

INVENTORY OF **PRE-APPRENTICESHIP PROGRAMS**

ACROSS PENNSYLVANIA



KEYSTONE RESEARCH CENTER (KRC)

On behalf of the Pennsylvania Workforce Development Board

JANUARY 7, 2019¹

..... **CONTENTS**

Executive Summary.....1

Pre-apprenticeship and it's place in Pennsylvania's Workforce Vision..... 4

The State of Pre-Apprenticeship in Pennsylvania: Result of the Online Survey..... 9

Key Findings from Interviews and Open-Ended Survey Responses.....19

Options for Strengthening Pre-Apprenticeship and Apprenticeship Programs 24

The Emerging PA Vision of 21st Century Learning for College, Career, and Life.....27

Appendix A: Profiles of 10 Pre-Apprenticeship Programs..... 28

 Construction — Central Montco Technical High School..... 28

Construction — Energy Innovation Center Institute 29

 Manufacturing — German-American Chamber of Commerce 31

 IT Generalist — JEVS Human Services.....32

 Manufacturing — Hanover Area Chamber of Commerce 33

 Culinary Arts and Construction — Milton Hershey School..... 35

 Agricultural Technician — Northeast Equipment Dealers Association (NEDA).....37

Manufacturing — Oberg Industries..... 38

 Manufacturing — Penn College of Technology 40

 Manufacturing — Penn United Technologies..... 41

EXECUTIVE SUMMARY

The United States Department of Labor (USDOL) and the Pennsylvania Department of Labor & Industry (L&I) define pre-apprenticeship programs as having a documented partnership with at least one registered apprenticeship program and preparing individuals to enter and succeed in apprenticeship. Pre-apprenticeships can also help students decide on an occupational track, develop their foundational skills, and improve productivity once individuals gain employment.

In early 2016, the Wolf Administration in Pennsylvania established a new Apprenticeship and Training Office (ATO) at L&I to oversee Governor Tom Wolf's ambitious plan to expand apprenticeship and pre-apprenticeship programs. In early 2018, Governor Wolf publicly committed to doubling apprenticeships in Pennsylvania by 2025. In November 2018, the state legislature passed, and Governor Wolf signed, a state budget with an additional \$30 million for the PAsmart initiative, including \$7 million for apprenticeship.

In the context of Governor Wolf's ambitious plan to expand apprenticeship as a central component of the state's workforce strategy, the Pennsylvania Workforce Development Board (PA WDB) contracted with Keystone Research Center (KRC) to conduct an inventory of the current state of pre-apprenticeship in the commonwealth. KRC conducted the inventory using an online survey of pre-apprenticeship programs (those registered and others that it believes fit the state's definition of pre-apprenticeship) and interviews with 10 currently operating and registered (or about-to-be registered) programs.

The inventory revealed a rich variety of pre-apprenticeships sponsored by different types of organizations: industry associations and individual manufacturers; career and technical centers (CTCs) and non-profit community-based organizations; labor-management apprenticeship funds and colleges. It also revealed that current pre-apprenticeships, including the programs registered (four when this inventory began, now at least 14 and growing fast) and those not-yet-registered, mirror the industry composition of current Pennsylvania apprenticeships: a significant number of pre-apprenticeships are in construction and manufacturing; a smaller number are emerging in occupations such as maintenance (e.g., agricultural equipment service technician), health care, and hospitality (e.g., culinary arts).

One hundred and twelve respondents started to complete the online survey with 63 completing most of the survey. About 30 percent of pre-apprenticeships have been running for at least several years; 20 percent have been established in the last year; roughly a third are in the "development stage." Responding programs perceive all key stakeholders to benefit from apprenticeship, including employers (86 percent), participants (83 percent), apprenticeship programs (62 percent), and schools (68 percent). Two thirds of pre-apprenticeships responding serve grade 12; more than half (55 percent) serve grade 11, and a quarter serve ninth and tenth grade.

About a third serve each of three older age groups: 18-21, 22-24, and 25 and older. One gap in pre-apprenticeship programs is geographic: 23 of Pennsylvania's 67 counties do not have pre-apprenticeship programs, and many of these counties do not have a community college.

¹This report was prepared under contract to the Pennsylvania Workforce Development Board (PA WDB). It was written by Stephen Herzenberg and Diana Polson. For assistance on this project and their input, the authors thank the staff of the PA WDB and the Pennsylvania Apprenticeship and Training Office (PA ATO), the Youth Committee of the PA WDB, and the PA Workforce Development Association (PWDA), and the individuals interviewed at 10 sponsors of pre-apprenticeship programs profiled. For their outreach to increase response rates to the pre-apprenticeship online survey we also thank representatives of four association (PWDA, the PA Association of Career and Technical Administrators, PA Apprenticeship Coordinators Association, and PA Commission for Community Colleges).

Main recruitment methods largely reflect the pre-apprentice sponsor: e.g., school-based and CTC pre-apprenticeships recruit from schools and CTC programs, and community programs from the community. Nearly all (48 of 51) of pre-apprenticeships responding provide successful students with industry-recognized credentials; 21-30 provide paid internships, summer employment, and/or other work-based learning opportunities.

Asked about their challenges, 61 percent of pre-apprenticeships responding cited funding (34 of 56). In open-ended responses, several identified coordination with school districts (e.g., around schedules) and need for support services. Of 55 programs answering the question on funding, 39 percent replied government grants, and 27 percent replied employers. Other critical sources are schools and colleges (part of the “other” category because the survey did not specify schools and colleges as funding options). Of 53 respondents, one in nine (11 percent) said they have enough funding to grow their program, a third (30 percent) responded that they have enough funding to maintain their program, and nearly half (45 percent) only have enough funding to sustain their program in the short term.

The interviews with 10 leading-edge apprenticeships supplemented by the survey responses (including the open-ended ones) revealed the following insights.

- The advantages for pre-apprenticeships of tight linkages to strong apprenticeships with significant numbers of openings each year.
- The importance of strong employer engagement and, more specifically, of employer input into the selection of pre-apprentices, which can give employers ownership of those students’ success.
- The value of identifying, and collaborating with, employers who want to help solve their own workforce needs—rather than spend time and energy on a blame game with educators.
- The potential of pre-apprenticeship to:
 - o accelerate the changing image of manufacturing jobs and to re-brand them as increasingly high tech, clean, and cool;
 - o diffuse awareness of apprenticeship as potentially the cheapest route to college;
 - o contribute to an elevation—or muddying—of the relative status of apprenticeship and the four-year college path; and a corollary unfreezing of the hard line between CTE and comprehensive, or non-CTE education. Both these shifts could encourage respect for all students, pathways, and types of jobs.
- The need to design pre-apprenticeships broadly enough to connect to a critical mass of potential apprenticeships in any geographical area. Manufacturing and construction pre-apprenticeships do this by having a single pre-apprenticeship connect to all apprenticeships in the sector.
- The challenges of organizing pre-apprenticeships (and apprenticeships) in horizontal and widely dispersed occupations in which most employers have no more than a few jobs and even some whole industries may not have that many openings.
- The need to recognize a potential tension between pre-apprenticeship as a tool for (a) “creaming”—to the benefit of affiliated employers—high school and young adult cohorts with high basic, science, technology, engineering and math (STEM) skills, and soft skills versus (b) expanding access to good-paying apprentice-able occupations for more diverse and low-income communities. Once recognized, this tension must be managed in part through sustained efforts to find more diverse workers that meet employer standards, including after pre-apprenticeship and with wrap-around supports.

