year. The three application teams were: (1) voice of the employer, (2) labor market landscapes, and (3) employer landscapes by sector. All three were intended to lead to a sustainable strategy for employer engagement once the grant ended.

College-Level Activities. At the college level, all three colleges followed a similar overall process for participating in the SEE CoP. Using the 21st Century Community College Model as a guide, each college successfully administered an employer engagement self-assessment survey, *Assessing Seven Dimensions of the College to Improve Labor Market Responsiveness*, to varying levels of leadership and faculty. These self-assessments led to a successful convening of college leaders, faculty, PATH staff, and other stakeholders, during which the results were shared and reviewed together. The overall results indicated that, while each organization had unique strengths and challenges, several opportunities existed to close the gaps between current and best practices and remove barriers to achieving higher levels of strategic employer engagement. Example barriers included:

- Communication across college divisions and programs regarding workforce development and employer engagement was lacking.

- Although the colleges had programs and connections that were achieving significant results, a clear, standardized approach to employer engagement was missing.

- Stronger connection between credit and noncredit programs was needed to alleviate competition for resources, funding, employer appeal, and other factors.

- Staff and faculty needed to perceive employer engagement as part of their job, and to cultivate an entrepreneurial spirit among them.

- There was a need to create sustainable relationships and partnerships that are ingrained in the institution and not merely personality-based.

Based on these identified barriers and opportunities, each college was asked to choose specific actions to improve employer engagement strategies, prioritize activities based on limited resources, and develop an action plan.

Implementation Highlights: NCC. After NCC completed its self-assessment process to develop an "as-is" picture of the institution's employer engagement strategies, the college developed an action plan to address barriers and improve or align them with best practices. To facilitate this process, NCC convened a college-wide employer engagement group called the *Northampton Employer Engagement Work Team (NEEWT).* Members of the team included college leaders and faculty across credit and noncredit programs, PATH

staff, student services representatives, and administrative staff. The NEEWT targeted the following seven dimensions of market responsiveness to address:

1. Leadership & Governance

2. Organizational Structure & Staffing

3. Organizational Culture

4. Resources & Funding

5. Information & Data

6. Relationship-building

7. Partnerships

NCC's action plan to address these dimensions included specific action items, each of which was associated with best employer engagement practices and designed to address institutional weaknesses:

- ***Develop institutional communication, culture, and relationships development.*** NEEWT was established to: (1) serve as an intra-college discussion format for improving communication across credit and noncredit silos, (2) share collective institutional knowledge, (3) build a common language about employer contacts, (4) implement shared/common employer engagement tactics; and, (5) create and implement an institution-wide employer relationship management process.

- ***Implement structural changes to address integration across credit and noncredit divisions.*** These changes involved visiting "best practice" schools to develop an in-depth understanding of their structure, with the purpose of precisely identifying structural changes necessary to collaboratively deliver training, education, and services; and to present a more integrated credit and noncredit front door for both students and employers.

- ***Leverage labor market information and other data:*** This dimension included continuing to integrate the use of SalesForce, EMSI, and Burning Glass—to compile, generate, and analyze PATH partner demographic and relationship management information and related regional labor market information.

- ***Relationships and partnering:*** This part of the action plan involved continuing to refine and use NCC's Employer Engagement Tool Kit to strengthen strategic relationship-building.

- ***Invest in professional development:*** This investment was to sponsor training to enable NCC PATH staff to effectively engage regional employers.

Implementation Highlights: LCCC. As with the other colleges, LCCC conducted a self-assessment of its existing employer engagement strategies and practices. LCCC then developed an action plan to improve or align these strategies and practices with best practices and to address any barriers. After the self-assessment process was completed, LCCC convened a two-hour group meeting with 27 of the 33 respondents, to help interpret and discuss the survey results. Through the discussion, LCCC realized that structural reorganization would be crucial in alleviating the perceived gaps. Following these discussions, LCCC decided to target four dimensions of market responsiveness:

- Organizational Structure and Staffing
- Organizational Culture
- Relationship Building
- Partnerships

LCCC's proposed actions for addressing the above dimensions included focusing on the following:

- ***Organizational Structure and Staffing, and Organizational Culture.*** LCCC made a commitment to reorganize its organizational structure to broaden responsibility for employer engagement across a wider range of individuals. The new organization chart—announced in spring 2016 for full implementation in fall 2017—reflected equal positioning of credit and noncredit departments, plus a new Vice President position for noncredit programs that was equal to the credit counterpart. The intent of this restructuring was to ensure the involvement of, and shared decision making by, noncredit faculty in cabinet-level governance activities.

- ***Relationship Building.*** To improve relationship building, LCCC coordinated with the healthcare and manufacturing schools to develop a shared credit/noncredit listing of events, meetings, and outcomes to serve as a resource in identifying existing relationships, contacts, and actions. Leveraging Sales Force, LCCC had faculty and staff continuously provide updates on employer contacts and engagement opportunities, in the hope that this new resource would be taken to scale and effectively used over time for the entire institution.

- ***Partnerships.*** To foster sustained, successful employer partnerships, LCCC developed a rating scale to be used in SalesForce (or other shared system) for grading its employer partnerships, with clearly defined commitments from the employers. This better allowed LCCC to measure the breadth and depth of their employer relationships, define needs, and identify employer partners to help meet those needs.

Implementation Highlights: Luzerne. Like the other colleges, Luzerne conducted a self-assessment of its existing employer engagement strategies to develop an "as-is" state, which was subsequently reviewed and compared against the best practices identified by the SEE CoP to identify gaps or opportunities for improvement.

One of the SEE CoP co-chairs was Director of the Center for Business Solutions at Luzerne. The Director felt that Luzerne was unique among the consortium colleges because it had been focusing on strategic employer engagement for over 20 years, and its practices were already well-aligned with the best practices identified in the 21st Century Community College guide. Nonetheless, Luzerne developed a strategic action plan after completing the self-assessment and decided to focus on two dimensions of market responsiveness: (1) Relationship Building and (2) Partnerships.

Luzerne regularly reached out to students, businesses, and other organizations to gather information about general economic conditions and specific employer concerns. The college was already engaged in sustained, successful employer partnerships that were responsive to the local market. To continue fostering and improving these relationships through continuous assessment and maintenance, Luzerne's action plan involved conducting the following activities and measuring their outcomes:

- Employer visits at employer sites

- Employers as guest lecturers in related classes

- Industry advisory board participation

- Employer participation in college-sponsored job fairs

- Internship/field placement/work-based learning opportunities

- Collaboration on creation of curricula, feedback on existing curricula and input on course delivery options

- Assistance to the college in marketing approaches for assisting in student recruitment

- Utilization of Luzerne for incumbent worker training

- Employers as mentors to students

- Equipment donation or loan for training purposes

- Externships for instructors (Educator in the Workplace)

- Interview priority for qualified candidates who are Luzerne program completers

Much of the time and research Luzerne performed under the SEE CoP initiative also informed the college's efforts on the MappingUp technical assistance grant from the U.S. Department of Education.

2.3.3 PATH Student Services

PATH programs offered students two key types of services: general support services and employment-focused services:

General support services—PATH Career Coaches used an intensive advising model in which, after initial intake and assessment, coaches contacted participants at least three times a semester to identify any participant issues. This outreach provided participants with a direct point of contact regarding any questions or concerns as they proceeded through the program, and served as a continual reminder of the services available to them. The career coaches offered and provided a wide variety of services to participants—either directly through referrals to other staff/programs within the college, or indirectly through CareerLink staff or other community-based organizations.

Included among the many support services available to PATH participants were assessments, career guidance, internal college referrals to academic counseling, remedial education and tutoring, and external referrals to programs and services offered by the CareerLink or other community service provider.

Employment-focused services—PATH students were exclusively offered employment-related service, focused within the PATH industry sectors, from dedicated job placement specialists and/or job developers. Job readiness services offered to participants included resume and cover letter writing assistance, interview skills training, and assistance with background checks and security clearances.

Job search assistance offered to participants included searching for and notifying participants about any employment opportunities aligned with their skills, education, and experience level. Job developers also worked proactively to develop job opportunities for PATH participants by engaging employers in the targeted industry sectors. This included sending employers resumes of PATH participants that matched the employers' hiring needs, facilitating one-on-one introductions to employers at career fairs, and working closely with businesses involved in the local workforce development boards to inform them of potential job candidates nearing graduation. Job developers also widely broadcasted to participants any upcoming job fairs and other public events where employers where looking to meet new candidates.

Though these services were available to all PATH students, the students were responsible for making use of them. Section 3.3 summarizes our findings with regard to the use of services among PATH students.

2.3.4 Outreach and Marketing

Outreach and marketing activities under PATH occurred at the consortium- and the college-level. Consortium-wide activities—which were led by the Marketing and Outreach Specialist (MOS) hired by fiscal agent—promoted the PATH program overall without focusing on a particular college, industry sector, or training program. College-level outreach and marketing activities were tailored to the specific PATH training programs offered by each college. At both levels, these activities fell into two distinct categories of outreach and marketing activities—one focused on recruiting current or prospective *students*, the other on *employers* in the targeted industry sectors.

Student Outreach and Marketing Activities. PATH used a multifaceted strategy to generate awareness of, and recruit individuals into, the program—strategies aimed at existing college students as well as non-students in the community. PATH used a wide range of communication methods at both consortium and college levels including, but not limited to:

- Traditional media advertising (radio, newspaper, billboard, and public transit ads)
- Social media outreach (Facebook, Twitter, YouTube), online advertisements, and web analytics (e.g., "follow-me ads")
- Online referrals from the PATH website and each institution's course catalog
- Presentations by PATH staff at local CareerLink offices and referrals from CareerLink staff
- Career fairs and presentations at local community-based organizations
- Program information briefings to other college divisions and classes

Since neither the fiscal agent nor the individual colleges could market PATH to potential participants until the training programs were developed, for most of Grant Year 1 both college and fiscal agent staff focused on start-up activities—curriculum development, equipment procurement, facility renovations, and hiring project staff. Participant outreach and marketing activities did not begin in earnest until the latter half of that year.

Funds reserved for the consortium-wide marketing and outreach activities in Grant Year 1 operations were used to create the PATH brand and develop a standalone program website (www.pathcareers.org) that provided detailed information about eligibility and courses

available at each school. Screenshots of the website (the main landing page and the student section home page) are shown in Exhibit 13 and Exhibit 14.

Exhibit 13: PATH Website (Main Page)
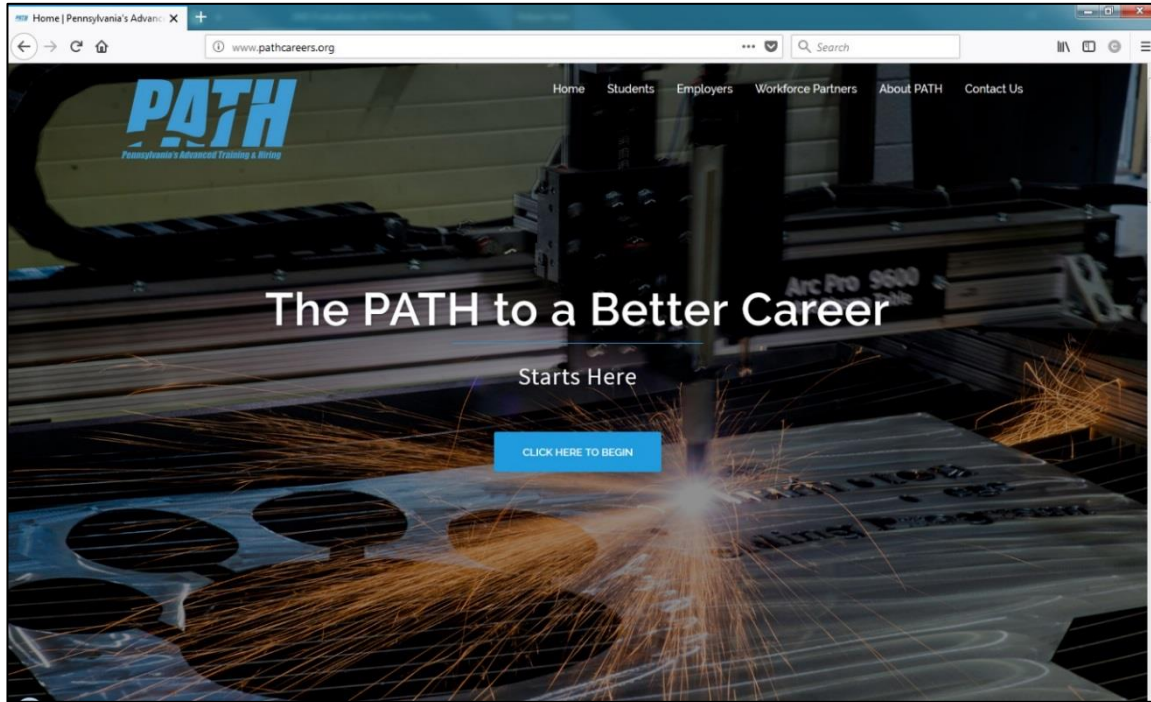
Exhibit 14: PATH Website (Student Page)
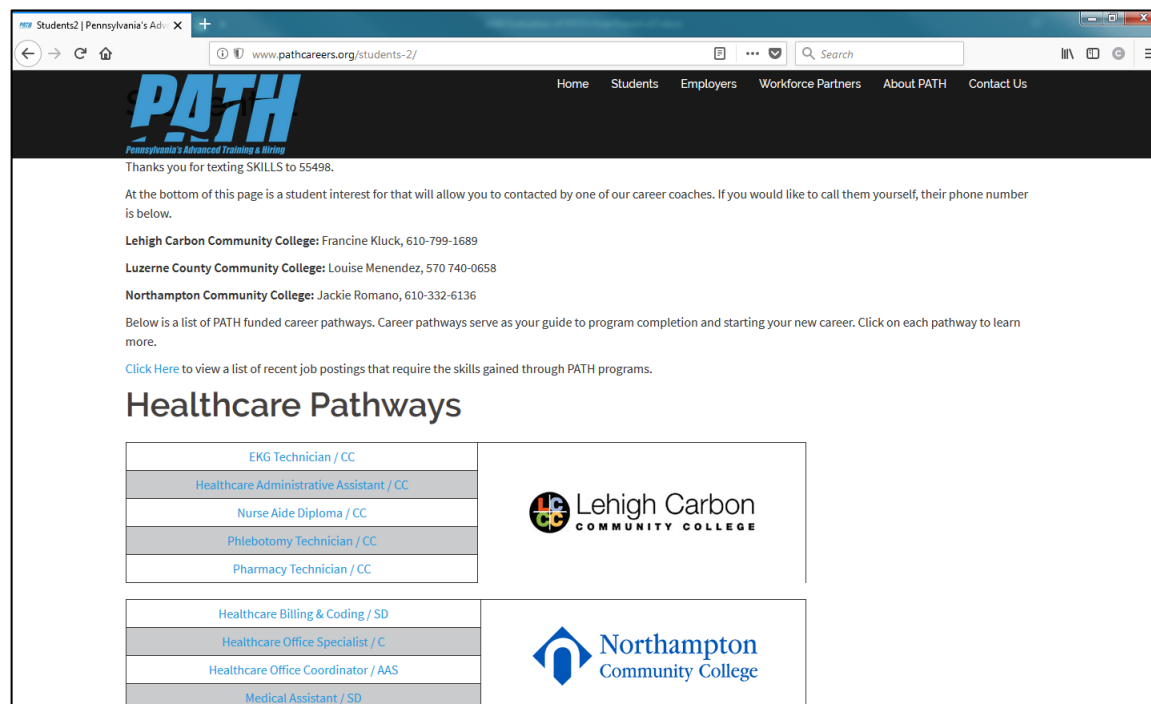
The website was intended to promote PATH, and to immediately drive students to further explore each college's program offerings and to enroll in PATH. The consortium-level website provided information on the overall purpose of the grant; specific career pathway programs for healthcare, advanced manufacturing, and transportation/logistics at each institution; and contact information for those interested in learning more. The website also provided certification or degree requirements for each program of study in an easy-to-understand presentation.[35]

Consortium-level grant funds were also used for the MOS to develop outreach and marketing materials and standard templates for each college to use, to ensure consistent branding. In addition, the MOS created two informational brochures—one for participants and one for employers. Further, the Grant Director and college PDs interacted with the local workforce development boards, making presentations to inform members about the PATH programs and courses available to meet stated employer needs.

Each college used its own budget line item to market and promote its unique program. College-specific outreach and marketing funds during the first year of program operation were used to market specific PATH courses of study through flyers, pamphlets, local radio and billboard advertisements, and web ads. The respective PATH programs of study were also advertised in each college's course catalog, through which students could enroll if they were interested in pursuing one of the three in-demand career fields.

PATH staff also conducted internal college briefings, to educate faculty and staff in other noncredit and credit program divisions about the course offerings and other PATH services available to students who might be interested in, or well-suited for, the program.

College staff worked closely with staff at the CareerLink offices to educate them about the PATH services and career pathway options available to their customers. For example, career coaches from each college conducted weekly, bi-monthly, and monthly information sessions at each CareerLink center. As job seekers came through the system, those eligible for training could be referred to the career coach at each college to inquire about the enrollment process and tuition funds available. As another example, a noncredit Introduction to the Healthcare Careers course, which was developed through PATH and designed to provide basic information about careers in healthcare, was conducted on a

---

[35] Examples include: credential type, expected completion time, prerequisite education, expected skills learned, career options and average salaries, and course roadmaps that detailed course sequencing.

rotational basis at the CareerLink offices and at NCC and LCCC—generating direct referrals that resulted in enrollments into PATH healthcare programs.

To further spread the word about the PATH course offerings, program staff at each college made sure to have a presence at community career fairs and other employment events held by community-based organizations.

Employer Outreach and Marketing Activities. PATH staff conducted outreach and marketed the program to employers in the targeted industry sectors to:

- Help identify skills and competencies to meet hiring needs
- Participate in program advisory boards and assist with curriculum design and delivery options
- Consider hiring successful completers of the PATH training programs and identify apprenticeship and internship opportunities for program participants
- Identify and refer incumbent workers who might benefit from additional skills training
- Provide mentors or speakers to assist students and participate in career fairs
- Donate or loan equipment for training purposes

PATH also used a variety of strategies and methods to engage employers. For instance, the PATH website included a section specifically for employers, where they could learn about the program's benefits and fill in a form indicating their interest in partnering and providing contact information.

Among other responsibilities, the MOS spent significant time cultivating new employer relationships, and engaging existing employer partners, in an effort to expand the depth and breadth of those relationships. In addition to developing PATH materials for employers, the MOS placed advertisements in business magazines, and sent targeted emails out to employers.

At the college level, job placement specialists and job developers regularly reached out to potential employer partners to identify job opportunities for PATH participants or participate in other job-related activities.

2.4 SUCCESSES, CHALLENGES, AND LESSONS LEARNED

Based on our observations of PATH implementation and data collected in support of the implementation analysis, we identified key program successes, challenges, and lessons learned. We judge these findings to be most relevant for other colleges that may consider implementing a program like PATH. We highlight key examples of these successes, challenges, and lessons learned, in turn.

2.4.1 Successes

PATH grant staff, in collaboration with program stakeholders, achieved many notable successes over the course of PATH's implementation. Below, we provide examples of what we consider to be prominent successes.

Equipment procurement, facilities renovations, and curricula development were completed on schedule, despite a short timeframe and logistical challenges. Within the first year, the consortium achieved the major equipment procurement and facility renovation milestones necessary before students could be enrolled in the program as scheduled. Meeting these important milestones required meticulous coordination among PATH grant staff members, college partners, equipment vendors, renovation contractors, and fiscal agent staff approval. The majority of curricula development activities across the three colleges were completed in time for the colleges to offer the newly created or revised training programs at the beginning of Grant Year 2. Much of this success was attributable to hiring dedicated and experienced curriculum developers at each college, as well as the extensive industry experience of the instructors.

The one-on-one support from career coaches, job placement specialists, and job developers was highly valued by PATH students. PATH students who engaged the career coaches appreciated the one-on-one support services tailored to their unique needs. Participants also valued the availability and responsiveness of PATH services, as well as the continuous reminders about their availability. PATH students often mentioned as particularly useful PATH help with their resume, job search assistance, "warm" introductions to employers at job fairs, and employer presentations in class.

Through PATH, the colleges created new credentialing options and improved the rigor of training programs in the targeted industry sectors. Curriculum changes, which were informed directly by employers and industry experts, have resulted in more rigorous training that is better aligned with employers' current skills needs and industry standards. Further, PATH has allowed colleges to offer more advanced training and credentials not previously available, providing students with a wider range of career pathway options.

PATH's efforts to embed nationally recognized certifications into the curriculum expanded students' employment opportunities. A key objective of PATH was to align curricula with nationally recognized credentials and certifications in healthcare[36] and manufacturing.[37] This involved incorporating actual (optional) certification tests into the program or preparing students to take national exams from third-party institutions outside class. Across the PATH training programs, optional certification testing (or preparation for testing) was embedded into the curricula so that, on graduation, students will have already obtained these nationally recognized certifications—making those students better prepared to meet employer expectations and find jobs.

At LCCC, PATH helped to improve the alignment of credit and noncredit programs and resources. PATH helped expand the relationships between LCCC's credit and non-credit departments, and facilitated conversations

> Companies…don't see us as noncredit or degree-seeking. We want to present ourselves as a [single] institution. The [SEE activities] helped change the way our whole institution is structured. Our leadership was surprised [about] the lack of awareness, the lack of communication between the different departments and understanding of what the college is as a whole. So, our college has been restructured. It's really a clearer structure of how we're all integrated.…where it was maybe more siloed before." – ***PATH College Grant Staff***

among faculty and college leadership about how to better align their resources. PATH also enabled LCCC to further develop noncredit to credit articulation paths for students, so time invested in a noncredit program can ultimately count toward a degree.

The CR and TEI CoPs both implemented a rigorous approach to researching and selecting models, and sponsored comprehensive technical assistance and training for faculty. The CR and TEI CoP members made concerted efforts to develop an implementation framework that, while well-defined, was flexible enough for instructors to adapt to their own courses. PATH also sponsored professional development and training initiatives to educate faculty and other stakeholders on the RA and TEI flipped classroom models, and provide guidance on implementation strategies.

---

[36] Examples include: National Healthcareer Association (NHA): Certified Medical Administrative Assistant (CMAA), Certified Billing & Coding Specialist (CBCS); American Academy of Professional Coders (AAPC): Certified Professional Coder (CPC); American Medical Technologists (AMT): Registered Medical Assistant (RMA), Pharmacy Technical Certification Board exam.

[37] Includes a variety of certifications/credentials endorsed by such bodies as: PMMI, National Institute for Metalworking Skills (NIMS), International Society of Automation (ISA) certifications, American Petroleum Institute (API), American Society of Mechanical Engineers (ASME), among others.

SEE CoP activities led to institutional changes to improve employer engagement. The combined efforts of PATH staff and other college stakeholders helped reveal institutional challenges to effective employer engagement—such as communication problems across departments and faculty reluctance to share employer relationships.

PATH exceeded its performance targets. Through March 2018, over 600 students had completed their PATH programs of study, nearly double the original projection of 314 completers. In addition, an estimated 91 percent of program completers were employed within three months of exiting the program, roughly 50 percent higher than the rate initially projected (61 percent). Finally, PATH served more than 1,100 students in total—more than double the goal of 497.

PATH provided a model of effective coordination among the three colleges. Effective coordination among the consortium colleges, and between the colleges and the fiscal agent, represented a significant improvement over the colleges' experience with an earlier TAACCCT grant.[38] We learned that, unlike in some other states, community colleges in Pennsylvania do not fall under a unified governance structure. We were told that this can present a major challenge for consortia grant managers, who must coordinate program operations across fully autonomous institutions—since it can be challenging to hold individual institutions accountable for meeting expectations for implementing grant activities. Under PATH, the three consortium colleges did a good job avoiding or mitigating these challenges.

2.4.2 Challenges

To achieve the implementation successes described above, the PATH grant team and their partners had to overcome a number of challenges. Below, we highlight what we observed to be the most prominent challenges encountered.

---

[38] All three PATH colleges were part of a consortium of all Pennsylvania community colleges that was awarded a TAACCCT grant under the first round of the program.

Development of a coordinated, regional strategy for career pathways proved to be a greater challenge than anticipated. PATH's intent was to research existing regional career pathway initiatives, identify the most appropriate model, and then work collaboratively with the consortium colleges and other partners to replicate the model across the PATH region. Although initial research identified some existing career pathway models, PATH leaders discovered that none were completely applicable in the

> *"Although the use of open resources—like existing videos—is good so as not to reinvent the wheel, the CoP stressed many times the importance of 'making it your own.' [It] may not be as polished, but research shows students make a stronger connection when it is their own instructor in the video. [You] also can't find certain things out there—such as course introductions. Instructors also have a good idea of where students falter. Creating your own assets improves the pedagogical approach."* - **TEI CoP Member**

context of PATH. Rather, each existing model was specifically designed for a single major industry in a region (or in some cases, a single large employer).

Without an existing, multi-industry, regional career pathway model to follow, the PATH team planned instead to independently research, design and implement one. The PATH management team instead proposed to use the Learning Community framework. Learning Communities were to research and identify gaps in current career pathways in the region, then work with the colleges to jointly develop and implement an enhanced regional strategy to address those gaps, and to effectively respond to regional employer needs.

However, accomplishing this goal within the grant period was not realistic. In addition to lack of an existing model to follow, there was no coordinated demand among the three PATH colleges for a regional approach. Interviewees cited two reasons for this. First, due to their overlapping service areas, NCC and LCCC compete with each other for students and for relationships with employers. Second, Luzerne's labor market and industry needs are not necessarily aligned with those of NCC and/or LCCC. In light of these two factors, the PATH management team felt that, for a regional career pathways initiative to be successful, coordination would have to be directed from the "top down"—championed by college presidents, leaders from the workforce system, and industry representatives, not merely by grant personnel. Successfully creating that kind of regional model would also have required leveraging additional funds and resources to support the coordinating activities.

This combination of challenges led PATH leadership to adjust their approach—focusing instead on providing guidance, tools, and resources to assist the consortium colleges in developing their own local strategies.

During the initial pilots, faculty and/or adjuncts or instructors faced significant challenges in implementing the CR intervention, due to combinations of factors. The CR pilots were implemented in highly technical programs of study involving significant hands-on training. The RA strategies used were instructional concepts with no clearly specified instructions for implementing them in the classroom. Since not all instructors had experience or credentials in education/instructional design, the lack of a concrete implementation plan made implementation difficult—leading some PATH staff to suggest having teachers who were more familiar with CR and thus more motivated to implement it.

The TEI pilots were productive and appear to have made lasting impacts at each college; however, the amount of originally authored content created varied by college. While the use of existing open source materials to enhance the flipped classroom experience was not discouraged, the goal was to create original material tailored to the course and the students. The amount of original content created varied from college to college and was sometimes lacking. Grant staff attributed this to challenges regarding the specification of roles for the instructional technologist and instructor, as well as time constraints on the part of the instructor.

Finding practicum and externship opportunities for PATH healthcare students became more challenging as time went on, due to a combination of increasing enrollment and external factors. In the HAA program at LCCC, for example, students must complete a 32-hour practicum requirement to earn the certificate of completion. At NCC, the Medical Assistant program requires students to complete an externship, and the Healthcare Office Coordinator program requires an internship. PATH staff invested significant time helping place students in practicum, externship, and internship opportunities, as well as helping them complete all the paperwork required before starting in those roles.[39] Despite strong existing relationships with the major hospital networks in the area, PATH staff reported that securing opportunities for students was becoming progressively more challenging, as enrollment increased and healthcare organizations in the area acquired smaller providers.

Manufacturing students wanted work-based learning opportunities incorporated into the curriculum, but finding willing employers proved difficult. NCC college faculty made concerted efforts to develop the on-the-job-training or internship opportunities with local employers PATH students wanted, but manufacturers generally want full-time employees who will work according to the employer's schedule. Further, employers—

---

[39] PATH staff helped students meet all screening requirements and obtain all necessary clearances and related documentation (e.g., criminal background checks, drug tests, immunizations, etc.).

particularly smaller ones—cannot afford to commit limited resources to training students who may or may not end up as permanent employees.

Curriculum development was a significant challenge due to a short timeline, the volume of proposed curriculum development activities, and difficulty hiring curriculum developers. Some PATH staff said the original grant proposal's ambitious number of courses and programs to be implemented resulted in overextending grant resources. The project timeline may also not have adequately accounted for the time required to clear curriculum changes for credit programs through the college governance process. In addition, hiring experienced curriculum developers was a challenging process because some were reluctant to take short-term employment (only 6-12 months). Where hiring curriculum developers was unsuccessful, current instructors took on the responsibility, but their limited availability due to other responsibilities made it difficult to meet milestones.

2.4.3   Lessons Learned

PATH staff learned valuable lessons as they developed solutions to challenges through formative evaluation of ongoing program activities. Key examples of lessons learned include the following:

Hiring external curriculum developers enabled the colleges to complete most curricula development activities in a timely manner. Despite an aggressive timeline, most proposed curricula development activities were successfully completed on schedule, which allowed the colleges to offer the newly created or revised training programs at the beginning of Grant Year 2. Much of this success was attributed to hiring dedicated and experienced curriculum developers at each college, as well as the instructors' extensive industry experience.

Onsite availability of both CR CoP co-chairs at Luzerne was instrumental to the success of the pilots and their potential to be replicated and sustained. As Luzerne employees, the CR CoP co-chairs were available onsite to help instructors understand, design, and implement RA strategies. According to the instructors, the co-chairs' guidance and support fostered engagement and buy-in that was critical to pilot success. Instructors also appreciated the flexibility they had to test

> *"If it wasn't for [the CR CoP co-chair] I would not have been able to do this, to be honest. I needed her to interpret and explain those pieces to me and help me understand them to be able to use them. It's just not a comfortable area for me. She did the training online and translated it into words I could understand, and then I implemented it in the classroom." – **College Instructor***

different strategies and only use those they found useful; they felt the initiative would not have been successful if they had been forced to implement a specific set of strategies.[40] Regular meetings and interactions between the co-chairs and instructors also created pilot visibility, generating interest and engagement from other college programs.

The TEI CoP pilots were most successful when instructors were engaged; both the CR and TEI pilots might have achieved broader impacts if PATH funding could have been used to pay adjunct instructors or non-faculty for their involvement. Some staff we spoke with emphasized that faculty involvement in the meeting discussions was essential, because the instructors implementing the interventions were most familiar with the classroom environment, student needs and barriers, and the curriculum. Faculty responsible for implementing the TEI pilots, including instructors and instructional technologists, were expected to actively participate in the TEI CoP throughout the grant period. Although the other CoP members played important roles and made valuable contributions to the initiative, faculty engagement in the CoP was inconsistent. Adjunct instructors, in particular, were insufficiently engaged. This is not surprising, given that adjunct instructors are paid only to teach, not to engage in institutional service (as are full-time faculty). Interviewees suggested that providing some sort of financial incentives—such as paying adjunct instructors for the extra time involved in preparing and implementing the pilots—would have helped increase their involvement and accountability.

PATH staff adapted their outreach strategies to effectively connect with participants and keep them engaged. Some PATH staff perceived a general disconnect with the students (and in some cases, instructors) early on, despite repeated efforts to engage them. PATH staff relied on different strategies to combat this disconnect and keep students engaged throughout training and after graduation. For example, PATH staff worked with instructors to carve out classroom time to conduct workshops on interview skills and job search techniques. This active approach enabled PATH staff to reach students who might otherwise not have attended these workshops or used other PATH services outside class. PATH staff stressed the importance of maintaining accurate contact information and continuously contacting students and graduates—by email and phone—with updated information on job opportunities and available services. PATH staff also suggested that instructor buy-in and support was important for successful participant engagement, and that participants were more likely to seek services when instructors encouraged them to do so.

---

[40] Although they found value in the RA strategies, the Welding instructors suggested that contextualized remedial math education may have been more appropriate and beneficial for their students.

Resume writing and job search assistance were the most frequently requested services; however, PATH staff suggested that participants underused all available services. According to one PATH staff person, only one-quarter to one-third of the participants requested resume writing assistance—and many of these only sought this service when they were near graduation, or after their graduation when they were applying for jobs. PATH staff also felt that more participants could have sought more types of assistance with actually applying for these jobs—for instance, participating in mock interviews and developing cover letters and resumes tailored for the relevant position.