- The need—as with all publicly funded workforce education and training—to avoid distributing pre-apprenticeship funds to employers with lower-quality jobs and high turnover. These have the most pressing ongoing need for new workers and often seek public subsidies for training.
- The potential of further embedding pre-apprenticeship and apprenticeship in K-12 and post-secondary education, the best-funded workforce funding streams and the most likely route to greater scale and sustainability for pre-apprenticeship and apprenticeship programs.

The penultimate section of this report reviews options for strengthening pre-apprenticeship and apprenticeship programs through performance management and capacity building/peer learning, enhancing efforts already initiated by the ATO, and capitalizing on the deep well of knowledge that exists in the field among Pennsylvania apprenticeships and pre-apprenticeship practitioners.

This report closes by reflecting, informed by the interviews for this inventory, on the potential of pre-apprenticeship and apprenticeship programs to help transform grades 11-14, especially for those not on the traditional four-year college path. This transformation could also be advanced by PAsmart, STEM and career and technical education (CTE) initiatives, and by a new initiative that aims to increase Pennsylvania's draw down of federal Pell grants by Pennsylvania students (including for apprenticeship and pre-apprenticeship related instruction), especially in areas of the state without access to community colleges. Implemented in the holistic way aimed for by the Wolf Administration, such an initiative could increase educational attainment in Pennsylvania, expand opportunity throughout the state, better meet employers' skill needs, and powerfully boost the state's economy.



PRE-APPRENTICESHIP AND ITS PLACE IN PENNSYLVANIA'S WORKFORCE VISION

The United States Department of Labor (USDOL) defines pre-apprenticeship as follows:

Pre-apprenticeship services and programs are designed to prepare individuals to enter and succeed in registered apprenticeship programs. These programs have a documented partnership with at least one registered apprenticeship program sponsor and together they expand the participant's career pathway opportunities with industry-based training coupled with classroom instruction.²

Box 1 elaborates the characteristics of quality pre-apprenticeship as spelled out by USDOL.

The Pennsylvania Department of Labor & Industry (L&I) further elaborates the purpose of pre-apprenticeship (in Workforce System Policy (WSP) No. 06-PY2015, as modified, August 27, 2018):

Pre-apprenticeship programs are for workers who may not have the fundamental skills to succeed in a registered apprenticeship program, and for youth who are exploring career options. Such programs operate within an approved plan under which candidates participate in a... training period in a school or training center, with the intent to place them into registered apprenticeships upon completion or soon after completion of the program. These training programs help apprenticeship candidates decide on an occupational track, develop foundational skills and improve productivity once employed.³

As revised in 2018, Pennsylvania's state plan for implementing the federal Workforce Innovation and Opportunity Act (WIOA) outlines how pre-apprenticeship fits into Governor Wolf's strategic vision for workforce development.⁴ That vision seeks to better connect education and training to the skills needed by employers. Apprenticeship is a proven way to do this and pre-apprenticeship can extend that connection further to high school students and to diverse out-of-school youth and adults in the community. The state WIOA plan has five goals and pre-apprenticeship is specifically addressed in sub-goals 1.4, 2.7, and 3.10 included below.

1.4 The commonwealth will promote and support the creation of pre-apprenticeship and registered apprenticeship programs, particularly in non-traditional occupations and for non-traditional populations, as part of relevant career pathway models. The commonwealth will add apprenticeship opportunities to the JobGateway® and Commonwealth Workforce Development Systems (CWDS) and will promote them as career options to job seekers.

2.7 The commonwealth will use state grant funds to promote the development of registered apprenticeship programs and utilization of pre-apprenticeship standards, with a focus on non-traditional industries and occupations. The grant[s] will also support efforts of existing registered apprenticeship programs to recruit female and minority apprentices. The state Apprenticeship and Training Office (ATO) will provide technical assistance to grantees and will promote the creation and growth of apprenticeship programs beyond the grantees.

²<https://www.doleta.gov/OA/preapprentice.cfm>

³<https://www.dli.pa.gov/Businesses/Workforce-Development/Documents/Directives/WSP%2006-2015.pdf>

⁴Tom Wolf, Governor, *Workforce Innovation and Opportunity Act (WIOA) Combined State Plan for the period of July 1, 2016 through June 30, 2020*, effective July 1, 2018; online at <https://www.dli.pa.gov/Businesses/Workforce-Development/Documents/wioa/WIOA-Combined-State-Plan-Modification-as-approved-Feb-13-2018.pdf>

3.10 The commonwealth will use the ATO to promote pre-apprenticeship and registered apprenticeship opportunities to youth, including establishing new partnerships with secondary and postsecondary education institutions.

Box 1. Quality Pre-Apprenticeship: The Basics⁵

Pre-apprenticeship programs prepare individuals to enter and succeed in registered apprenticeship and have a documented partnership with at least one registered apprenticeship program that expands participants' career pathway opportunities with industry-based training and classroom instruction.

What are some of the benefits to participants? Pre-apprenticeship training is a great way for participants to:

- Explore and learn about exciting careers.
- Qualify to meet the minimum standards for selection to a registered apprenticeship program.
- Benefit from classroom and technology-based training.
- Build the literacy, math, English, and work-readiness skills employers desire.

What are some of the benefits to registered apprenticeship program sponsors?

Pre-apprenticeship training is a great way for apprenticeship sponsors to:

- Recruit and pre-screen qualified, job-ready apprentices likely to complete the apprenticeship.
- Expand the pool of diverse, prepared apprenticeship candidates.

What are some ways registered apprenticeship program sponsors support pre-apprenticeship? Sponsors can support pre-apprenticeship programs by:

- Articulating apprenticeship eligibility requirements.
- Serving on advisory committees or negotiating formal Memoranda of Agreement.
- Offering guidance and helping to establish training goals or competency models.
- Collaborating on assessment, curriculum and preparatory training.
- Sharing state-of-the-art technology.
- Considering direct entry and advance placement agreements in apprenticeship.

What is the pre-apprenticeship quality framework? Pre-apprenticeship is defined by the Employment and Training Administration (ETA) of the U.S. Department of Labor as a program or set of strategies designed to prepare individuals to enter and succeed in a registered apprenticeship program, including:

- **Approved Training and Curriculum** based on industry standards and approved by the registered apprenticeship partner(s) that prepare individuals enter registered apprenticeship.

⁵This box condenses the USDOL description online at <https://www.doleta.gov/OA/preapprentice.cfm>. That source, in turn, draws from Training and Employment Notice 13-12, "Defining a Quality Pre-Apprenticeship Program and Related Tools and Resources," November 30, 2012; https://wdr.doleta.gov/directives/corr_doc.cfm?docn=5842

Box 1. (continued)

- **Strategies for Long-Term Success.** Strategies that increase registered apprenticeship opportunities for under-represented, disadvantaged or low-skilled individuals:
 - o Strong recruitment of under-represented populations.
 - o Educational and pre-vocational services that prepare individuals to meet the entry requisites of registered apprenticeship (e.g. career and industry awareness workshops, job readiness courses, English for speakers of other languages, Adult Basic Education, financial literacy seminars, math tutoring, etc.).
 - o Exposure of participants to apprenticeship programs and assistance in applications.
- **Access to Appropriate Support Services.**
- **Greater Employer Use of Registered Apprenticeship for Hiring** and as a preferred means for developing a skilled workforce and creating career opportunities for individuals.
- **Meaningful Hands-On Training that Does Not Displace Paid Employees,** but simulates the industry and occupational conditions of the registered apprenticeship sponsor(s).

Box 2 summarizes the Pennsylvania pre-apprenticeship standards referred to in sub-goal 2.7. Pre-apprenticeships become “registered” when the ATO affirms that they meet the basic standards.