It is important to begin implementation quickly. PATH was fortunate to have a well-qualified grant team. Most staff members possessed relevant subject matter expertise, a network of professional contacts, and previous TAACCCT grant experience—enabling the grant team to "hit the ground running." PATH staff emphasized that a quick start is key to meeting enrollment targets, and that programs are at risk if they are not ready to begin enrolling students within six months of the program start date. To the extent feasible, grantees should also staff up within the first three months of the grant period.

Staff motivation is important for success. The PATH team found that trying to implement grant activities with personnel not funded by the project became a stumbling block. This was because promoting the model and getting buy-in required more time than the PATH-paid staff had available. The PATH team felt that full-time faculty should be recruited for sustainability, so the work and experience developed via PATH could continue after the end of the grant. For example, the CR instructors at NCC—one a full-time Instructional Technologist and the other an adjunct trained in CR—left the college for other jobs, leaving no one to lead CR efforts within the college.

2.5 SUSTAINABILITY

The initiatives funded by TAACCCT are intended to be sustained, at least in part, beyond the end of the grant. During our final round of site visits and telephone interviews with PATH staff, we asked interviewees about whether different elements of PATH appeared likely to continue after the grant ended. Our observations about the potential sustainability of PATH components, as perceived by PATH staff, follow.

The TEI and CR initiatives are well-positioned to be sustained and expanded into other programs. The intervention implemented via the CR CoP (RA) is well-positioned to be sustained beyond the grant. But ultimately, the extent to which the RA strategy will retain traction depends on support from college leadership. Two colleges now have staff certified as trainers in RA. These individuals are employed by the colleges, so they are able to

continue training others on RA beyond the end of the PATH grant. In addition to these training sessions, various professional development events (e.g., conferences and peer learning workgroups) have been established to promote the RA strategies. The intent of these activities is to support the potential expansion of RA into other education and training programs at the colleges.[41] Faculty and staff outside the PATH project (and from different academic disciplines) have attended these functions, and PATH appears to be gaining interest and traction among them.

Two consortium colleges do not have concrete plans to continue the same career coaching offered through PATH; one college is adopting a similar model. Despite the discontinuation of career coach support in March 2018, PATH students at Luzerne and LCCC still have access to regular college advising and career services. PATH students at NCC no longer have any access to PATH-funded career coaches. However, NCC has begun implementation of a new Guided Pathways advising model for its students, which maintains important aspects of the career coaching model.[42] When fully implemented, the Guided Pathways model will offer support similar in many ways to the career coaching provided to PATH students.

Although it is unlikely that the three CoPs will be sustained in the same structure, the collaborative relationships developed across faculty and colleges, and the cross-dissemination of information, are likely to continue. Feedback from interviewees on their experience participating in the CoPs was resoundingly positive. The opportunities that the CoPs presented for faculty and staff across colleges—including introducing and teaching new technologies, strategies, employer engagement best practices, and an exchange of ideas and lessons learned—was judged to be invaluable. While it is uncertain whether the CoPs' administrative structure and its formal meetings will continue, interviewees firmly believed the relationships established with other college faculty

> *"It's all about collective intelligence. We have good people in our immediate group [within the college], but now when we multiple that by three, because we're three colleges, there's a lot more background to bring to the foreground to solve some of these challenges. Honestly, I see that at every TEI meeting. Some meetings are more dynamic or informative than others, but every time we get together, I know I learn something new." – TEI CoP Member*

---

[41] A 5-session RA workshop was recently held and attended by 28 individuals from across the colleges (many of whom were not part of the grant but were interested in RA). An expert speaker was brought in to facilitate the workshop sessions, however four of them were led by the two newly-certified RA trainers.

[42] Some program elements were rolled out in spring 2018; full implementation is planned for fall 2018.

would persist and communication in some form would continue.

Progress on the colleges' strategic employer engagement action plans is likely to continue after the grant at some level, but the degree to which these efforts will be sustained depends on institutional leadership. The full SEE CoP continued to meet through March 2018, with a focus of the Grant Year 3 meetings on the colleges' progress towards implementing their own employer engagement action plans (the Voice of the Employer and Labor Market Landscape application teams also met on a quarterly basis through March 2018). Although the SEE CoP will probably not continue to meet as a group, interviewees suggested that, given the buy-in and support from college leadership, activities from SEE action plans will likely continue in some form.

For example, NCC established the Northampton Employer Engagement Work Team (NEEWT) to continue discussions about effective employer engagement strategies. Realizing that the funding stream for workforce education programs is changing and that PATH was the last iteration of the TAACCCT grants, Luzerne anticipated that their partnerships with industry associations, One-Stops, and WedNetPA[43] will help them sustain both resources and students. Corporate support, endowments, and employer tuition/reimbursement support are examples of innovative funding that will be required in the future. The other consortium colleges are also holding regular internal meetings with college leadership and other relevant staff to maintain progress—but the degree to which these groups continue to meet and work together on implementing action plans will depend on institutional leadership.

Although the PATH grant has enabled the three colleges to successfully build on prior TAACCCT-funded efforts, additional work and investments are needed to achieve long-term strategic goals. The three PATH colleges were all members of a consortium of colleges in Pennsylvania that received a grant under the first round of TAACCCT. The first TAACCCT grant (T1) allowed the colleges to begin the process of updating, enhancing, and creating new training programs. For example, Luzerne created a noncredit welding program under T1, which was further enhanced under PATH to become a credit diploma program. Luzerne also purchased instrumentation and process control equipment under T1 to start updating the training program. Additional equipment was purchased though PATH to enhance the program. Both TAACCCT grants have helped propel the colleges towards their long-term goals of preparing the next generation of workers. Staff we interviewed felt

---

[43] WEDnetPA (Workforce & Economic Development Network of Pennsylvania) supports Pennsylvania companies by investing in the training needed to upgrade the skills, knowledge and effectiveness of their current employees. See http://www.wednetpa.com/ for more information.

that these investments and strategic initiatives should not be viewed as short-term fixes—rather, that the investments made through the two grants represent major steps in a long-term process that will serve as a foundation for future success.

2.6 SUMMARY

As one of the two main components of the evaluation, the implementation analysis was focused on answering research questions in five topic areas:

1. PATH Programs of Study and Student Services

1. Outreach and Marketing

2. Employer Engagement and Stakeholder Alignment

3. Challenges, Successes, and Lessons Learned

4. Sustainability

The programmatic period of performance for the PATH grant ran from October 2014 through March 2018. Some key program milestones include changes in grant leadership early in the grant period, student enrollment in PATH programs at all three colleges by September 2015, and meeting the grant's overall enrollment target roughly halfway through the grant period (in August 2016).

Through PATH, the three colleges developed or enhanced 30 credit and noncredit training programs across three industry sectors: 18 in advanced manufacturing, 10 in healthcare, and two in transportation/logistics. One college, LCCC, offered exclusively noncredit programs through PATH. Part of this process at each college involved renovating classroom space and purchasing new equipment.

In addition to occupational training, a second key element of PATH was the establishment and operation of three CoPs. Two of them—the CR and TEI CoPs—focused on identifying specific interventions to be piloted in PATH programs of study. CoP activities were managed across the consortium but the implementation of the interventions was customized by instructors and project directors at each college. The CR CoP selected and supported the implementation of RA; the TEI CoP selected and supported the implementation of the flipped classroom. As part of the implementation process, the PATH management team gathered feedback on the implementation of the interventions to help guide subsequent improvements. The third CoP (SEE) was focused on improving employer engagement practices among the consortium colleges. Two highlights of the SEE CoP's achievements were that each college conducted a review of its existing practices and then

created an action plan for improving them and the purchase of a customer relationship management software platform to better coordinate employer engagement activities.

Students in PATH programs were offered two key types of support services: general support services and employment-focused services. General support services included dedicated career coaches, who proactively contacted students periodically during their enrollments. Examples of the supports provided by the career coaches include: assessments, career guidance, and referrals to other programs or services. Employment-focused services included support from dedicated job placement specialists and job developers, who offered students services like resume assistance, help preparing for job interviews, and job search assistance.

To attract interested students, PATH used a multifaceted outreach strategy. It was marketed both at the consortium and individual college level via a number of methods, including traditional media (e.g., radio, newspaper, billboard), social media, presentations at local CareerLink offices, and career fairs. The consortium also created a PATH website, www.pathcareers.org, which promoted PATH, provided detailed information about the programs of study and support services, and explained how to request more information. Beyond working to attract students, PATH managers also worked to attract employers, both to inform the design and operation of the occupational training programs and to identify job opportunities for PATH graduates.

Our observations of PATH operations and the qualitative data we collected via site visits and telephone interviews revealed a number of program successes, challenges, and lessons learned:

Successes

- Equipment procurement, facilities renovations, and curricula development were completed on schedule, despite a short timeframe and logistical challenges.

- The one-on-one support from career coaches, job placement specialists, and job developers was highly valued by PATH students.

- Through PATH, the colleges created new credentialing options and improved the rigor of training programs in the targeted industry sectors.

- PATH's efforts to embed nationally recognized certifications into the curriculum expanded students' employment opportunities.

- At LCCC, PATH helped to improve the alignment of credit and noncredit programs and resources.

- SEE CoP activities led to institutional changes to improve employer engagement.

- PATH exceeded its performance targets.

- PATH provided a model of effective coordination among the three colleges.

Challenges

- Development of a coordinated, regional strategy for career pathways proved to be a greater challenge than anticipated.

- During the initial pilots, faculty and/or adjuncts or instructors faced significant challenges in implementing the CR intervention, due to combinations of factors.

- The TEI pilots were productive and appear to have made lasting impacts at each college; however, the amount of originally authored content created varied by college.

- Finding practicum and externship opportunities for PATH healthcare students became more challenging as time went on, due to a combination of increasing enrollment and external factors.

- Manufacturing students wanted work-based learning opportunities incorporated into the curriculum, but finding willing employers proved difficult.

- Curriculum development was a significant challenge due to a short timeline, the volume of proposed curriculum development activities, and difficulty hiring curriculum developers.

Lessons Learned

- Hiring external curriculum developers enabled the colleges to complete most curricula development activities in a timely manner.

- Onsite availability of both CR CoP co-chairs at Luzerne was instrumental to the success of the pilots and their potential to be replicated and sustained.

- The TEI CoP pilots were most successful when instructors were engaged; both the CR and TEI pilots might have achieved broader impacts if PATH funding could have been used to pay adjunct instructors or non-faculty for their involvement.

- PATH staff adapted their outreach strategies to effectively connect with participants and keep them engaged.

- Resume writing and job search assistance were the most frequently requested services; however, PATH staff suggested that participants underused all available services.

- It is important to begin implementation quickly.

- Staff motivation is important for success.

Near the end of the grant operational period, we asked PATH staff about the potential sustainability of different aspects of the program. Our observations about this potential, as perceived by PATH staff, are:

- The TEI and CR initiatives are well-positioned to be sustained and expanded into other programs.

- Two consortium colleges do not have concrete plans to continue the same career coaching offered through PATH; one college is adopting a similar model.

- Although it is unlikely that the three CoPs will be sustained in the same structure, the collaborative relationships developed across faculty and colleges, and the cross-dissemination of information, are likely to continue.

- Progress on the colleges' strategic employer engagement action plans is likely to continue after the grant at some level, but the degree to which these efforts will be sustained depends on institutional leadership.

Although the PATH grant has enabled the three colleges to successfully build on prior TAACCCT-funded efforts, additional work and investments are needed to achieve long-term strategic goals. Staff at the colleges felt that these investments and strategic initiatives should not be viewed as short-term fixes—rather, that the investments made through PATH and an earlier TAACCCT grant represent major steps in a long-term process that will serve as a foundation for future success.

3. Participation in PATH

Across the three colleges, the PATH program enrolled over 1,000 students, more than doubling the consortium's original projection of 497. This chapter focuses on quantifying important aspects of student participation in PATH. Section 3.1 describes enrollment patterns by college, industry sector, completion status, and PATH student credential attainment. Section 3.2 presents summary information about the characteristics of PATH students, both overall and by college. Section 3.3 uses survey data to describe student use of PATH support services.[44]

3.1 STUDENT FLOWS THROUGH PATH PROGRAMS

Exhibit 15 summarizes the flow of students through PATH programs at each of the three colleges. The far-left side of the diagram shows how the total number of students enrolled in PATH (1,129) breaks down by college.[45] With 545 PATH students, NCC accounted for close to half (48 percent) of total enrollments. LCCC enrolled the second-most students in PATH programs (412), which accounted for 36 percent of total enrollments. Luzerne enrolled far fewer students in PATH (172, 15 percent of total enrollments) than either of the other two colleges.

The paths from the far-left side to the next column of three nodes show the industry sectors into which PATH students from each college enrolled. For example, roughly two-thirds of PATH students at LCCC enrolled in healthcare programs, with the others enrolling in advanced manufacturing programs. Overall, 677 PATH students (60 percent) enrolled in healthcare programs, 428 in advanced manufacturing programs (38 percent), and 24 in transportation/logistics programs (2 percent).

---

[44] The data are from the student survey we administered, which is described in detail in Chapter 4.

[45] A small number of students enrolled in more than one PATH program. For such students, the figures and diagram account for only the first PATH program in which the student was enrolled.

Exhibit 15: PATH Student Flows
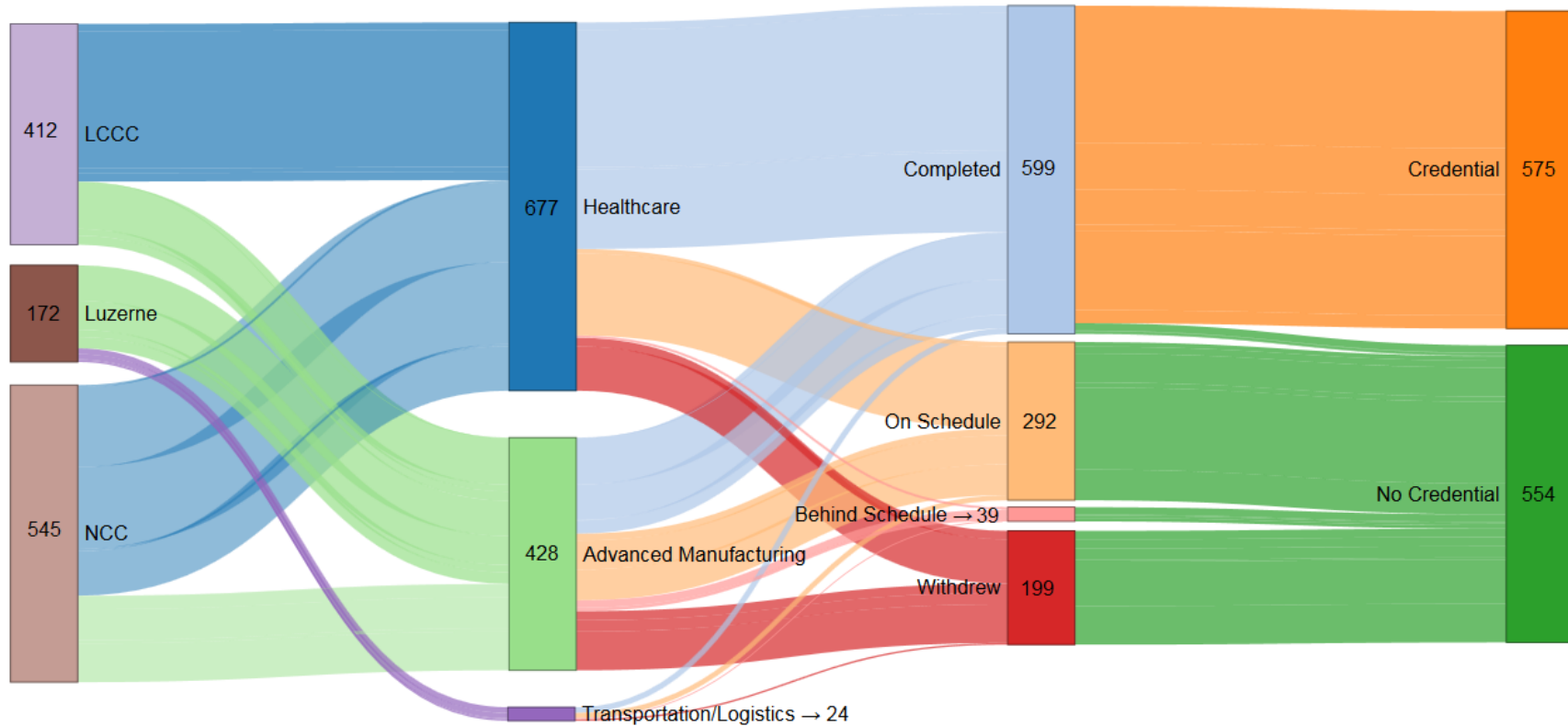
The paths from the industry sector nodes to the completion status nodes summarize the completion patterns among PATH students from each industry sector. Among all PATH students, 599 (53 percent) completed at least one PATH program. Among non-completers, some students had enrolled in PATH so near the end of our observational period that not enough time had passed for them to have completed their programs. The second two nodes in the completion status column identify the proportions of students still enrolled in PATH at the end of our observational period, which fall into two categories: (1) those who are on schedule to complete their programs on time, according to the expected length of their PATH programs; and (2) those who are behind schedule—have been enrolled for longer than the expected length of their PATH programs. Among the 331 students who have not completed a PATH program, the vast majority (292, 88 percent) were on schedule. The bottom node in the completion status column shows that 199 students (18 percent) withdrew from their PATH programs before completion.