As part of the effort to expand pre-apprenticeship as a central component of the state’s workforce strategy, the PA WDB commissioned this inventory of the current state of pre-apprenticeship in the state. The inventory consists of two components: an online survey of pre-apprenticeship programs, including registered programs and other programs that deemed themselves to meet the definition of a pre-apprenticeship program (and which could thus become registered); and interviews with 10 already-registered (or about to be registered) pre-apprenticeship programs listed in **Table 1**.

Box 2. Pennsylvania Pre-Apprenticeship Program Standards

Pennsylvania pre-apprenticeship standards require programs to complete an application package that includes the following.⁶

- A written plan describing pre-apprentice training/supervision in an apprentice-able occupation.
- A written agreement with a registered apprenticeship sponsor.
- A written commitment from the sponsor and employer that graduating pre-apprentices will receive predetermined articulated credit and/or experience if accepted into registered apprenticeship.
- Specification of:
 - (1) The related classroom training of the pre-apprentice in a skilled occupation.
 - (2) A curriculum developed by the program sponsor(s) and approved by the ATO director.
 - (3) Provision for organized, related instruction in a classroom, occupational or industry courses, electronic media, or other instruction approved by the ATO director. An agreed-upon percentage of pre-apprenticeship hours will count toward a Registered apprenticeship and pre-apprentices will not be penalized for leaving early to become an apprentice.
 - (4) Periodic evaluation of pre-apprentices' classroom performance and keeping records on their progress.
 - (5) Adequate and safe equipment and facilities and safety training for pre-apprentices.
 - (6) A written Pre-Apprenticeship Agreement.
 - (7) Program sponsor assurance of qualified training personnel and adequate supervision.
 - (8) A certificate of program completion from the sponsor for successful pre-apprentices and a pathway for pre-apprentices into an associated registered apprenticeship program(s).
 - (9) Contact information for the individual with authority to receive and respond to complaints.
 - (10) The conditions under which the apprentice program may discontinue its relationship with the pre-apprenticeship program.
- Identification by the pre-apprenticeship program of:
 - o Outreach and recruitment methods, including to attract women and minorities.
 - o Organizational experience relevant to training and industry standards.
 - o Program goals and desired outcomes.
 - o Program description including tuition or other costs to trainees.
- Information required to track program outcomes.
 - o A list of pre-apprenticeship graduates for each class (e.g., name, address, start and end date, and, on a voluntary basis, Social Security Number).
 - o Assignment of a unique ID number for each pre-apprentice into the ATO Apprentice Tracking Database, including to track future migration into Registered Apprenticeship.

⁶ The application package is at <https://www.dli.pa.gov/Individuals/Workforce-Development/apprenticeship/Documents/ATO-1.pdf>. For information on how new pre-apprenticeship programs can "get started" go to <https://www.dli.pa.gov/PreApprenticeship/Pages/default.aspx>

Table 1. Registered Pre-Apprenticeship Programs Interviews

Pre-Apprenticeship Sponsor	WDB	County	Occupation(s)	RA Program Sponsor(s)
Central Montco Technical High School	Montgomery	Montgomery	Carpentry, Electrician, Plumbing/ Pipefitter, Masonry / Bricklayer	Southeastern PA Chapter ABC, Inc.
Energy Innovation Center	Partner4Work	Allegheny	Building Trades	Multiple joint apprenticeship and trades programs
German-American Chamber of Commerce-Pittsburgh Chapter	Partner4Work	Allegheny	Mechatronics' Technician Extrusion Operator, Blow Mold Operator	Mechatronics Technician Process Mechanic in Polymer
Hanover Chamber of Commerce	South Central	York	Welding, machining, mechatronics	Hanover Chamber of Commerce; Manufacturers' Apprenticeship of SCPA
JEVS Human Services / TechServ	Philly Works	Philadelphia	IT Generalist	JEVS /Other Employers in Philadelphia IT Opportunity Collaborative; Trans Ed in Harrisburg
Milton Hershey School	South Central	Dauphin	Culinary Arts, Hybrid Apprenticeship	Hershey Entertainment & Resorts; Milton Hershey
Northeast Equipment Dealers Association	South Central / Lancaster	Carlisle	Agriculture Equipment Service Tech	Northeast Equipment Dealers' Association
Oberg Industries	Tri County	Butler	Multiple manufacturing occupations	Oberg Industries
Penn United Technologies, Inc.	Tri County	Butler	CNC Operator-Milling and Turning; Machinist	Penn United Technologies Inc.
Pennsylvania College of Technology	Central	Lycoming	Manufacturing (not occupation-specific)	Pennsylvania College of Technology

⁷The scope of work indicated that KRC should interview the four programs registered at the time the project began. Additional registrations made it possible to interview the 10 programs in Table 1.



THE STATE OF PRE-APPRENTICESHIP IN PENNSYLVANIA: RESULTS OF THE ONLINE SURVEY

KRC drafted the online survey instrument (see Appendix B) based on the questions of interest to the PA WDB as specified in the scope of work. The draft survey was then vetted with the staff and Youth Committee of the PA WDB, the ATO, and the Pennsylvania Workforce Development Association (PWDA) and iterated based on their input. A “beta test” was then conducted with registered pre-apprenticeship programs that had already been interviewed (because those respondents understood the context and purpose of the survey). The final survey went live at the end of August 2018. A link to the survey was distributed by email to a list of registered pre-apprenticeship programs provided by the ATO and to local members of four associations so that they could either complete the survey or distribute it to pre-apprenticeship programs to complete the survey. (The four associations were the PWDA, the Pennsylvania Association of Career and Technical Educators, the Pennsylvania Commission for Community Colleges, and the Pennsylvania Apprenticeship Coordinators Association.) The survey closed Monday, Oct. 15, 2018.

A total of 112 respondents started to answer the survey with approximately 63 respondents completing most of the survey. The charts and text below summarize the responses.

Note: The source for all charts below is the KRC online survey of Pennsylvania pre-apprenticeship programs for the PA WDB.

Figure 1.