The paths from the completion status nodes to the two nodes on the far right of the diagram show credential attainment among PATH students, based on their completion status. The top part of the diagram shows that over half of PATH students (575) had received a credential by January 2018. Virtually all the 599 students who completed a PATH program earned a credential—only 24 completers (4 percent) did not earn one. The number of students who earn a credential through PATH is likely to increase, as some of the 331 students still enrolled in PATH programs complete them.

3.2 CHARACTERISTICS OF PATH STUDENTS

When students enrolled in PATH programs, they were asked to complete forms providing both demographic characteristics and some information about their employment history. Exhibit summarizes the characteristics of PATH students at the time of their enrollment in PATH, by age, race, ethnicity, and gender.

Exhibit 20: Characteristics of PATH Students

Characteristic	LCCC (N = 412)	Luzerne (N = 172)	NCC (N = 545)	Total (N =1,129)
Age				
18 – 24	27.0	63.5	42.1	39.9
25 – 34	26.3	22.9	26.8	26.1
35 – 44	19.9	8.8	13.8	15.3
45 – 54	17.0	3.5	12.9	12.9
Over 54	9.8	1.2	4.4	5.9
Race*				
Black	12.9	2.9	10.5	10.2
White	65.1	82.0	71.0	70.5
More than one race	3.9	4.1	5.5	4.7
Other	2.7	6.4	2.4	3.1
Hispanic	25.5	61.6	20.2	28.4
Male	34.7	91.9	31.6	41.9

Source: PATH administrative data.
Notes: Table entries represent percentages. Totals may not sum to 100 percent due to rounding. *Race information was missing for 37 participants. The race category Other includes the following races: American Indian, Alaskan Native, and Hawaiian Native or Pacific Islander.

Four key patterns emerge:

- **Most PATH students (two-thirds) were less than 34 years of age**. PATH students enrolled at Luzerne were on average younger than students at the other two colleges—64 percent of them younger than 24, compared with 42 percent of NCC students and 27 percent of LCCC students.

- **The majority (nearly three-quarters) of PATH students were white**. The proportion was highest at Luzerne (82 percent) and lowest at LCCC (65 percent).

- **The proportion of students who were Hispanic was highest at Luzerne (62 percent)**. This was much higher than the proportions at either LCCC (26 percent) or NCC (20 percent).

- **Forty-two percent of PATH students were men; most (58 percent) were women**. The gender distributions of students were similar for LCCC and NCC—the proportion of male students ranging from 32 percent (NCC) to 35 percent (LCCC). At Luzerne, the outlier, 92 percent of PATH students were men.

3.3 USE OF PATH SUPPORT SERVICES

As described in Chapter 4, one of our data collection activities was to field a web-based survey of PATH students. Some of the survey questions asked respondents about the support services they received through PATH.[46] Exhibit summarizes the use of support services among survey respondents, based on the most recent wave of the survey.[47]

Exhibit 21: Use of Support Services Among PATH Survey Respondents

	LCCC (N = 98)	Luzerne (N = 24)	NCC (N = 116)	Combined (N = 238)
Support Services Received				
Resume Building/Development	62.2	45.8	31.0	45.4
Job Search Assistance	48.0	62.5	25.9	38.7
Information About Job Fairs	48.0	45.8	27.6	37.8
Career Counseling/Assessment	43.9	37.5	27.6	35.3
Academic Advising	16.3	16.7	44.0	29.8
Job Interview Training	38.8	25.0	7.8	22.3
Job Placement Assistance	27.6	33.3	7.8	18.5
Assistance Finding an Internship/Practicum	20.4	20.8	13.8	17.2
Referrals to Other Support Services	10.2	16.7	10.3	10.9
Other (Not Specified)	1.0	4.2	7.8	4.6
Number of Different Support Services Received				
None	14.3	4.2	14.7	13.5
One	25.5	37.5	38.8	33.2
Two	9.2	16.7	12.9	11.8
Three	11.2	4.2	16.4	13.0
Four or more	39.8	37.5	17.2	28.6

---

[46] As noted in Chapter 4, the survey data are only representative of the experiences of survey respondents. We make no attempt to generalize the survey results beyond this group. To the extent that survey respondents differ systematically from non-respondents and such differences are associated with the use of support services, the survey results may not accurately reflect support service use among the broader population of PATH students.

[47] The data are from the survey wave fielded in Spring 2018.

	LCCC (N = 98)	Luzerne (N = 24)	NCC (N = 116)	Combined (N = 238)
Frequency of Interaction with Career Coach*				
Daily	2.1	0.0	0.0	0.8
Weekly	40.2	12.5	4.3	19.8
Monthly	35.1	37.5	10.3	23.2
Once a Semester	-	33.3	58.6	32.1
Never	22.7	16.7	26.7	24.1

Source: Round 5 PATH student survey.
Notes: Table entries represent percentages. *The response "once per semester" was not an option for respondents from LCCC, since PATH programs at LCCC did not operate on the semester schedule.

Our key observations about the use of support services among respondents are:

- The most commonly used services across all colleges were resume building/development (45 percent), job search assistance (39 percent), and information about job fairs (38 percent).

- Most respondents (86 percent) reported having used at least one of the support services. Twenty-nine percent of respondents reported having used at least four services.

- Seventy-six percent of respondents interacted with their Career Coaches. Forty-four percent reported interacting with their Career Coaches at least once a month. Only 24 percent never interacted with their Career Coaches.

The support service usage patterns noted above were similar to the patterns we observed in earlier waves of the student survey. Taken as a whole, the survey results indicate that respondents did make use of the PATH support services available to them and they interacted with their Career Coaches.

3.4 SUMMARY

Over the course of the grant's programmatic period, PATH programs at the three participating colleges enrolled 1,129 students. Of these, the 545 students at NCC accounted for nearly half of the total (48 percent), with LCCC enrolling 412 students (36 percent) and Luzerne enrolling 172 students (15 percent). Almost all PATH students enrolled in programs in either healthcare (60 percent) or advanced manufacturing (38 percent). Only 24 students (2 percent) enrolled in PATH programs in transportation/logistics.

As of June 2018, 599 students had completed their PATH programs of study. All but 24 of those students had earned a recognized credential. One hundred ninety nine PATH students (18 percent) withdrew from their chosen programs.

Among the 331 students who had neither completed nor withdrew from the program, many had enrolled so recently that not enough time had passed for them to have completed, given the expected length of each PATH program. We determined that, among the 331 students still enrolled in PATH in June 2018, 292 (88 percent) were on schedule to complete on time.

PATH enrollment data enabled us to observe selected characteristics of PATH students. Key patterns include:

- Most PATH students (66 percent) were less than 34 years of age.
- The majority of PATH students (71 percent) were white.
- The proportion of students who were Hispanic (28 percent) was highest at Luzerne (62 percent).
- The majority of PATH students (58 percent) were women.

Using data from the most recent wave of the student survey, we analyzed the patterns of support service usage among PATH students. Our key observations are:

- The most commonly used services across all colleges were: resume building/development (45 percent), job search assistance (39 percent), and information about job fairs (38 percent).
- Most respondents (86 percent) reported having used at least one support service. Twenty-nine percent of respondents reported having used at least four services.
- Seventy-six percent of respondents interacted with their Career Coaches. Forty-four percent of respondents reported interacting with their Career Coaches at least once a month.

4. Student Survey

The purpose of the student survey was to learn how students felt about different aspects of the PATH program. The PATH leadership team used the results of the five rounds of the survey to consider whether the program appeared to be meeting its objectives, and to identify areas on which to focus potential improvements. In this chapter, we describe the student survey and summarize its key results.

4.1 SURVEY DESIGN AND IMPLEMENTATION

IMPAQ administered a web-based survey five times during the grant period: April 2016, November 2016, April 2017, November 2017, and March 2018.[48] Students were e-mailed a survey invitation that included a link to the web-based survey instrument. The instrument, which, was identical across all five waves, asked students a series of questions about the following topics:

- College and program of study in which they participated
- PATH services they received
- Their goals at the time of enrollment
- Their satisfaction with the PATH program

Students who had participated in programs that implemented the TEI intervention—the flipped classroom—were also asked questions about the effectiveness of different aspects of that model. Each survey wave was open to all students who had ever enrolled in PATH. For each of the five survey waves, 20–24 percent of PATH students responded. Exhibit presents the response rates for all five survey rounds.

---

[48] The Spring 2018 survey was administered in March rather than April, because grant operations ended in March.

Exhibit 22: PATH Student Survey Response Rates

	April 2016	Nov 2016	Apr 2017	Nov 2017	Mar 2018
All Colleges					
Responded	66 (20%)	127 (24%)	167 (24%)	211 (22%)	238 (23%)
Did not Respond	258 (80%)	403 (76%)	534 (76%)	729 (78%)	806 (77%)
Total	**324**	**530**	**701**	**940**	**1,044**
LCCC					
Responded	25 (27%)	56 (31%)	79 (31%)	90 (27%)	98 (26%)
Did not Respond	68 (73%)	125 (69%)	175 (69%)	244 (73%)	274 (74%)
Total	**93**	**181**	**254**	**334**	**372**
Luzerne					
Responded	12 (18%)	16 (17%)	18 (18%)	23 (15%)	24 (15%)
Did not Respond	54 (82%)	77 (83%)	82 (82%)	133 (85%)	139 (85%)
Total	**66**	**93**	**100**	**156**	**163**
NCC					
Responded	29 (18%)	55 (21%)	70 (20%)	98 (22%)	116 (23%)
Did not Respond	136 (82%)	201 (79%)	277 (80%)	352 (78%)	393 (77%)
Total	**165**	**256**	**347**	**450**	**509**

Source: PATH student surveys, Rounds 1-5.

Across the survey waves, the highest response rates were among respondents from LCCC (26—31 percent). Responses were lowest among students from Luzerne (15–18 percent).

4.2 RESULTS

The survey instrument included four questions related to different aspects of student satisfaction with the PATH program: two related to overall satisfaction, one about whether the program was helping the respondent reach his/her goals, and one about whether the PATH program was aligned with industry standards.

Student Satisfaction. The survey instrument asked students about two measures of overall satisfaction with PATH: (1) their overall satisfaction with PATH and (2) whether they would recommend PATH to a friend. Exhibit 16 summarizes the results for the first question: "Overall, how satisfied are you with your experience in PATH?"

Exhibit 16: Reported Satisfaction among Survey Respondents
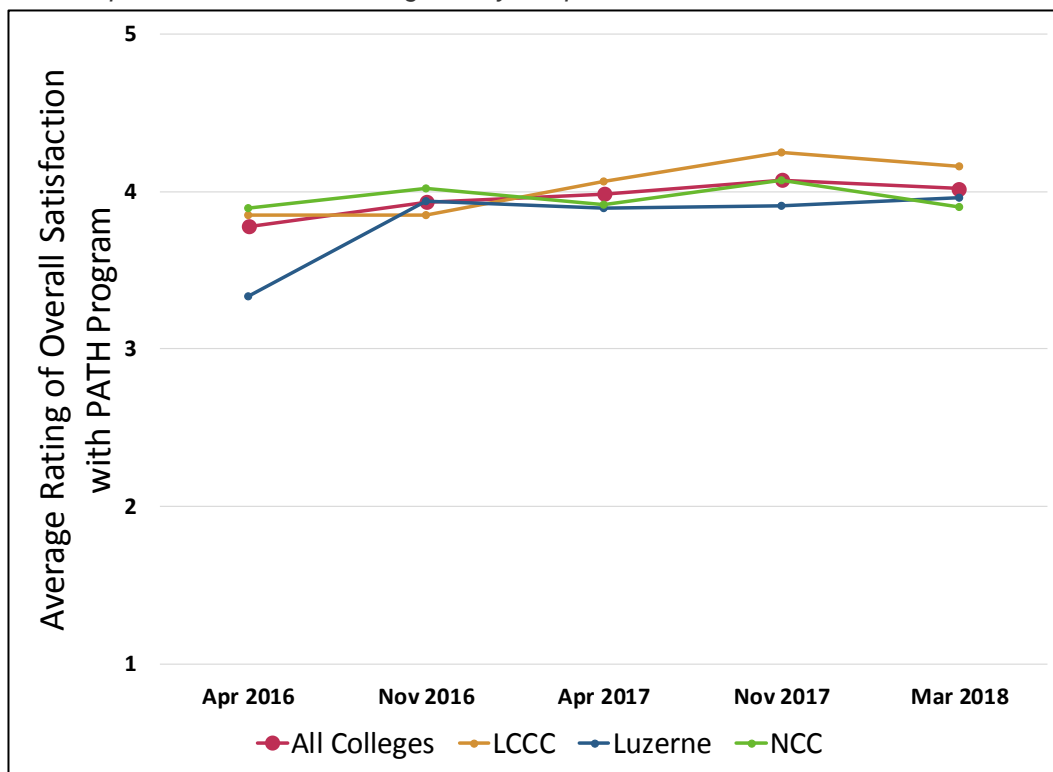
Source: PATH student surveys, Rounds 1-5.

Note: Possible responses were: very dissatisfied (1), dissatisfied (2), neutral (3), satisfied (4), and very satisfied (5).

Reported satisfaction among respondents was consistent across survey rounds. On average, respondents gave the program a rating of 4 (satisfied) out of 5. The result is consistent across colleges, except for students at Luzerne during the first round of the survey. This Luzerne result may be due to the small sample of respondents, since so few students from Luzerne responded to the survey—the average rating of 3.3 for the first survey round at that college captures satisfaction among only 12 students.

Exhibit 17 summarizes the survey data on whether respondents would recommend the PATH program to a friend. The results show the same pattern as the results for reported satisfaction. Across survey rounds, 80–90 percent of respondents said they would recommend the program to a friend. The lone exception is among respondents from Luzerne at the first round of the survey— when only 50 percent indicated they would

recommend PATH to a friend. As with the result for reported satisfaction, this result is likely due to the small number of students from Luzerne who responded to that survey round.

Exhibit 17: Proportion of Survey Respondents Who Would Recommend PATH to a Friend
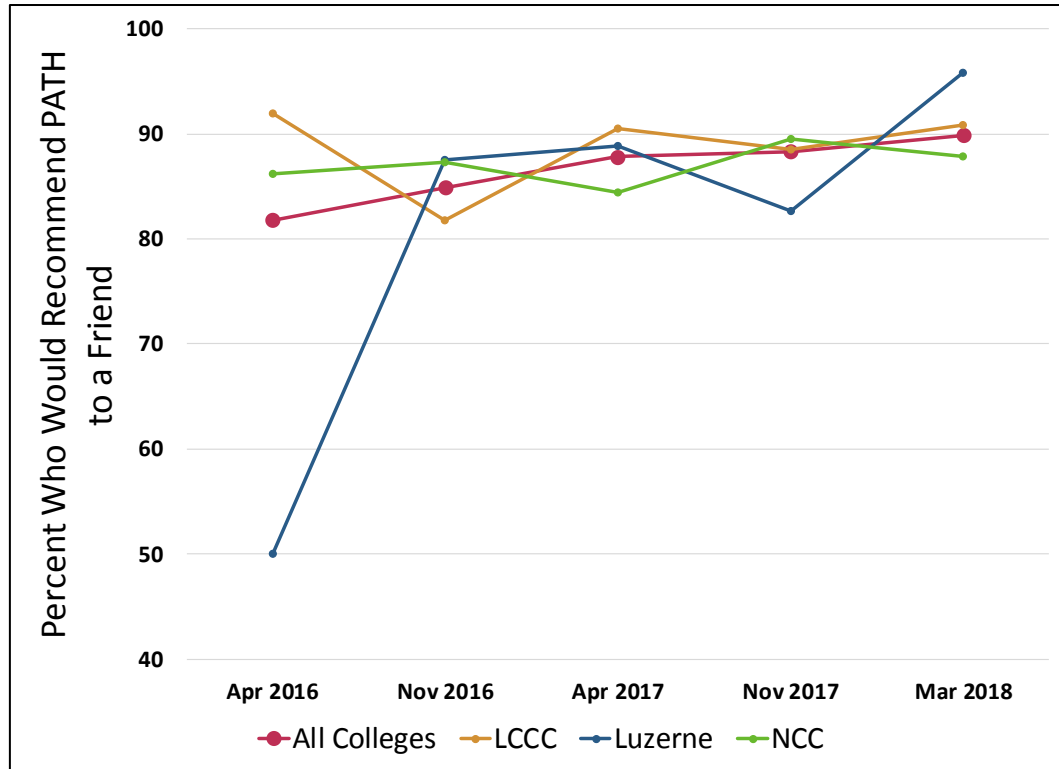
Source: PATH student surveys, Rounds 1-5.