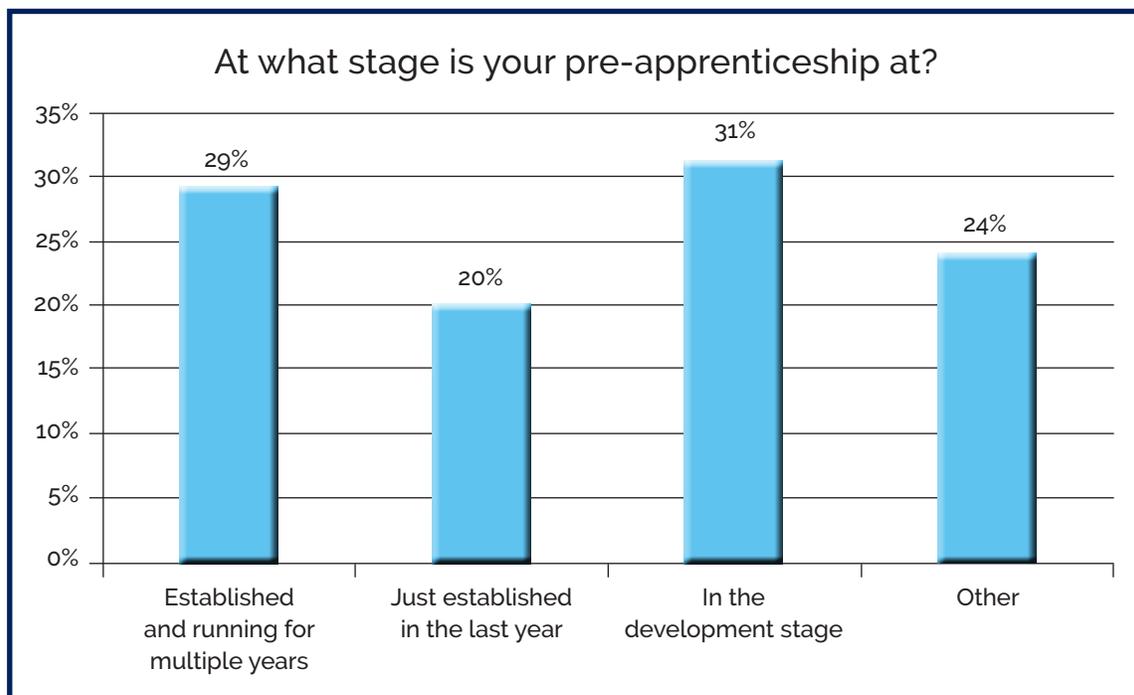
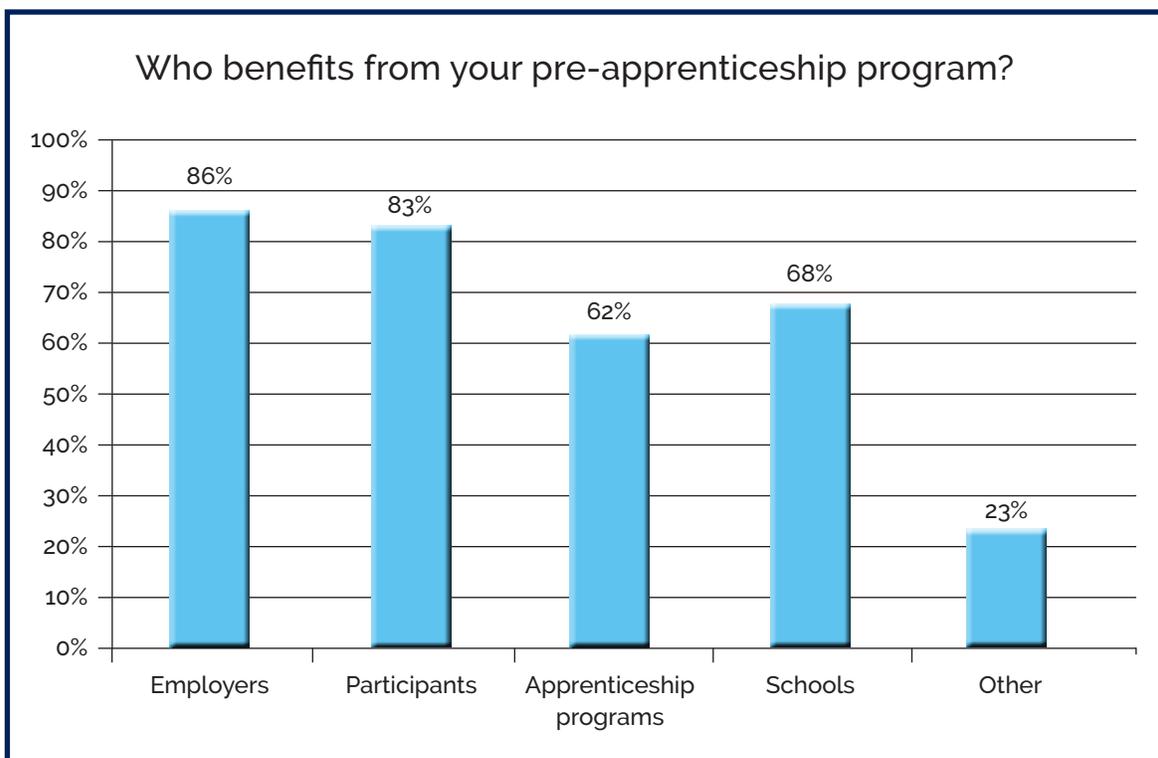


Figure 1 illustrates the current stage of pre-apprenticeship programs of the 112 survey respondents. The 36 programs that reported a number (or range) of students entering each year had a combined

total of about 1,440 annual pre-apprentices, 41 per program. About 1,220 completed an apprenticeship program, an 85 percent completion rate. Ten programs reported participation numbers of 50 or more (up to 220). These include four Southeastern and South Central CTEs; two programs linked with joint construction apprenticeships in Philadelphia and Pittsburgh (including the Energy Innovation Center Institute profiled in Appendix A); a community college program; a pre-apprenticeship operated by the Manufacturing Assistance Center at the University of Pittsburgh; a faith-based pre-apprenticeship; and a program run by Penn United Technologies (see the profile in Appendix A).

Of 65 respondents, four out of five stated the programs benefit employers and participants alike. In addition, about two thirds state that pre-apprenticeships also benefit schools and apprenticeship programs (**Figure 2**).

Figure 2.



About two-thirds of the 64 programs that responded serve 11th and 12th graders, a quarter serve younger grades (usually in addition), a third of programs each serve out-of-school youth 18-21 and out-of-school youth 22-24, and nearly a third serve adults 25+ (**Figure 3**). In response to an open-ended question about populations served, two programs said they serve veterans, two others stated they support “hardest-to-serve” adults, one serves dislocated workers, and one serves incumbent workers seeking to upskill.

⁸These four programs were the Eastern Center for Arts and Technology, Reading Muhlenberg CTC, North Montco Technical Career Center, and Lancaster County Career and Technology Center. The North Montco Technical Career Center Youth Apprenticeship Program is profiled in Gary Scarpello, “Pennsylvania Youth Apprenticeship Program: Over 20 Years of On-the-Job Training,” Techniques, January 2015, pp. 34-38; <https://www.acteonline.org/>

Figure 3.