To explore student satisfaction with PATH in greater detail, we examined the relationship between reported satisfaction and two factors: (1) the industry sector of the PATH program in which the respondent was enrolled, and (2) whether the respondent had completed a program. Exhibit 18 summarizes responses to the two satisfaction measures by industry, using data from the March 2018 survey round.

Exhibit 18: Satisfaction with PATH among Survey Respondents, by Industry Focus

	Healthcare (N = 176)	Advanced Manufacturing (N = 59)	Combined (N = 237)
Overall Satisfaction with PATH			
Very Satisfied	35.8	39.0	36.3
Satisfied	35.2	39.0	36.7
Neither Satisfied nor Dissatisfied	22.2	20.3	21.5
Dissatisfied	4.6	0.0	3.4
Very Dissatisfied	2.3	1.7	2.1
Would you recommend PATH to a friend?			
Yes, would recommend	87.5	96.6	90.0
No, would not recommend	12.5	3.4	10.0

Source: Round 5 PATH student survey.
Notes: Table entries represent percentages. The combined column includes data from 2 observations with missing information on industry focus and is missing information for one respondent who exited the survey without completing all questions.

The top panel of the exhibit shows no evidence that satisfaction with PATH was related to industry focus. However, the second panel shows that survey respondents who had participated in PATH programs in healthcare were four times as likely not to recommend PATH to a friend than respondents who participated in PATH programs in advanced manufacturing. Even so, nearly nine out of every 10 respondents who participated in PATH programs in healthcare indicated they would recommend the program to a friend (88 percent). Exhibit 19 summarizes reported satisfaction with PATH separately for respondents who reported having completed at least one PATH course and those who had not, using data from the March 2018 survey round.

Exhibit 19: Satisfaction with PATH among Survey Respondents, by Completion Status

	Have Not Completed a PATH Course (N = 125)	Completed at Least One PATH Course (N = 112)	Combined (N = 237)
Overall Satisfaction with PATH			
Very Satisfied	28.0	45.5	36.3
Satisfied	41.6	31.3	36.7
Neither Satisfied nor Dissatisfied	25.6	17.0	21.5
Dissatisfied	2.4	4.5	3.4
Very Dissatisfied	2.4	1.8	2.1
Would you recommend PATH to a friend?			
Yes, would recommend	90.4	89.3	90.0
No, would not recommend	9.6	10.7	10.0

Source: Round 5 PATH student survey.
Notes: Table entries represent percentages. The combined column is missing information for one respondent who exited the survey without completing all questions.

Respondents who had completed a PATH course were more likely to report being satisfied with the program than respondents who had not completed a course—77 percent vs. 70 percent. The two groups did not differ in their reported willingness to recommend PATH to a friend.

Helping Students Reach Their Goals. Exhibit summarizes student agreement with the statement that "the PATH course/program is helping me reach my goals." Across all three colleges, the average agreement rating was consistently around 3.8 out of 5, with a rating of 4 corresponding to a response of "agree." Results for each of the colleges show little variation over time, being generally within one-tenth of a unit above or below 3.8, with two minor exceptions. First, the average rating for LCCC increased slightly during the last two survey waves—rising to 4.1 then dropping, but only to 4.0. Second, the average rating among students from Luzerne was abnormally low (3.0) in the first survey wave—a result likely due, as noted, to the small number of respondents to that survey wave from Luzerne.

Exhibit 27: Reported Agreement that PATH is Helping Survey Respondents Reach Their Goals
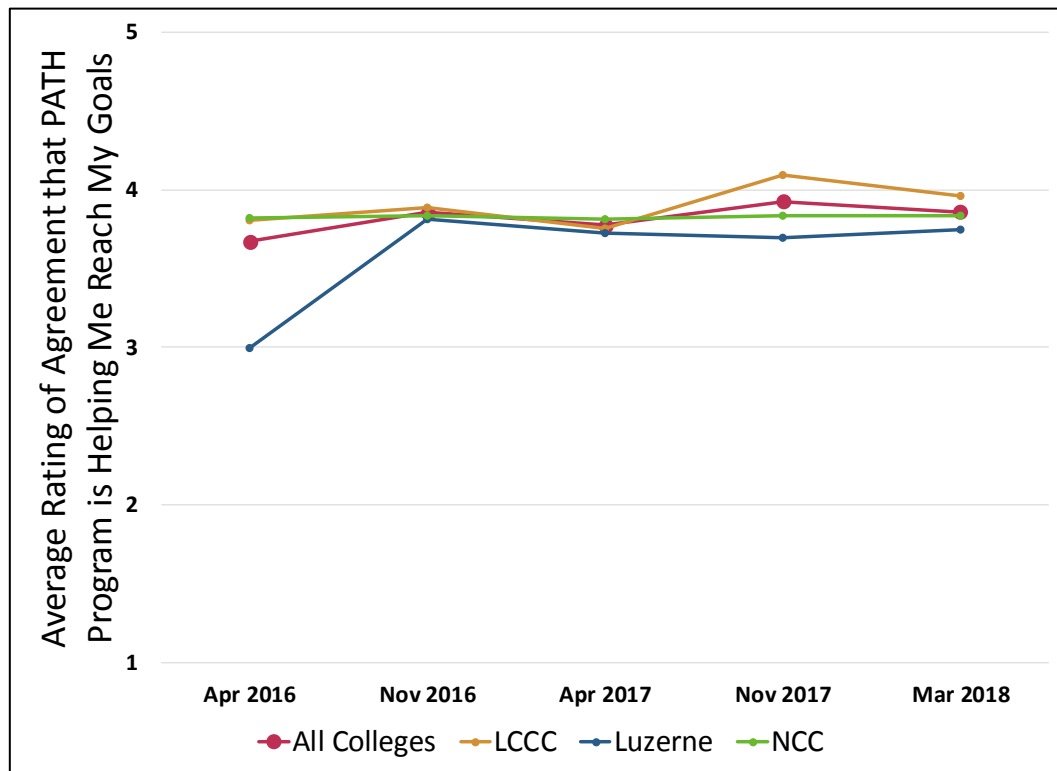
Source: PATH student surveys, Rounds 1-5.

Note: Possible responses were: strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5).

Alignment with Industry Standards. Exhibit 20 shows respondents' agreement with the statement that "the curriculum and/or equipment in my PATH course/program is aligned with current industry standards." Across all waves of the survey, students on average agreed with this statement. Across all colleges, the average rating was 3.9 (with a rating of 4 corresponding to the response "agree") for all survey waves except one, when it was slightly higher (at 4.1). Likewise, the average rating among respondents at each college was virtually unchanged over time. The one exception was among respondents at Luzerne—respondents to the third wave of that survey on average rated their agreement as 4.3 (a rating of 5 corresponded to the response "strongly agree").

Exhibit 20: Reported Agreement that PATH is Aligned with Industry Standards
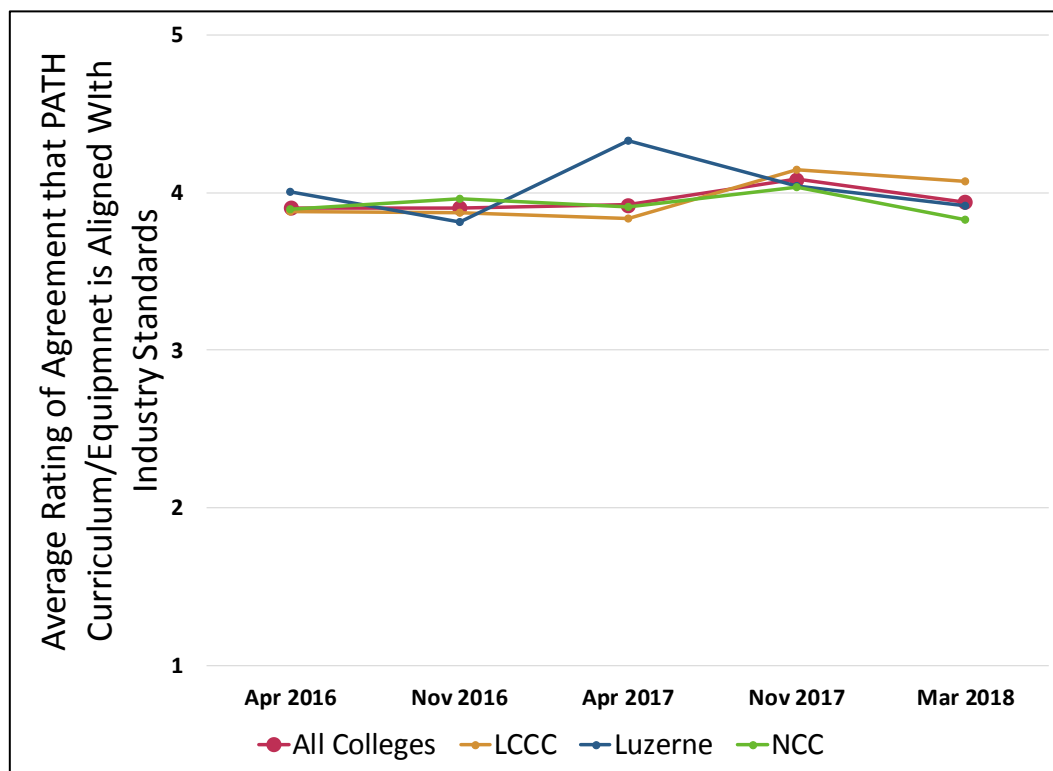
Source: PATH student surveys, Rounds 1-5.

Note: Possible responses were: strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5).

4.3 SUMMARY

To support the PATH management team and to complement the evaluation, we fielded five waves of a web-based survey of PATH students. It was open to all students ever enrolled in a PATH program as of the date the survey was fielded. Across the five survey waves, 20–24 percent of students invited to take the survey successfully completed it.

The survey included several questions related to student satisfaction with different aspects of the PATH program. Key survey results include:

- Survey respondents were consistently satisfied overall with PATH, with an average satisfaction rating of about a 4 on a 5-point scale.

- Across survey waves, 80–90 percent of survey respondents indicated they would recommend PATH to a friend.

- Survey respondents on average rated their agreement that PATH was helping students reach their goals as around 3.8 on a 5-point scale (the scale ranging from strong disagreement [1] to strong agreement [5]).

- Survey respondents rated their agreement that the PATH program/equipment was aligned with industry standards as 3.9 on the same 5-point scale.

- Aside from some results for a single college (Luzerne) from the first survey wave (which featured only 12 respondents), the survey response data showed little variation either across colleges or across survey waves.

Because the students who responded to our survey may differ from non-respondents in systematic ways, the survey results may not accurately represent the opinions of the broader population of all PATH students. Nevertheless, the results of the PATH student survey collectively suggest that PATH students thought highly of the program in many regards.

One of the key focuses of the evaluation was to estimate the impact of PATH on key education and labor market outcomes for PATH students. The next chapter describes our impact and outcomes analysis in detail.

5. Impact and Outcomes Analysis

5.1 APPROACH

A major evaluation focus was to estimate the impact of PATH on key education and labor market outcomes for PATH students. This chapter describes our impact and outcomes analysis in detail—including our approach, how we modified our approach in response to challenges we encountered, the data we used, and our results.

5.1.1 Original Approach

In the Detailed Evaluation Plan submitted to the TAACCCT national evaluation team, we proposed to examine the effectiveness of PATH in improving the labor market and educational outcomes of participants. We designed the impact analysis to address three research questions:

- Was the program effective in improving educational achievement?

- What was the impact of the program on finding and retaining employment?

- What was the impact of the program on the earnings of participants?

To measure program impacts, we planned to use a quasi-experimental approach to estimate program impacts by comparing the outcomes of program participants (i.e., the treatment group) to the outcomes of non-participants (i.e., the comparison group). The overall approach would involve five steps: (1) identify a comparison group, (2) collect data for treatment and comparison groups, (3) apply propensity score matching (PSM) methods to the treatment and comparison group data to construct an observationally equivalent comparison group to the treatment group, (4) estimate program impacts by comparing the outcomes of PATH participants to those of the comparison group, and (5) analyze and report the impact estimates.

A key requirement of this type of approach is the ability to identify an appropriate comparison group—a group of individuals that do not participate in PATH but are as similar as possible to the treatment group (i.e., PATH students). When designing the impact analysis, we expected that individuals comprising the pool from which we would draw the comparison group would be students enrolled in programs at the three PATH consortium colleges that were similar to PATH programs. Although there are no formal criteria for measuring the degree of similarity between two particular programs, our overall goal was to

select programs that were similar to TAACCCT-funded programs in terms of prerequisites, course length, credentials awarded, and other factors we would expect to be related to the post-program educational and labor market outcomes of student participants. In addition to characteristics of the courses or programs themselves, we planned to look for programs in which the students who enroll closely resemble those expected to enroll in TAACCCT-funded programs.

The original impact analysis design anticipated using four main data sources:

1. **Program intake forms**—As part of the PATH application process, participants were to provide data on demographics (gender, race, age), their employment status (whether they are employed at enrollment, hours worked if employed), and their educational attainment.

2. **The Pennsylvania Information Management System (PIMS)**—This system is an administrative database maintained by the Pennsylvania Department of Education, which contains information on educational outcomes.

3. **College student information systems (SIS)**—Each of the three colleges has its own internal administrative data system. These systems house student information, including demographics, course enrollment, course grades, and course completion, among other topics.

4. **Individual level unemployment insurance (UI) wage record data**—Maintained by the Pennsylvania Department of Labor and Industry (DLI), these data provide quarterly earnings information for many workers in the state. Data elements include year and quarter of employment, total earnings, and industry of employment.

Using these data sources, we planned to generate two types of variables—explanatory and outcome—for both treatment and comparison group students. Explanatory variables were to include any factors we expected to be related to both the decision to enroll in PATH and the educational or labor market outcomes of interest. Examples of explanatory variables include: demographic characteristics of students (e.g., age, gender, race, educational attainment prior to enrollment); measures of the labor market histories of students (e.g., whether employed prior to enrollment quarterly earnings for up to two years prior to enrollment); and characteristics of the programs in which they enrolled (e.g., industry focus, which college students attend, length of program). Outcome variables were to be the educational and labor market outcomes in which we are interested (e.g., whether the student completed the program, whether the student pursued further education, whether the student was employed in the calendar quarters following program enrollment, and the student's earnings in the calendar quarters following program enrollment).

To estimate program impacts, our approach would have involved four steps. First, we would estimate the following statistical model:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots \beta_N X_N + \varepsilon \qquad (1)$$

In equation (1), the dependent variable Y is equal to one for students in the treatment group and zero for students in the pool of comparison group programs. The X terms on the right-hand side represent the explanatory variables; α is a constant, the β terms are regression coefficients to be estimated, and ε is a mean-zero error term. Using the estimated regression coefficients, we would produce the predicted probability that a student was in the treatment group—called the propensity score.

The second step would be to use the propensity score to match each PATH participant to one or more comparison group students with identical or nearly identical propensity scores. After generating propensity scores for all PATH students, the third step would be to confirm that the treatment and matched comparison groups are balanced in terms of their observable characteristics. If not, we would revise equation (1), generate new propensity scores, repeat the matching procedure, and reassess the balance between groups. This process would continue until matching was successful.

The last step would be to estimate the impacts of the program. This would be done by calculating the differences in outcomes for the treatment group and the matched comparison group. Equation (2) shows the estimator:

$$\Delta Y = \frac{1}{T}\sum_{i=1}^{T}\left[Y_{1i} - \overline{Y_{0ij}}\right] \qquad (2)$$

In equation (2), ΔY represents the outcome of interest. On the right-hand side, the term in brackets represents the difference in the outcome of interest between individual i in the treatment group and the mean of the outcome variable over all matched comparison group members (indexed by the subscript j) for individual i. This calculation would be performed for each of the T individuals in the treatment group, with the results averaged over the entire treatment group.

5.1.2 Revised Approach

Subsequent to submission of the Detailed Evaluation Plan, we worked with the PATH grant team to finalize the comparison groups and make the necessary arrangements for the data

collection needed to support the evaluation. During that process, two important developments affected the original evaluation design:[49]

5. We were unable to identify acceptable comparison group programs for PATH programs to be implemented at LCCC.

6. DLI did not agree to provide unemployment insurance (UI) wage record data.

Lack of Comparison Groups for LCCC PATH Programs. We worked with the PATH leadership team at NCC and key staff at LCCC to identify viable comparison groups for the PATH programs at LCCC. LCCC implemented programs in two sectors: healthcare and advanced manufacturing. All PATH courses offered at LCCC were noncredit courses. Unfortunately, no similar noncredit courses were offered at LCCC to use as comparison group programs. Moreover, no similar noncredit courses were offered at either of the other two consortium colleges. Because of this, LCCC PATH programs were excluded from our impact analysis. Instead, we limited our analysis of LCCC programs to characterizing student outcomes.

Access to UI Wage Record Data. Over the course of the evaluation, we learned that the Center for Workforce Information and Analysis (CWIA)—the department within DLI that manages the data—had determined that it was unable to provide our research team with individual-level UI wage record data. The unavailability of individual-level labor market outcome data meant that we would not be able to estimate program impacts on labor market outcomes as originally intended. Instead, CWIA indicated that it would be limited to providing only aggregated employment and earnings information, thus preventing us from establishing a causal effect of PATH on these outcomes. Ultimately, CWIA was able to provide this aggregate information for PATH completers only. Because we were unable to obtain these data for the comparison group, our analyses are limited to describing these outcomes among PATH program completers only.

The lack of individual-level earnings data covering the period before program enrollment also limited our ability to implement matching methods for the educational outcomes of interest. This is because the lack of earnings data limited the amount of information available to us upon which to base the matching procedure.

---

[49] We also made a minor adjustment to our approach that did not affect the general design. Early in the evaluation, we discovered that the PIMS system would not be a viable source of postsecondary enrollment information. We confirmed with the colleges and the PATH leadership team that we would instead rely on the National Student Clearinghouse, maintained by the U.S. Department of Education.

Comparison Groups. Despite our inability to identify comparison groups for PATH programs at LCCC, working with the PATH leadership team and representatives from Luzerne and NCC enabled us to identify comparison group programs at those colleges. Our aim was to identify, for each PATH program, a corresponding comparison program(s) as similar as possible to the PATH program in: (1) program content, length, terminal credential, among other program dimensions; and (2) the characteristics of students likely to enroll in the program. Exhibit 29 and Exhibit 30 show the comparison groups we identified for each PATH program of study, along with the classification of instructional programs (CIP) code for each program.[50]

---

[50] CIP codes are a classification scheme used to organize programs of study in higher education. Programs with the same or similar CIP code will resemble each other in both content and objectives.

Exhibit 21: PATH and Comparison Group Programs at Luzerne

PATH Program		Comparison Group Program											
		Computer Systems Technology (AAS)	Electronics Engineering Technology (AAS)	Nuclear Engineering Technology (AAS)	Building Maintenance (Certificate)	Building Maintenance Technology (Diploma)	Building Maintenance Technology (AAS)	Electrical Construction Technology (AAS)	Electrical Construction Technology (Diploma)	Industrial Maintenance (AAS)	Industrial Maintenance (Diploma)	Plumbing and Heating	Plumbing, Heating and Air Conditioning Technology
Program	CIP	15	47	15	46	46	46	46	46	47	47	46	47
Computer Numeric Control	48	✓				✓	✓	✓	✓				
Engineering Design Manufacturing Technology	15	✓		✓									
Welding (Diploma)	48				✓						✓	✓	✓
Welding (Certificate)	48										✓	✓	✓
Diesel Truck Technology (Diploma)	47		✓								✓		✓
Diesel Truck Technology (Certificate)	47									✓	✓		✓

Exhibit 30: PATH and Comparison Group Programs at NCC

PATH Program		Comparison Group Program									
		Automotive Technology	Computer Aided Design	Computer Maintenance & Service Technology	Construction Management	Electronics Technology	Engineering	Medical Assistant	Legal Administrative Assistant	Legal Office Specialist	Nanofabrication Manufacturing Technology.
Program	CIP	15	15	15	46	47	14	51	52	52	15
Instrumentation	15	✓	✓	✓			✓				✓
Welding Technology	48				✓	✓	✓				✓
Healthcare Office Coordinator	51							✓	✓	✓	

For many of the PATH programs at Luzerne and NCC, we identified more than one comparison group program. This was to ensure the pool of comparison group students would be sufficiently large to permit our planned analyses.

5.2 DATA

Our analyses, therefore, rely on three data sources:

1. College data on PATH completers (i.e., students who enrolled and completed a PATH program).

2. College data on students who did not participate in PATH but were enrolled and completed a similar program at PATH colleges (i.e., comparison group students).

3. State aggregate employment and earnings data for PATH students.

Data on PATH students come both from forms completed at program enrollment and from college student information systems (SISs). The data provide information on student demographic characteristics (e.g., age, gender, race, educational attainment); work history (e.g., whether employed at enrollment); and educational information/outcomes (e.g., declared major, enrollment date, withdrawal date, graduation date).

Data on comparison group students, which come only from college SISs, include similar information as available for PATH students, but with some exceptions. For instance, the data for comparison group students do not include any information on educational attainment or employment status at enrollment. The student characteristics available for both PATH students and comparison group students are limited to three variables: age, gender, and race.

State employment and earnings data come from CWIA. NCC provided CWIA with input files containing identifying information for both PATH and comparison group students. CWIA matched the PATH student records to Pennsylvania state UI wage records and retrieved out-of-state UI wage record data via the Wage Record Interchange System (WRIS). CWIA calculated a number of outcome measures (e.g., employment rate, retention rate, average earnings) for different groups of PATH students; and then returned the results of those calculations to NCC, which provided the aggregate output data to us. Thus, our data on earnings and employment outcomes for PATH students are limited to aggregate outcomes. As mentioned above, because CWIA was not able to provide these aggregate measures for the comparison group, we provide descriptive analyses of these outcomes for PATH students only.

The quasi-experimental methods we use to estimate the impacts of PATH, as noted, rely on matching PATH completers to students in comparison group programs as similar as possible in the characteristics we can observe. For example, we might match a white male PATH student between ages 18–24 with a white male student in the same age group who did not participate in PATH. To implement this method, we need the pool of comparison students to be as similar as feasible to the pool of PATH students. The more similar the two groups, the more likely we are to find close matches to PATH students from among the pool of comparison group students.

Exhibit 31 summarizes key demographic information for PATH students and students in comparison group programs. The top panel of the exhibit presents data for all students; the bottom panel presents data only for those students who completed a program of study (since some of our subsequent analyses focus exclusively on completers).

Exhibit 31: Characteristics of PATH and Comparison Group Students

	PATH Students			Comparison Group Students		
	All	**Luzerne**	**NCC**	**All**	**Luzerne**	**NCC**
All Students						
Number of students	753	176	577	1,659	374	1,285
Age						
18-24	46.5	63.1	41.4	72.6	63.6	75.3
25-34	26.4	22.7	27.6	17.8	18.7	17.6
35+	26.7	13.1	30.9	9.3	17.7	6.9
Male	43.7	92.1	28.9	82.5	92.8	79.5
White	73.3	81.8	70.7	67.9	71.4	66.9
Completers Only						
Number of students	267	77	190	316	66	250
Age						
18-24	49.1	59.7	44.7	69.9	68.2	70.4
25-34	29.2	28.6	29.5	19.0	13.6	20.4
35+	21.4	10.4	25.8	11.1	18.2	9.2
Male	38.2	94.8	15.3	67.1	98.5	58.8
White	74.2	84.4	70.0	77.5	87.9	74.8

Source: PATH administrative data and college SIS data.
Notes: Except for number of students, table entries represent percentages. Totals across age group categories may not sum to 100 percent due to rounding and due to six records for which the student's age was missing. Totals for all PATH students omit students who enrolled in PATH programs at LCCC.
The number of students overall and the number of completers represent unduplicated counts. That is, students enrolled in multiple programs will be counted for once for each program in which they are enrolled.

These data reveal a number of insights regarding the similarities and differences between PATH students and comparison group students, both overall and at the two individual colleges:

▪ **The overall pool of comparison group students is large relative to the number of PATH students**. In total, our data include 1,659 comparison group students, over twice the number of PATH students (753). A smaller comparison group would

reduce the chance that statistical matching would be an effective methodology to minimize the risk of biased comparisons.

- **The population of comparison group students for Luzerne is roughly similar to the population of PATH students for Luzerne**. Among all PATH students from Luzerne, the group of comparison group students shares a similar age distribution, has a nearly identical proportion of men (93 percent among comparison students; 92 percent among PATH students), and has only a slightly lower proportion of whites (71 percent compared to 82 percent). The similarities between PATH students and comparison group students also hold for the group of completers, though the age distribution among comparison group students features higher proportions of the oldest and youngest students than the age distribution for PATH students. Among completers, the racial and gender makeups of comparison group students at Luzerne are more closely aligned with those of PATH students at Luzerne than among the broader population of all students.

- **The population of comparison group students for NCC is substantively different from the population of PATH students for NCC**. NCC comparison group students are far younger than the NCC PATH students, and the proportion of men (80 percent) is over 2.5 times that of the NCC PATH students (29 percent). The only dimension along which the two groups resemble each other is race (67 percent of NCC comparison group students were white vs. 71 percent of NCC PATH students). Similar patterns hold when comparing completers at NCC. These substantial differences are likely to make it difficult for our matching procedures to identify comparable matches for all PATH students.

Exhibit 32 summarizes key enrollment information for PATH students and comparison group students, regardless of whether they completed a program of study.

Exhibit 32: Enrollment Characteristics of PATH and Comparison Group Students

	PATH Students			Comparison Group Students		
	All	**Luzerne**	**NCC**	**All**	**Luzerne**	**NCC**
Number of students	753	176	577	1,659	374	1,285
Industry Sector						
Advanced Manufacturing	41.3	86.4	27.6	81.9	50.3	91.1
Healthcare	55.5	-	72.4	6.9	-	9.0
Transportation and Logistics	3.2	13.6	-	11.2	49.7	-
Enrollment Quarter						
Q3 2014	0.0	0.0	0.0	8.1	35.8	0.0
Q4 2014	0.0	0.0	0.0	0.3	0.0	0.4
Q1 2015	0.0	0.0	0.0	25.0	6.7	30.3
Q2 2015	0.0	0.0	0.0	1.4	0.0	1.8
Q3 2015	14.7	27.8	10.8	18.8	15.0	19.8
Q4 2015	0.3	0.0	0.4	0.0	0.0	0.0
Q1 2016	21.9	10.2	25.5	6.1	4.3	6.6
Q2 2016	0.5	0.0	0.7	1.1	0.0	1.4
Q3 2016	18.6	21.0	17.9	16.1	11.0	17.6
Q4 2016	0.3	0.6	0.2	.1	0.0	0.1
Q1 2017	13.4	4.6	16.1	6.1	6.4	6.0
Q2 2017	1.5	0.0	1.9	1.2	0.0	1.5
Q3 2017	19.7	32.4	15.8	14.3	13.4	14.6
Q4 2017	0.1	0.0	0.2	0	0.0	0.0
Q1 2018	9.0	3.4	10.8	1.7	7.5	0.0

Source: PATH administrative data and college SIS data.
Notes: Except for number of students, table entries represent percentages. Totals for all PATH students omit students who enrolled in PATH programs at LCCC.

The number of students represents unduplicated counts. That is, students enrolled in multiple programs will be counted for once for each program in which they are enrolled.

The data highlight how PATH and comparison group students compare in industry sector and enrollment timing:

- **Compared to PATH students, a higher proportion of comparison group students at Luzerne were enrolled in transportation/logistics programs**. Only 14 percent of Luzerne PATH students were enrolled in programs in transportation/logistics, compared to 50 percent of comparison group students. This complicates the task of identifying good matches for PATH students who enrolled in healthcare programs at Luzerne.

- **Compared to PATH students at NCC, few comparison group students were enrolled in healthcare programs there**. Twenty-eight percent of PATH students at NCC were enrolled in programs in advanced manufacturing, compared to 91 percent of the NCC comparison group. The remaining 72 percent of NCC PATH students enrolled in healthcare programs, compared to only 9 percent of their comparison group counterparts.

- **For both colleges, enrollment patterns were similar for PATH students and comparison group students during the observational period**. For both PATH and comparison group students, enrollments followed a pattern consistent with the academic semester system—most enrollments occurred in either the first or third quarter of the calendar year. The major difference between the two groups was that, among comparison group students, 35 percent enrolled in their programs of study prior to Q3 2015, the first quarter of PATH enrollment when the PATH program was just getting under way.

Except for the two academic achievement outcomes (completion and academic progress), our analyses only include outcomes among completers. Exhibit 33 shows the same information as Exhibit 32, but for only those students who completed a program of study.

Exhibit 33: Enrollment Characteristics of PATH and Comparison Group Students, Completers Only

	PATH Students			Comparison Group Students		
	All	**Luzerne**	**NCC**	**All**	**Luzerne**	**NCC**
Number of students	267	77	190	316	66	250
Industry Sector						
Advanced Manufacturing	35.2	87.0	14.2	63.0	45.5	67.6
Healthcare	61.1	-	85.8	25.6	-	32.4
Transportation/Logistics	3.8	13.0	-	11.4	54.6	-
Enrollment Quarter						
Q3 2014	0.0	0.0	0.0	15.5	74.2	0.0
Q4 2014	0.0	0.0	0.0	0.3	0.0	0.4
Q1 2015	0.0	0.0	0.0	50.0	10.6	60.4
Q2 2015	0.0	0.0	0.0	1.6	0.0	2.0
Q3 2015	22.9	33.8	18.4	22.2	15.5	24.0
Q4 2015	0.8	0.0	1.1	0.0	0.0	0.0
Q1 2016	40.5	14.3	51.1	1.0	0.0	1.2
Q2 2016	0.0	0.0	0.0	0.6	0.0	0.8
Q3 2016	21.4	28.6	18.4	7.3	0.0	9.2
Q4 2016	0.4	1.3	0.0	0.0	0.0	0.0
Q1 2017	10.1	9.1	10.5	1.6	0.0	2.0
Q2 2017	0.0	0.0	0.0	0.0	0.0	0.0
Q3 2017	4.1	13.0	0.5	0.0	0.0	0.0

Source: PATH administrative data and college SIS data.
Notes: Except for number of students, table entries represent percentages. Totals for all PATH students omit students who enrolled in PATH programs at LCCC.

The number of students represents unduplicated counts. That is, students enrolled in multiple programs will be counted for once for each program in which they are enrolled.

The data for completers shows patterns similar to those we observed among all students. The differences between PATH students and comparison group students are largely the same, though the group of NCC comparison group completers features a proportion of

students in healthcare programs that is not as drastically different from the proportion among NCC PATH students (32 percent versus 86 percent) as among all students (9 percent versus 72 percent). The timing of enrollments shows the same fluctuations with the academic calendar as before, with a significant proportion of comparison group students enrolled earlier than the first cohorts of PATH students. As noted in the discussion earlier, differences between PATH students and the pool of comparison group students may jeopardize our ability to implement the planned matching techniques. If there are PATH students for whom there are no good matches from among the pool of comparison group students, the matching algorithm may rely too heavily on poor matches, which runs a heavy risk of biasing our estimates.