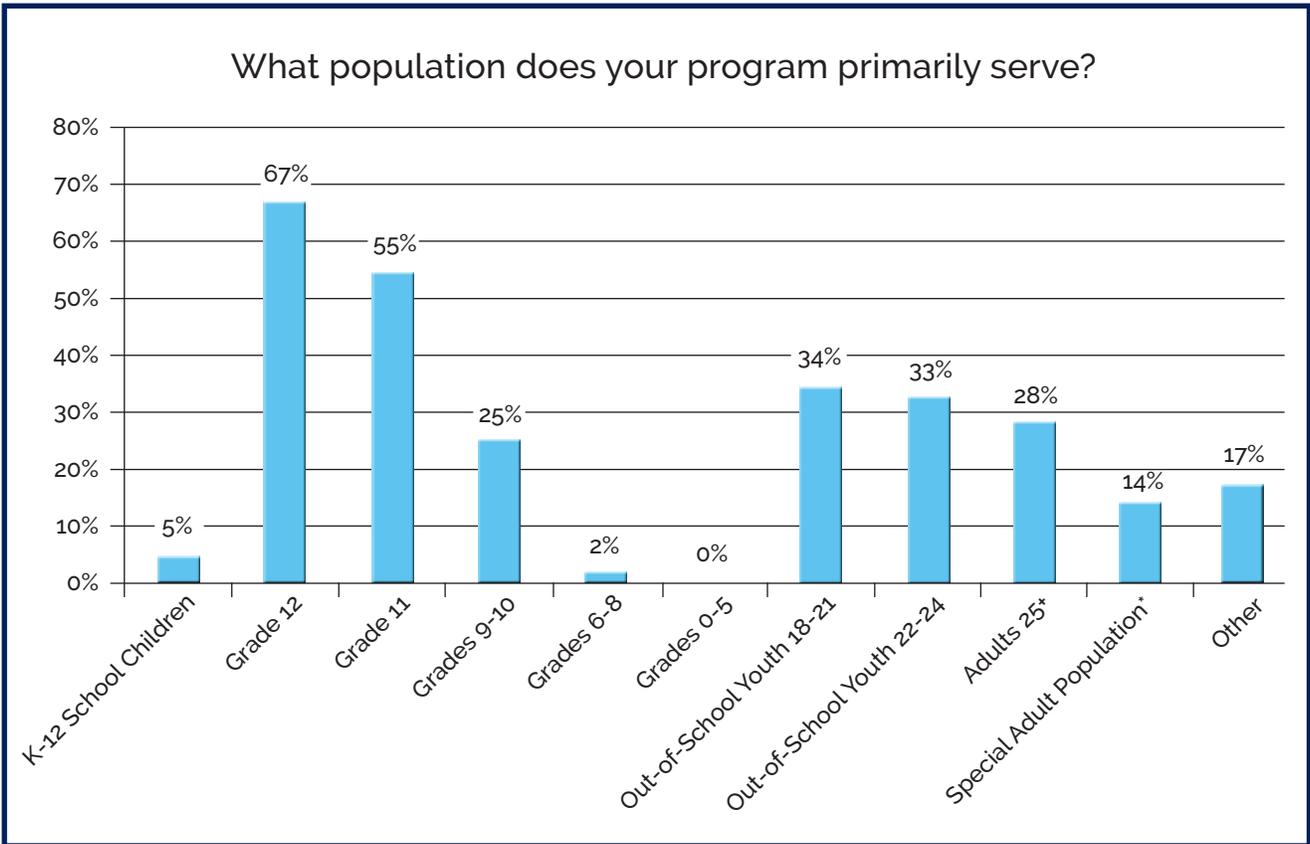


Figure 4.

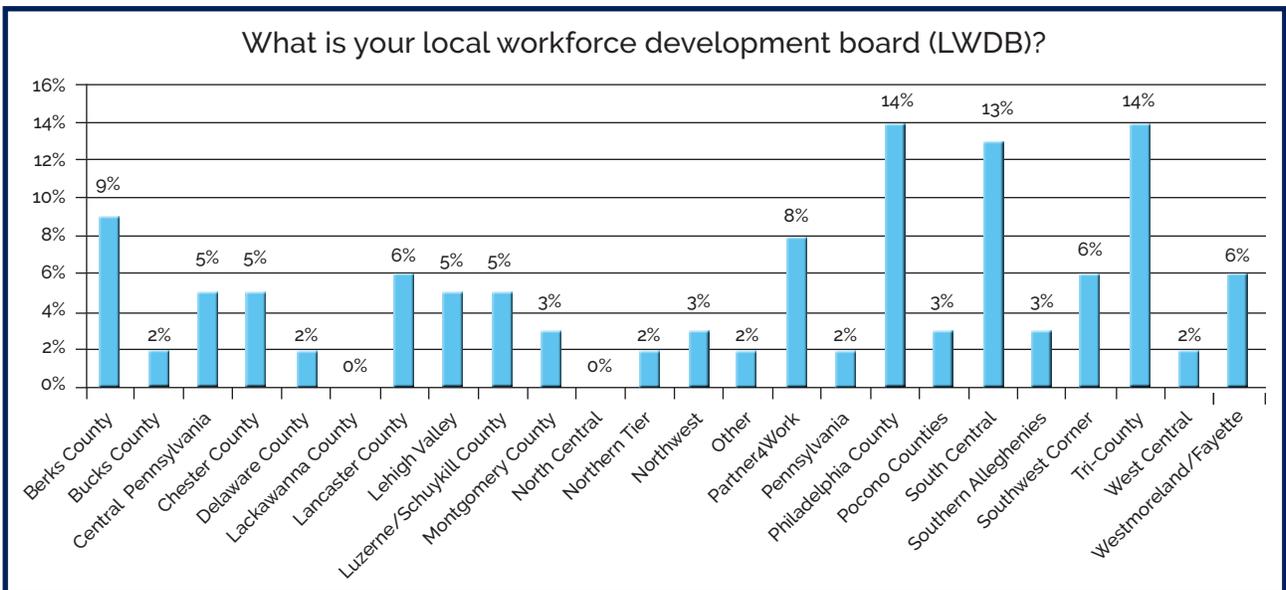
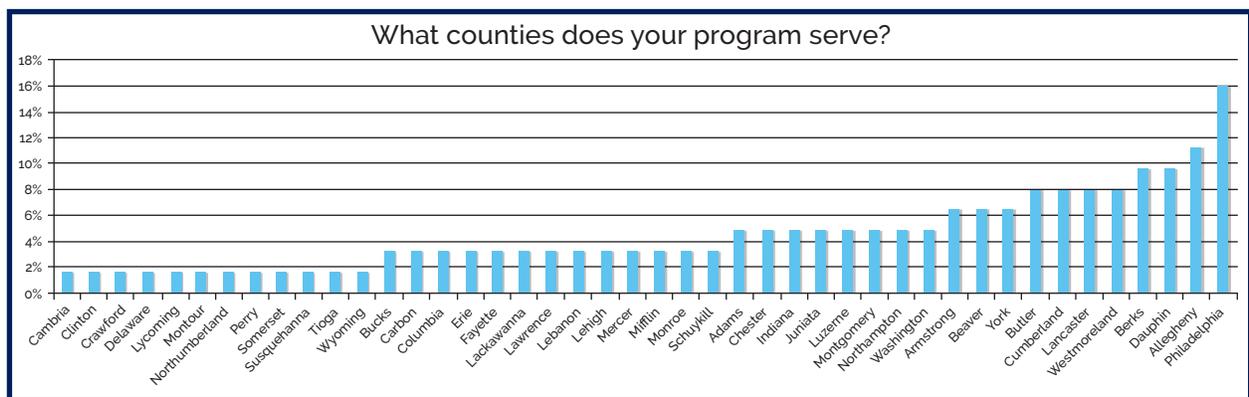


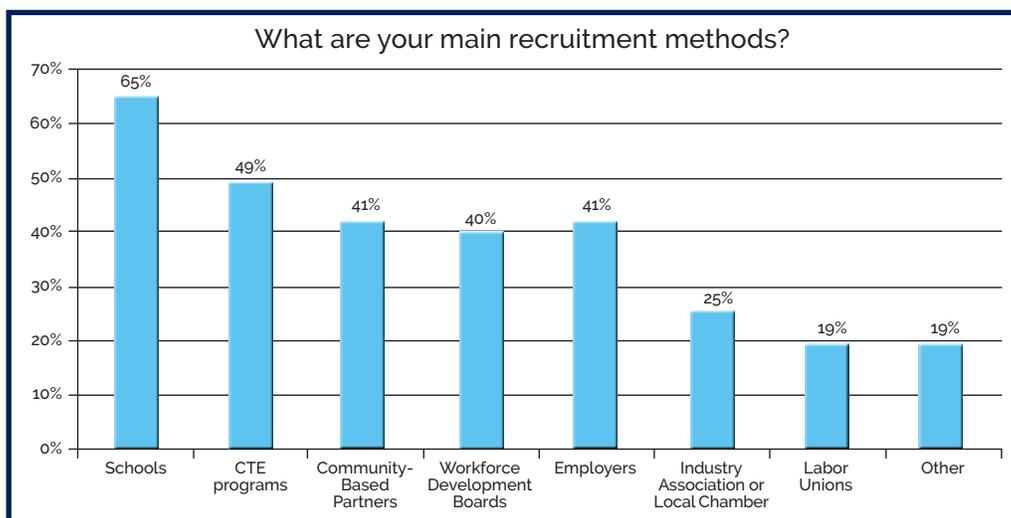
Figure 4 shows the Workforce Development Area of survey respondents. Respondents serve 44 of Pennsylvania’s 67 counties. Many of the counties not served do not have a community college or a branch campus where students would pay “double tuition” (because neither the county nor its school districts provide local funding to the community college) (**Figure 5**). Counties not served through pre-apprenticeship and apprenticeship programs include Bedford, Blair, Bradford, Cameron, Centre, Clarion, Clearfield, Elk, Forest, Franklin, Fulton, Greene, Huntingdon, Jefferson, McKean, Pike, Potter, Snyder, Sullivan, Union, Venango, and Warren. In part, this reflects the low population in these counties. The lack of pre-apprenticeship opportunities in large parts of rural Pennsylvania also mirrors the more general shortage of post-secondary educational opportunities, including the existence of “higher education deserts” with few or no colleges. Pre-apprenticeship and apprenticeship programs provide an opportunity to eliminate Pennsylvania’s post-secondary education limitations in rural counties.