5.3 RESULTS

Our analyses focused on understanding how PATH influenced two main educational outcomes:

1. **Completion—whether the student completed his/her program of study.**

2. **Academic progress**—for students still enrolled in a program of study, whether s/he is on schedule to complete his/her program of study in the appropriate number of academic semesters. Students are counted as behind schedule if they have been enrolled for at least the number of semesters their programs are designed to last but have not yet completed their programs.[51]

In addition, we provide descriptive analyses of the following labor market outcomes for PATH completers. [52]

3. **Employment**—whether the student was employed in the first calendar quarter after the quarter in which s/he completed his/her program of study. A student is counted as being employed if s/he had any positive earnings in the UI wage record data during the reference quarter.

4. **Job retention**—whether the student was employed in the second and third calendar quarters after completing his/her program of study. This measure is only calculated

---

[51] We obtained information on expected program length for all comparison group programs from the relevant college catalogs.

[52] Measures 3-5 are outcomes derived from employment and earnings data provided to NCC by CWIA. We were not directly involved in negotiations between NCC and CWIA regarding the earnings and employment outcomes to be reported to NCC, though we did provide the PATH leadership team with input regarding our preferred labor market outcome measures. The three labor market outcome measures we examine here are defined as the PATH leadership team chose to define them when finalizing the data sharing agreement with CWIA.

for students employed in the first calendar quarter after their quarters of completion. Employment in the second and third quarters after program completion is defined the same as for the employment outcome measure.

5. **Earnings**—total earnings in Q4 2017. This measure also is only calculated for students employed in the first calendar quarter after their quarters of completion.

As mentioned above, completion and academic progress are the only outcomes for which we obtained individual-level data. As a consequence, they are the only outcomes for which we could estimate the causal impact of PATH using the quasi-experimental methods originally planned.

5.3.1 Impacts on Completion

Student data used to assess impacts on completion, cover program completions through Q4 2017—limiting our analysis sample to those students who had enrolled early enough that they could have completed the PATH on or before the end of Q4 2017, the end of the observational period. Thus, our analysis includes only students who could potentially have completed their programs of study if sufficient time had passed for us to observe on-time completion.

Exhibit 34 summarizes completion rates among PATH students and comparison group students, including completion rates disaggregated by college and industry.

Exhibit 22: Completion Rates for PATH and Comparison Students

	PATH students (N = 341)	Comparison students (N = 1,020)	Difference
All students	60.7	28.8	+31.9***
By college			
Luzerne	62.9	27.4	+35.5***
NCC	59.8	29.3	+30.6***
By industry sector			
Advanced manufacturing	47.4	21.8	+25.6***
Healthcare	72.1	89.0	-16.9***
Transportation/logistics	66.7	30.5	+36.2***

Source: PATH administrative data and college SIS data.

Note: Table entries represent percentages. ***/**/* indicate statistical significance at the 1/5/10 percent level. Data include only students who enrolled sufficiently early that they could have completed on or before Q4 2017, given the expected length of their programs of study.

The number of students represents unduplicated counts. That is, students enrolled in multiple programs will be counted for once for each program in which they are enrolled.

Exhibit 34 features a number of interesting results:

- **Among all students, the proportion of PATH students who completed their programs of study was twice as high as the proportion who did so among comparison students**. Over 60 percent of PATH students completed their programs of study, compared to less than 30 percent of comparison students. The difference of 32 percentage points was statistically significant (since almost all the statistically significant impacts are significant at the 1 percent level, future reference to statistical significance means at the 1 percent level except when otherwise noted).

- **The difference in completion rates between PATH students and comparison students was similar for Luzerne and NCC**. At both colleges, about 60 percent of PATH students completed their programs of study, compared to slightly less than 30 percent of comparison students. The difference was statistically significant for both schools.

- **Differences in completion rates between PATH students and comparison students varied by industry sector**. PATH students enrolled in programs of study in two industries—advanced manufacturing and transportation/logistics—completed those programs at rates over twice as high as their comparison student counterparts. On the other hand, PATH students in healthcare programs completed at a rate *lower* than comparison students (72 percent for PATH healthcare students compared to 89 percent of comparison students, a difference of 17 percentage points). All differences in completion rates by industry were statistically significant.

Comparing raw completion rates suggests that PATH programs may have increased the likelihood that students would complete their programs of study. However, the results of these simple comparisons do not account for other factors that may be responsible for some of the observed differences. For example, perhaps students who possessed greater determination to finish their studies were more likely to enroll in PATH programs than comparison programs. If students with greater determination are more likely to complete their programs of study, then in this scenario, the greater average determination among PATH students—i.e., *not* the PATH program itself—will be responsible for some (or all) of the observed differences in completion rates between the two groups. The problem for estimating the effect of PATH on completion rates in this setting is the presence of *selection bias*—systematic differences between the students who enrolled in PATH and those who

enrolled in the comparison programs that affect the outcome we are interested in (i.e., program completion).

Implementing the matching methods described in Section 5.1 is one way to attempt to control for differences like student determination in the hypothetical example. There are different types of matching methods, but each has the same goal: to match each member of a treatment group (in this setting, students who enrolled in PATH) to one or more members of a pool comprising a potential comparison group, with the matches chosen so that a particular individual from the treatment group is matched with member(s) of the comparison group with as similar observable characteristics as possible to those of that individual. If the assumptions of the matching methods are satisfied, the results of the procedures can be interpreted with a known degree of statistical confidence as the causal effect of the treatment on the outcome of interest.

To estimate the impact of PATH on program completion, we used three common matching methods: (1) nearest neighbor (NN) matching, (2) propensity score matching (PSM), and (3) inverse probability weighted regression adjustment (IPWRA).[53] Exhibit 35 summarizes the results for all three matching procedures using the sample of all PATH and comparison group students, again with the restriction that the students in the PATH sample had begun their programs of study sufficiently early that they could have completed the program on time within our observational period.

---

[53] See Appendix A for technical details regarding these methods and how we implemented them.

Exhibit 23: Estimated Impact of PATH on Program Completion

	Matching Method		
	NN	**PSM**	**IPWRA**
All students	+21.8***	+20.4***	+20.5***
By college			
Luzerne	28.2***	31.2***	27.8***
NCC	11.0**	11.3**	9.2**
By industry sector			
Advanced manufacturing	-	20.9***	23.0***
Healthcare	-	-16.0***	-17.8***
Transportation/logistics†	N/A	N/A	N/A

Source: PATH administrative data and college SIS data.

Note: Table entries represent percentages. ***/**/* indicate statistical significance at the 1/5/10 percent level. Data include only students who enrolled sufficiently early that they could have completed on or before Q4 2017, given the expected length of their programs of study. † Program impacts are not estimated for this industry due to insufficient sample size.

The three methods give consistent results. Each suggests that, for the entire sample of students who in theory could have completed their programs of study on time within our window of observation, PATH programs led to an increase in the completion rate of roughly 20–21 percentage points, a statistically significant result. The magnitude is large—an improvement of 72 percent, given that the completion rate among the comparison group was only 29 percent.

The second panel of the exhibit again shows consistent results across the three methods for both colleges, although the size of the impact varies by college. For Luzerne, PATH increased completion rates by a statistically significant 28–31 percentage points (roughly doubling the rate among comparison students). For NCC, PATH increased completion rates by 9–11 percentage points, an increase of 31-38 percent over the rate among comparison students, which is statistically significant, but only at the 5 percent level.

The bottom panel of the exhibit summarizes our impact estimates by industry sector. The results again are consistent across the two methods for which matching was possible, and for the two-industry sector with sufficient sample size. The results by industry shed light on the aggregate effects at the college level. For programs in advanced manufacturing, we estimate that PATH increased the completion rate by 21–23 percentage points. For programs in healthcare, in sharp contrast, the estimated impact shows that PATH

decreased the completion rate by 16–18 percentage points. The contrast by industry in fact reflects the different mixes of enrollments by industry at the two colleges. Recall that Luzerne offered programs in advanced manufacturing and transportation/logistics, but not healthcare; NCC offered programs in advanced manufacturing and healthcare, but not transportation/logistics. The uniformly positive impact estimates at the college-level (shown in the second re driven by PATH's impact on completion within each of the different industry pairs offered by the two colleges' PATH programs.

Interpreting the Results. Our estimates of the impact of PATH on program completion suggest that the program had very large effects, increasing the likelihood of program completion. On the surface, these results suggest that programs like PATH, which combine occupational training in key industries with robust student support services, may be especially effective in increasing program completion. Before interpreting this as a reliable result, however, two methodological considerations need to be considered as we interpret our results.

First, the procedures we used to match each PATH student with one or more similar comparison group students were limited to matching along observable dimensions. The key assumption underlying these methods is that the matching on observable characteristics is rich enough to capture all factors related to both the treatment assignment (i.e., whether the student participated in PATH or not) and to the outcome of interest. Because we had relatively few observable student characteristics on which to base the matching procedure, however, there may remain important student characteristics related to both the likelihood of enrolling in PATH and the likelihood of completing a program of study that are unobservable. These cannot be appropriately controlled because they are, by definition, omitted from the analysis. To the extent that this is true, our impact estimates reflect, not only the impact of PATH, but also the impact of these omitted variables. Second, and related to the first point, the programs of study from which our comparison students are drawn may attract very different types of students in ways we cannot directly observe. To the extent they are not good substitutes for PATH programs, our estimates risk mistakenly attributing to PATH some of the effects of these dissimilarities.

Given these caveats, the most appropriate way to interpret our results, in our judgment, is to focus less on the magnitude of the impacts and more on their statistical significance and their *direction*. The impact of PATH may not quite as large as the results we obtain for the reasons noted, but we can put more confidence, given the direction of the effects, that the program did, in fact, increase completion rates for advanced manufacturing and transportation/logistics programs, though not for healthcare programs.

5.3.2 Impacts on Academic Progress

Our analyses of program completion, as before, includes only students who could have potentially completed their programs of study within our observational period, given how long their individual programs of study are designed to take. For students still enrolled in PATH or comparison programs at the end of our observational period, we also examined whether PATH affected the extent to which students were making normal academic progress, as defined earlier. Exhibit 36 summarizes this outcome measure for all students, and for students disaggregated by college and industry.

Exhibit 36: Normal Academic Progress Rates for PATH and Comparison Students

	PATH students (N = 341)	Comparison students (N = 1,020)	Difference
All students	60.7	28.8	+31.9***
By college			
Luzerne	62.9	27.4	+35.5***
NCC	59.8	29.3	+30.6***
By industry sector			
Advanced manufacturing	47.4	21.8	+25.6***
Healthcare	72.1	89.0	-16.9***
Transportation/logistics	66.7	30.5	+36.2***

Source: PATH administrative data and college SIS data.
Note: Table entries represent percentages. ***/**/* indicate statistical significance at the 1/5/10 percent level. Data include only students who enrolled sufficiently early that they could have completed on or before Q4 2017, given the expected length of their programs of study.

The number of students represents unduplicated counts. That is, students enrolled in multiple programs will be counted for once for each program in which they are enrolled.

Several observations about the patterns of academic progress among PATH and comparison students are instructive:

- **Collectively, the proportion of PATH students on schedule to complete their programs of study is over double the proportion of comparison students**. Sixty-one percent of PATH students were making steady academic progress at the end of the observational period, compared to only 29 percent of comparison students. The difference of 32 percentage points is statistically significant.

- **The difference in academic progress rates between PATH and comparison students is roughly similar for both Luzerne and NCC**. Among students at Luzerne, 63 percent of PATH students vs. only 27 percent of comparison students were making normal academic progress. At NCC, the corresponding rates were 60 percent and 29 percent. For both colleges, the difference in rates of academic progress between PATH and comparison students was between 31 and 36 percentage points, both of which were statistically significant.

- **Differences in academic progress rates varied by industry sector**. For programs of study in two industries—advanced manufacturing and transportation/logistics—the proportion of students making normal academic progress was higher among PATH students than among comparison students. The difference was largest (36 percentage points) among students in transportation/logistics programs, though only slightly lower among students in advanced manufacturing programs (26 percentage points). Among students in healthcare programs, in contrast, the rate of academic progress was *lower* for PATH students (72 percent) than for comparison students (89 percent). All the differences by industry were statistically significant.

Comparing raw rates of academic progress suffers from the same limitations we described in the context of completion rates. To isolate the impact of PATH on this outcome, we implemented the same three matching methods described earlier. Exhibit 37 summarizes our estimates of PATH's impact on academic progress.

Exhibit 24: Estimated Impact of PATH on Academic Progress

	Matching Method		
	NN	**PSM**	**IPWRA**
All students	+20.0***	+19.6***	+19.7***
By college			
Luzerne	-25.9***	-38.5***	-65.2***
NCC	+29.6***	+30.7***	+29.7***
By industry sector			
Advanced manufacturing	+23.9***	+21.9***	+22.2***
Healthcare	-	1.5	0.8
Transportation/logistics†	N/A	N/A	N/A

Source: PATH administrative data and college SIS data.

Note: Table entries represent percentages. Academic progress is defined as a binary variable equal to 1 if the student is on schedule to complete his/her program of study on time and 0 if the student is behind schedule. ***/**/* indicate statistical significance at the 1/5/10 percent level. Data include only students who enrolled sufficiently early that they could have completed on or before Q4 2017, given the expected length of their programs of study. † Program impacts are not estimated for this industry due to insufficient sample size.

The top row of the exhibit shows that for the Luzerne and NCC students in the sample, PATH led to an increase in the likelihood that a student was making normal economic progress of 20 percentage points. In other words, PATH students were 20 percentage points *less* likely to be behind schedule in their chosen programs of study in both colleges. The estimated effect was statistically significant and large in magnitude. Given that only 29 percent of comparison students were classified as making normal academic progress, the impact of PATH represents an increase of 69 percent.

The second panel of the exhibit estimates the effect of PATH on the likelihood of normal academic progress by college. The results for the two colleges are quite different from each other. For Luzerne students, PATH led to a large *decrease* in the likelihood of making normal academic progress (in other words, PATH students were more likely to be behind schedule), with the magnitude varying quite a bit across the three matching methods. The impact estimate was largest (65 percentage points) when estimated using IPWRA. The wide range of point estimates for Luzerne students suggests that there may be important unobserved differences between still-enrolled PATH students and their comparison group counterparts that lead to poor-quality matches.

The bottom panel of the exhibit presents the impact estimates separately by industry. PATH improved the likelihood of making normal academic progress by 22–24 percentage points for students still enrolled in advanced manufacturing programs. In contrast, there was no statistical impact on the academic progress rate for PATH students in healthcare programs.

Interpreting the Results. All the same cautions noted regarding the interpretation of our estimates of the impact of PATH on completion also apply to our estimates of PATH's impact on academic progress. Rather than the point estimates themselves, the most likely interpretation of our results is that PATH improved the likelihood that students still enrolled in programs of study as of the end of the observational period were making normal academic progress. As before, the results were likely driven primarily by the impact of PATH on students at NCC and students in advanced manufacturing programs.

5.3.3 Employment Outcomes

Exhibit 38 summarizes employment rates among PATH program completers.

Exhibit 25: Employment Rates for PATH Program Completers

	PATH completers (N = 604)
All students	62.4
By college	
LCCC	58.2
Luzerne	68.4
NCC	67.7
By industry sector	
Advanced manufacturing	67.8
Healthcare	59.9
Transportation/logistics	90.0

Source: PATH administrative data and state administrative data from CWIA.
Note: Table entries represent percentages.
The number of students represent unduplicated counts. That is, students enrolled in multiple programs will be counted for once for each program in which they are enrolled.

Among the 604 completers for whom we received outcome data, 62 percent were employed in the calendar quarter following the quarter in which they completed their PATH programs, with some variation by college. PATH completers from Luzerne and NCC were employed at the same rate, at 68 percent. The employment rate among PATH completers at LCCC was 10 percentage points lower, at 58 percent. Finally, employment rates for PATH completers varied substantially by industry sector. For the relatively few PATH students who completed programs in transportation/logistics, the employment rate was 90 percent—22 and 30 percentage points higher than the rates for PATH completers in advanced manufacturing programs (68 percent) or healthcare programs (60 percent).

5.3.4 Job Retention Outcomes
Exhibit 39 summarizes job retention among PATH program completers.

Exhibit 26: Job Retention for PATH Program Completers

	PATH completers (N = 377)
All students	59.7
By college	
LCCC	63.8
Luzerne	42.3
NCC	60.3
By industry sector	
Advanced manufacturing	59.0
Healthcare	60.1
Transportation/logistics	44.4

Source: PATH administrative data and state administrative data from CWIA.
Note: Table entries represent percentages. Figures are calculated among only those completers who were employed in the first calendar quarter following the calendar quarter of program completion.