Figure 5.



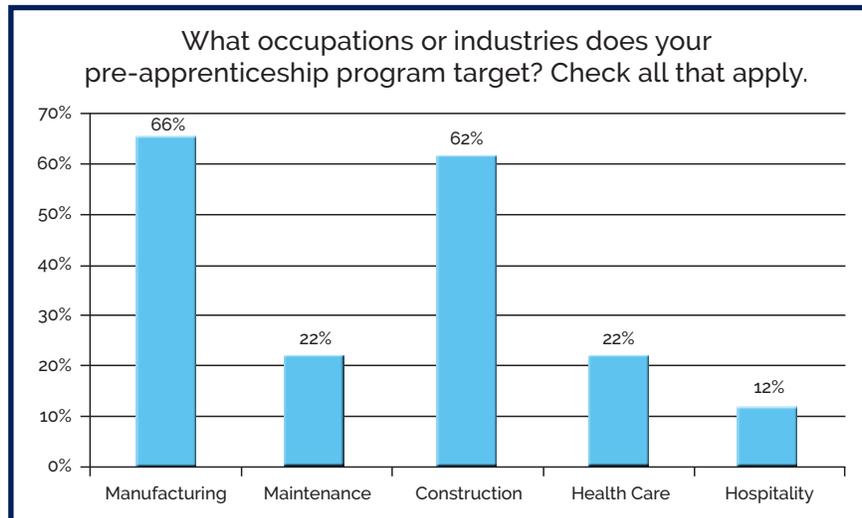
Of the 63 respondents, nearly two-thirds of programs recruit from schools, half from CTE programs, 40 percent from local workforce boards, 41 percent from employees, and a quarter from industry associations or local chambers (**Figure 6**). In open-ended responses, seven programs indicated they recruit using social media and other direct marketing; three highlighted past program graduates and “word-of-mouth” and two listed CareerLink®.

Figure 6.



Of the 50 respondents, two thirds link with manufacturing, 62 percent with construction, just over a fifth with maintenance and health care, and three programs (6 percent) with hospitality (**Figure 7**). Open-ended responses highlighted two kinds of occupations that cut across multiple industries. Four identified “information technology,” which cuts across virtually every part of the modern economy. Three identified technical/maintenance occupations for different service industries (one agricultural equipment, one automotive technology, and one warehouse and logistics technician).

Figure 7.



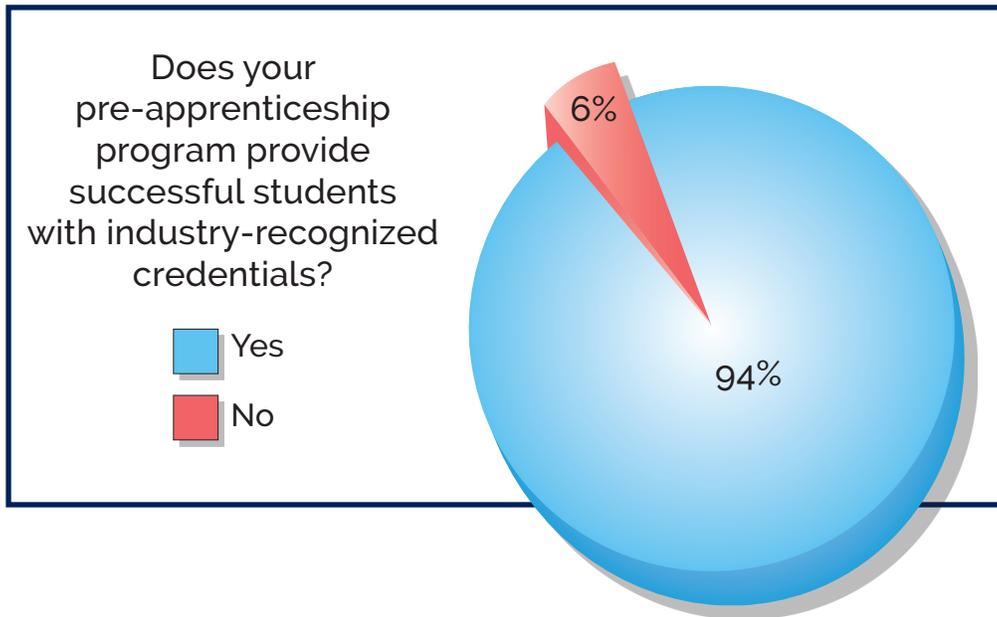
Thirty-six programs reported a “documented partnership” with an apprenticeship program; 23 (including some of the same ones) reported a “less formal” partnership. About 10 documented informal partnerships with manufacturing companies (in three cases Penn United Technologies) or manufacturers’ associations (including the National Tooling and Machining Association) and another 10 with joint labor-management construction apprenticeships.

Almost all programs responding—48 of 51—reported providing successful students with industry-recognized credentials (**Figure 8**). In response to an open-ended question about “which credentials,”

- the largest number (15) listed OSHA-10 safety certification, a credential awarded by both construction and manufacturing pre-apprenticeships;
- about 10 listed National Institute of Metalworking Standards (NIMS) and smaller numbers listed other manufacturing credentials (e.g., MTI level 1, the Certified Production Technician (CPT) credential developed by the Manufacturing Skills Standards Council, welding, or mechatronics credentials);
- several listed other construction credentials (e.g., related to insulation and whole house “sealing,” safe lead paint removal, or issued by the National Center for Construction Education and Research (NCCER) (the education arm of non-union construction contractors) or the North American Building Trades Unions (NABTU)); and
- one or two programs listed credentials connected with other occupations such as automotive service and emissions, culinary arts, and forklift safety.

In the aggregate, the open-ended responses convey substantial collective knowledge and experience of industry and its skills needs. Pennsylvania pre-apprenticeships are not starting from scratch. One challenge for the state is finding efficient ways to pool, share, and build on the existing knowledge.

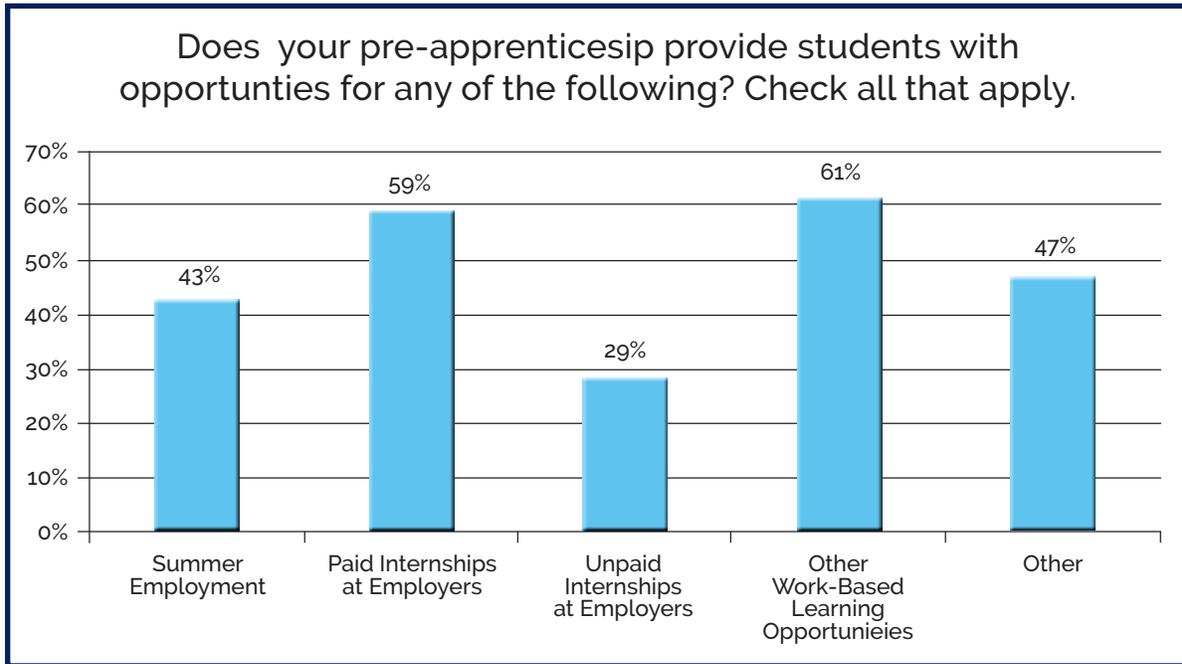
Figure 8.



In other indicators of the 49 programs that responded, their programs provide **(Figure 9)**:

- o 21 provide summer employment.
- o 29 provide paid internships.
- o 14 provide unpaid internships.
- o 30 provide other work-based learning opportunities.

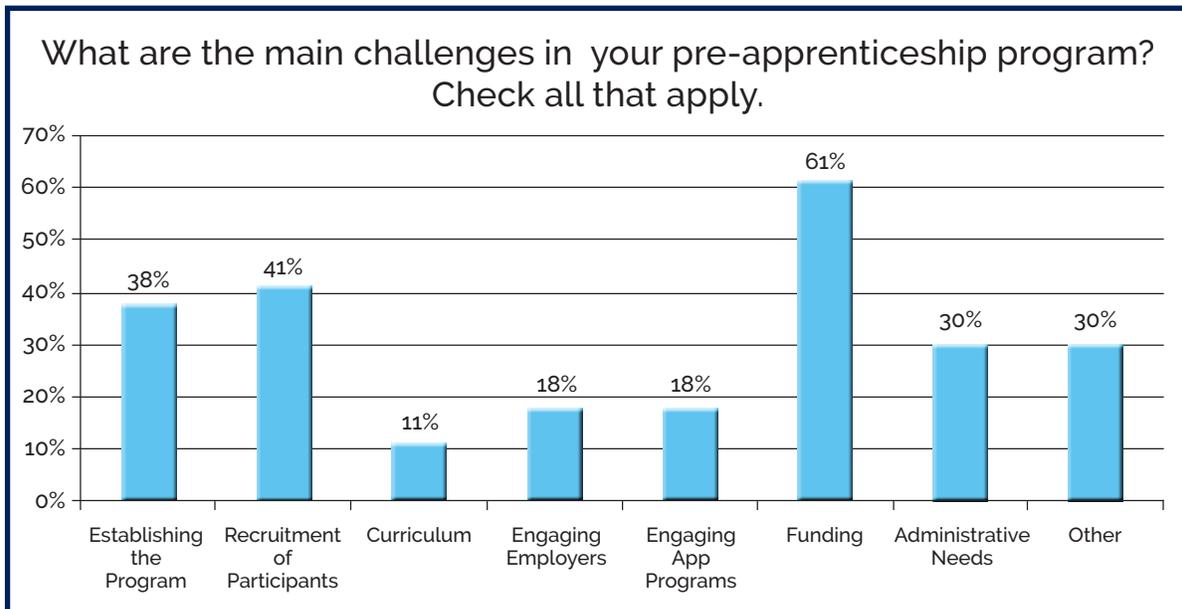
Figure 9.



Asked about their “main challenges,” 56 programs responded (**Figure 10**):

- 34 highlighted “funding.”
- 23 recruitment of participants.
- 21 setting up and establishing the program.
- 17 administrative needs.
- And 10 each engaging employers and engaging apprenticeship programs.

Figure 10.



In response to an open-ended question, 15 programs further detailed their challenges (see Table 2).

- Several highlighted “supportive services” like transportation (e.g., in rural areas), car insurance, and housing for low-income AmeriCorps participants (without which retention is difficult).
- Several others identified coordination with school districts, including around student schedules and availability and to deal with varied curricula (e.g., at CTCs versus at comprehensive schools).
- Construction pre-apprenticeship programs cited “drivers’ licenses” and that “apprenticeship tests are typically once a year and, in some instances, participants joining late have to wait a long time to apply.”

Table 2. Selected Open-ended Responses to Questions About the Main challenges in Pre-apprenticeship Programs

Construction Programs
Apprenticeship tests are typically once a year...some participants joining late must wait a long time to apply
A valid driver’s license is required for all the apprenticeship programs.
Driver’s license
Post-completion application and initiation fees
Getting an [employer] sponsor for candidates who pass the joint apprenticeship committee (JAC) exam, but we work with the JAC & GBCA to identify prospective employers
Participants are not able to start apprenticeships until dues are paid. Costs vary by trade.
School-based Programs
Coordination is the main challenge.
Coordination and bridging the apprenticeship and pre-apprenticeship curricula between apprentice training providers and high schools. It’s a challenge, but also feasible.
Logistics in dealing with school districts
Logistics related to schedules, varied curriculum, and student availability
Schools have varied schedules and already teach a range of topics related to our program from zero instruction to a significant amount—balancing schedules and curriculum requirements is a challenge.
Coordination with school districts (e.g., schedules, varied curricula, student availability).
Getting schools on board is a very lengthy process. There are many hoops to jump through.
Lack of respect for CTE programs by parents, fellow educators and the workforce development system.
Our biggest challenge is breaking the “college for all” mentality. Every business we have contacted is very supportive of the idea.
We have a great recruiting program in our high schools, but we struggle getting students excited about some of our programs in our school, so we are low enrolled in some of our programs. Lately, our numbers are up.
Helping parents understand and accept the program.
Community-Based and Other Programs in Which Some Participants Need Support Services
Although we had 85 percent retention in our first year, it was a constant press on coordinators to follow up with participants and keep them engaged, focused, and navigating service/life balance. Stable housing is critical to an individual’s success in the program. There are limited options for 18-24 if their housing becomes unstable during their program year.