Because the retention outcome measure is defined only for those program completers who were employed in the first calendar quarter after the quarter in which they completed their programs of study, the figures in Exhibit 36 are for the 377 PATH completers who met these criteria. Among that group, 60 percent retained employment in the second and third calendar quarters after the quarter of program completion. Job retention rates were similar for completers from LCCC (64 percent) and NCC (60 percent), both of which were much higher than the rate for completers at Luzerne (42 percent).

The bottom panel suggests that this is due to differences in employment retention across industry sectors. Retention rates among students who completed programs in advanced manufacturing or healthcare were virtually identical, at 59 and 60 percent, respectively. LCCC and Northampton offered PATH programs exclusively in these two industries. In comparison, the job retention rate for students who completed programs in transportation/ logistics was much lower, at 44 percent (despite the employment rate of 90 percent for this group).

5.3.5 Earnings Outcomes

Exhibit 40 summarizes average quarterly earnings among PATH program completers, the data for which only go through Q3 2017. Figures in the exhibit are calculated only among completers employed in the first calendar quarter after the quarter of program completion.

Exhibit 40: Average Quarterly Earnings for PATH Program Completers

	PATH completers (N = 377)
All students	$7,621
By college	
LCCC	$8,169
Luzerne	$7,551
NCC	$6,648
By industry sector	
Advanced manufacturing	$9,876
Healthcare	$6,402
Transportation/logistics	$7,929
By quarter of completion	
Q3 2015	$11,297
Q4 2015	$7,911
Q1 2016	$11,957
Q2 2016	$6,804
Q3 2016	$8,720
Q4 2016	$7,069
Q1 2017	$7,885
Q2 2017	$6,854
Q3 2017	$7,281

Source: PATH administrative data and state administrative data from CWIA.
Note: Earnings amounts represent quarterly earnings for the most recent calendar quarter available in the CWIA data (Q4 2017).

Among the 377 students who completed PATH programs and were employed in the first calendar quarter after the quarter of completion, average quarterly earnings were $7,621, which is equivalent to annual earnings of $30,484. Average earnings among PATH completers varied across the three colleges. Average quarterly earnings were highest for PATH completers from LCCC, who averaged $8,169. This figure was 8 percent higher than among Luzerne PATH completers ($7,551) and 23 percent higher than among NCC PATH completers ($6,648).

In a similar pattern as for the employment outcome, average earnings for PATH completers varied by industry sector. PATH students who completed programs in advanced manufacturing had the highest average quarterly earnings at $9,876—equivalent to annual earnings of $39,504. Average quarterly earnings were lower among students who completed PATH programs in transportation/logistics ($7,929), and lower still among students who completed PATH healthcare programs ($6,402). The pattern across industry sectors helps explain the pattern across colleges, as the colleges with the highest earnings outcomes for PATH completers are those that offered programs in the industry sectors with the highest average earnings for completers. This is likely also the result of the mix of program intensity offered at the colleges. Since nearly all PATH programs in healthcare were certificate/diploma programs aimed at putting students in entry-level positions, it is not surprising that students completing PATH healthcare programs had lower earnings outcomes than students who completed PATH programs in the other sectors.

The last panel of Exhibit 40 shows how average earnings varied among completers depending on the calendar quarter in which they completed their PATH programs. Because the earnings data reflect earnings for Q4 2017, they represent different follow-up periods for different cohorts of completers. For example, for the most recent completers in our earnings data—those who completed their PATH programs in Q3 2017—the earnings outcome measures average earnings among this group at one quarter post-completion. For the earliest completers in our data, those who completed PATH programs in Q3 2015, the earnings outcome measures average earnings at nine quarters (e.g., over two years) post-completion. Average quarterly earnings among completion cohorts ranged from $6,804 (equal to $27,216 annually) to $11,957 ($47,828 annually). Average earnings were generally higher for cohorts that completed earlier in the grant period. For instance, four of the five cohorts with the highest earnings in Q4 2017 completed PATH programs in Q3 2016 or earlier. One interpretation of this pattern is that PATH completers may have entered jobs in which their earnings steadily rise over time.

5.4 SUMMARY

As one of the two main components of our evaluation, the impact analysis was designed to answer three research questions:

1. Was the program effective in improving educational achievement?
2. What was the impact of the program on finding and retaining employment?
3. What was the impact of the program on the earnings of participants?

To answer these questions, our original design proposed to estimate the impacts of PATH using matching methods, which would compare the outcomes of PATH students to the outcomes of matched comparison groups. The comparison groups would comprise students from the three colleges that were enrolled in programs as similar to the PATH programs as feasible.

We adjusted our original approach due to two developments. First, we were unable to identify comparison group programs at one of the colleges—LCCC—which offered only noncredit PATH programs. As a result, we omitted LCCC from our impact analyses. Second, we were unable to obtain individual-level employment and earnings data from the state workforce agency. As a consequence, we estimated program impacts for only the educational achievement outcomes. For the employment and earnings outcomes of interest, we were limited to a descriptive analyses of PATH program completers.

Our analyses rely on three data sources:

1. College data on PATH students

2. College data on students who did not participate in PATH but were enrolled in similar programs at PATH colleges (i.e., comparison group students)

3. State aggregate employment and earnings data for PATH students

We estimate the impact of PATH on two key educational outcomes (completion and academic progress) and provide descriptive characteristics of three employment- and earnings-related outcomes (employment, job retention, and earnings) for PATH completers.

Impacts on Completion. The results for program completion indicate that among Luzerne and NCC students, PATH led to a 21 percentage point impact on the likelihood that a student would complete his/her program of study. The impact was equal to 28–31 percentage points for Luzerne students and 9–11 percentage points for NCC students. The impact of PATH also varied by industry sector—students who enrolled in PATH programs in advanced manufacturing were 21–23 percentage points more likely to complete their programs of study than comparison students. Those enrolled in PATH programs in healthcare, in contrast, were 16–17 percentage points *less* likely to complete.

Impacts on Academic Progress. Our results for academic progress show that for PATH students still enrolled at Luzerne and NCC (collectively), participating in PATH led to a 20 percentage point average increase in the likelihood that the student would be making normal academic progress. This impact was primarily driven by students still enrolled at NCC (for whom we estimate an impact of 30–31 percentage points) and for students in

advanced manufacturing programs (for whom we estimate an impact of 22–24 percentage points). In comparison, we estimated that PATH *decreased* the likelihood of making normal academic progress for Luzerne students who were still enrolled (i.e., it *increased* the likelihood that they were behind schedule). However, the Luzerne results vary widely by estimation method, strongly suggesting that the pool of comparison students may feature poor comparison group matches for PATH students.

Employment Outcomes. Employment outcome data for PATH students shows that 62 percent of students who completed a PATH program of study were employed in the first calendar quarter after the quarter of completion. The rate was similar among the three colleges—the rate was 68 percent for Luzerne and NCC students, and 58 percent for LCCC students. Students who completed PATH programs in transportation/logistics were much more likely than students who completed PATH programs in either healthcare or advanced manufacturing to be employed. Among the first group, 90 percent were employed, compared to 68 percent for advanced manufacturing PATH students and 60 percent for healthcare PATH students.

Job Retention Outcomes. Among PATH students employed in the first calendar quarter after completing a PATH program of study, the job retention rate for the second and third quarters after completion was 60 percent. The rate was similar for LCCC (64 percent) and NCC (60 percent)—much higher than among students from Luzerne (42 percent). Retention rates were similar for students who completed programs in either advanced manufacturing (59 percent) or healthcare (60 percent)—both much higher than among students who completed PATH programs in transportation/logistics (44 percent).

Earnings Outcomes. Average earnings in Q4 2017 (the end of the observational period) for PATH students employed in the first calendar quarter after completing a program of study were $7,621 (equal to $30,484 annually). Average earnings varied by college. They were highest among PATH completers from LCCC ($8,169, equal to $32,676 annually); second-highest among Luzerne PATH completers ($7,551, equal to $30,204 annually); and lowest among NCC PATH completers ($6,648, equal to $26,592 annually). Likewise, average earnings varied by industry focus. PATH students who completed programs in advanced manufacturing had the highest average earnings ($9,876, equal to $39,504 annually); followed by those who completed programs in transportation/logistics ($7,929, equal to $31,716 annually). PATH students who completed programs in healthcare had the lowest average earnings ($6,402, equal to $25,608 annually). Average earnings figures also varied according to the timing of program completion. Broadly speaking, average earnings for PATH students who completed earlier in the grant period were higher than for those who completed more recently.

6. Discussion

The PATH program brought together three Pennsylvania community colleges in partnership to implement enhanced occupational training programs of study and to use the CoP model to test cutting-edge approaches to instruction and employer engagement. The colleges successfully implemented the key components of their proposed grant program, establishing 30 PATH programs of study in three targeted industry sectors, implementing the three CoPs, and ultimately enrolling over twice as many students (1,129) as projected (497). Beyond simple operational detail, the grant also offered an opportunity for the three consortium colleges to collaborate and to develop working relationships beyond what had existed previously.

PATH students had access to a menu of support services and survey data suggest that students made use of them. Moreover, survey data suggest that PATH students were generally satisfied with their experiences in the program—around 90 percent of survey respondents indicated that they would recommend PATH to a friend.

Our quantitative results suggest that PATH had positive impacts on educational achievement, increasing both the likelihood of program completion and the likelihood that students make regular academic progress. Labor market outcomes for PATH program completers indicate that nearly two-thirds (62 percent) were employed within one quarter of completion, that 60 percent of those subsequently retained employment, and that average quarterly earnings among those employed were $7,621 (equal to $30,484 annually).

Overall, PATH was successfully implemented as planned and served many more students than expected. Though the operation of PATH varied somewhat across the three colleges, each was able to deliver new or enhanced programs of study through PATH, augmenting existing programs and integrating the new programs into deliberate career pathways. Once the grant has finished, the PATH programs of study along with the equipment and facility upgrades made possible through PATH will continue to be made available to future cohorts of students, thereby extending the positive influence of PATH beyond the grant period.

Although PATH was implemented successfully and was well-received by the participating institutions, it is less clear what impacts PATH had on the educational and labor market outcomes that were the focus of the impact and outcomes analysis component of the evaluation. First, our impact estimates suggest that PATH was responsible for improving educational achievement measures. However, given the limited nature of the data available

for our analyses, the results should be interpreted with some caution. Second, it was unfortunately not feasible to estimate the impact of PATH on labor market outcomes. Given the data limitations, the type of more technically rigorous analysis that might have shed light on PATH's impacts on labor market outcomes was not possible.

Concluding Remarks. One of the motivations for the TAACCCT grant program was to enable community colleges across the country to design and implement evidence-based programs aimed at providing workers with access to new and/or enhanced occupational training programs aligned with local labor market needs. The three colleges that jointly operated PATH successfully fulfilled the promise of the TAACCCT program, working together to strengthen their support of the labor market in northeast Pennsylvania. In the future, other similarly situated groups of community colleges should consider following the PATH model as a way not only to enhance what they offer to their local communities but also to strengthen their existing relationships and work together to better serve both students and businesses. It is our hope that this report will help any colleges considering such a project to understand the PATH experience so that they may replicate PATH's Appendix A. Technical Details

To estimate the impacts of PATH on program completion and academic progress, we used three different quasi-experimental methods: nearest neighbor matching, propensity score matching, and inverse-probability-weighted regression-adjustment.[54] All three methods use data on comparison students as proxies for what the outcomes of PATH students would have been, had they not participated in PATH. The three methods differ in how they use the comparison group data. The purpose of this appendix is to briefly describe how each method works.

---

[54] All calculations were performed using Stata (version 14) and the following estimation commands: `teffects nnmatch`, `teffects psmatch`, and `teffects ipwra`.

Appendix A. Technical Details

A.1 NEAREST NEIGHBOR MATCHING

Nearest neighbor (NN) matching estimates the treatment effect by matching each treated unit (in this setting, a PATH student) to one or more comparison units (i.e., comparison students) that are most similar to the treated unit in terms of observable characteristics. For example, suppose one of the observations in our data is of a PATH student who is between the ages of 18 and 24, female, and white. To estimate the impact of PATH on the outcome of interest, nearest neighbor matching involves identifying one (or more) comparison group students who are also 18-24, female, and white, then calculating the difference in the outcome of interest between the PATH student and the matched comparison group student. In instances where there are no comparison students who are exact matches for a given PATH student, the comparison student(s) that are most similar to that PATH student are used instead. The degree of similarity between a PATH student and a comparison student is measured using the Mahalanobis distance, which involves calculating a weighted function of the covariates for each unit then comparing the resulting values.[55] When the procedure involves selecting more than one comparison unit, then the estimated impact for an individual treated unit is calculated as the difference between the average outcome among the group of comparison units and the outcome for the treated unit. This process is repeated for all observations in the data (including comparison units, which are matched to similar treated units). The average of the calculated differences, over all units of observation, is an estimator of the average treatment effect (ATE).[56]

Put into an equation, the NN estimator of the ATE is given by:

$$\text{ATE}_{NN} = \frac{1}{N} \sum_i (\hat{y}_{1i} - \hat{y}_{0i})$$

---

[55] The procedure also allows for the researcher to specify that one or more categorical variables must match exactly. For instance, a researcher may specify that matches must be of the same gender. Under this scenario, each treated unit will be matched to the one or more comparison units of the same gender that are most similar in terms of the other observable characteristics.

[56] Another estimator that is sometimes of interest is called the average treatment effect on the treated (ATET), which is equal to the average of the individual-level impacts over only those observations in the treatment group.

In the equation, N is the number of observations, i indexes the units of observation (i.e., students), and y represents the outcome of interest, with the terms in parentheses defined as

$$\hat{y}_{ti} = \begin{cases} y_i & \text{if } t_i = t \\ \dfrac{1}{N_j} \displaystyle\sum_{j \in \Omega(i)} y_j & \text{otherwise} \end{cases}$$

The term on the left-hand side of the equation, $\hat{y}_{ti}$, is the estimated outcome for observation i under treatment condition t. On the right-hand side of the equation, y_i represents the outcome for observation i, t_i represents the treatment condition for student i, N_j is the number of matches for student i, and $\Omega(i)$ is the set of all observations that are matches for student i.

A.2 PROPENSITY SCORE MATCHING

Propensity score matching (PSM), like NN matching, estimates the impact of a treatment by comparing the observed outcomes to estimated potential outcomes under the opposite treatment condition, where the estimated potential outcomes are based on the outcomes of matched observational units. The difference between the two methods is that whereas under NN matching the matches are determined by the degree of similarity between two observations based on their observable characteristics, under PSM the degree of similarity is based on a single variable called the propensity score.

The propensity score for an individual observation is the probability that the individual receives the treatment (see Section 5.1.1 for a discussion of the propensity score). To estimate the impact of the treatment, PSM uses the same procedure as NN matching, using the estimated propensity score to determine the matches. The formula for the PSM estimator is identical to the one presented in Section A.1.

A.3 INVERSE-PROBABILITY-WEIGHTED REGRESSION-ADJUSTMENT

Inverse-probability-weighted regression-adjustment (IPWRA) estimation of the impact of a treatment on an outcome of interest works differently than NN matching and PSM. Rather than identifying one or more matches for each observation in the data and computing potential outcomes based on the outcomes of the matches, IPWRA involves estimating a weighted regression function. The weight for an individual observation is equal to the

estimated inverse probability of treatment (i.e., the inverse of the estimated propensity score).

The equations describing the IPWRA estimator are complex and we do not provide them here. Rather, we outline the steps of the estimation process:

1. **Step 1**: Estimate a regression model in which treatment status is modeled as a function of explanatory variables and an error term. In the case of a binary treatment, the regression is typically modeled as a logit or probit regression.

2. **Step 2**: For each observation, use the estimated regression coefficients from step 1 to generate predicted values of the likelihood of treatment (i.e., the propensity score).

3. **Step 3**: Calculate a weight for each observation by taking the inverses of the predicted values from step 2.

4. **Step 4**: Estimate a weighted regression model in which the outcome of interest is modeled as a function of explanatory variables and an error term, using the weights from step 3.

5. **Step 5**: Calculate the ATE by computing the average outcome over all observations for each treatment level (using the estimated regression coefficients from step 5), then taking the difference between the average outcome for the two treatment levels.

These steps are automated by standard statistical computing software programs that offer IPWRA commands.