Table 2. (continued)

Retention and housing.
Students available transportation and ancillary issues of insurance etc.
Supportive services--retention and housing, transportation (including in rural areas), and car insurance.
Transportation for students in a rural area
There is much more funding for the apprenticeships, but we are trying to connect the under-served, under-represented populations to those apprenticeships. Having people do work readiness and pre-apprenticeships are the way we can connect those who are unemployed and untrained with the skills they need to pass the entrance requirements for the apprenticeships and then provide the supportive services needed (case management, housing, food, resources acquisition) to be able to continue the training.
It is difficult to find individuals with the ability to succeed in programs such as pre-apprenticeship who are not currently working. Our best market is under-employed individuals.
Recruitment and retention of students is becoming more of a challenge--our students have more barriers to employment...All worth the time, effort and resources because these programs have been life transforming for so many of our students. Win - win...
Student enrollments are not as strong as we'd like
This program is only for our best auto technologies juniors. Often, we have more dealership demand than we have qualifying students

Funding (many respondents said they need more funding; we include here only comments spelling out specific funding needs.)

Materials and equipment for training have become more expensive.
Our programs cost \$6,000-\$7,000 and our LWDB funds only up to \$5,500 per participant, so there is funding gap of \$500 to \$1,500.
Individual Training Account (ITA) stipends [which we can access as an eligible training provider] cover a little over 80 percent of our students. But ITAs cover, at most, 5/6th of one class and most of our students want to take two classes (machining and CNC programming/operations). Most of our students come from underserved neighborhoods in Pittsburgh and have financial barriers, so we offer them a scholarship for what their ITA does not cover, but we are not a line item in our budget, so funding is our largest challenge.

Other Challenges

We need assistance with selling the employers on the value of an apprenticeship. This should be a grant funded position. The pre-apprenticeship already exists, but is useless without a bona-fide apprenticeship recognition.
We could always use more employer and internship partners.
We are not currently registered as a pre-apprenticeship program but would need to engage an apprenticeship program to align to, and since we provide our program at no cost to the student, we always are looking for more funding support.
Currently test development (performance/competency) is our biggest challenge.
Despite successful job placement of pre-apprentice graduates, there remain few registered apprenticeship programs to connect with pre-apprenticeship.

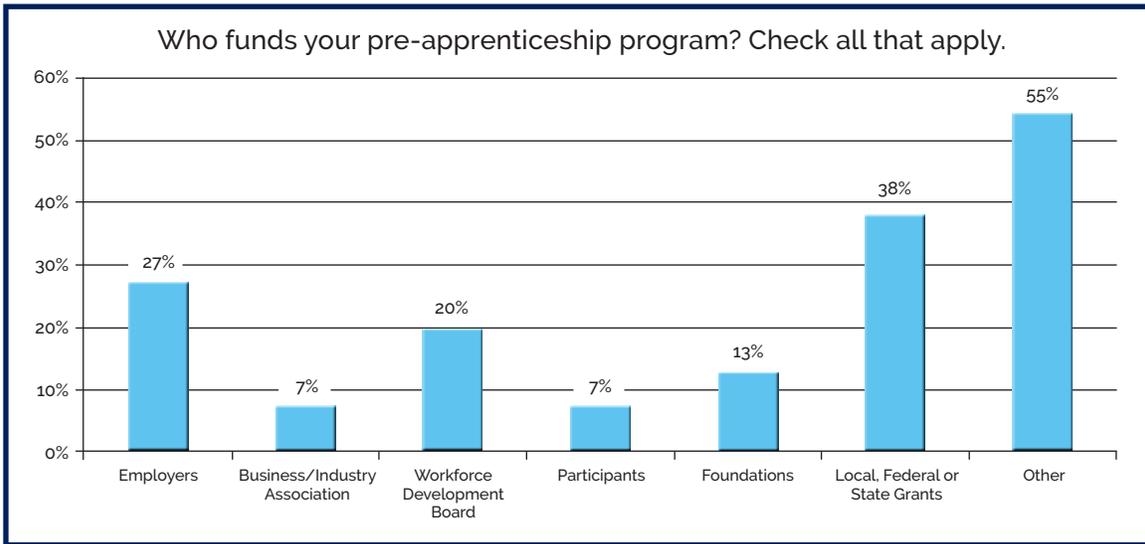
Table 2. (continued)

Engaging employers is our biggest stumbling block. They want entry-level employees but are unwilling to pay a little more for someone with credentials.

Our adult education programs are non-accredited making it difficult to be recognized and form partnerships with established apprenticeship programs.

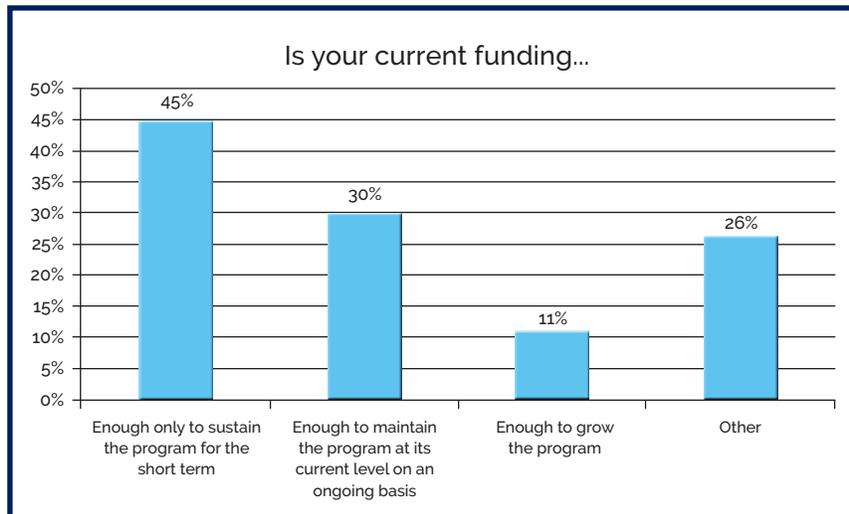
Asked who funds their program, of 55 respondents, 38 percent said government grants, 27 percent said employers, 20 percent said LWDBs, 13 percent said foundations, 7 percent said participants, and 55 percent said “other” (Figure 11).

Figure 11.



Of 53 respondents, 30 percent said they have enough to maintain their program at its current level and 11 percent said they enough funding to grow their programs (Figure 12). Forty-five percent said they only have enough funding to sustain their program for the short term.

Figure 12.





Key Findings from Interviews and Open-Ended Survey Responses

The nature and potential of pre-apprenticeship come to life in interviews with the 10 leading-edge pre-apprenticeship programs profiled in Appendix A. This section extracts some lessons for other practitioners and for policymakers from those 10 interviews and from the answers to open-ended questions on the online survey. Reading these extracted lessons is no substitute for reading the 10 profiles, or for deeper engagement with, and peer learning from the growing number of high-quality pre-apprenticeships in Pennsylvania.

Table 1 on page 7 profiles the 10 programs interviewed, managed by four different types of groups:⁹

- Three industry associations (German-American Chamber, Hanover Chamber of Commerce, and Northeast Equipment Dealers Association);
- Two individual manufacturers (Oberger Industries and Penn United Technologies);
- Three educational institutions (Central Montco Technical High School, Milton Hershey School, and Penn College); and
- Two community-based organizations (JEVS and the Energy Innovation Center Institute (EIC)).

Five of the top programs connect to manufacturing, two of the three (and soon a third, Milton Hershey) connect to construction, and one each to information technology, the culinary arts, and the agricultural technician occupation. The 10 programs do not include any examples from health care, a growing sector of apprenticeship activity in Pennsylvania. In addition, only three of the programs connect significantly to diverse, low-income populations (EIC, Milton Hershey, and JEVS), and Milton Hershey is atypical because of the level of resources available to support pre-apprentices in high school and in post-secondary education or apprenticeship.

Several of the 10 profiles illustrate the advantages for pre-apprenticeships of tight linkages to strong apprenticeship programs and of making real the possibility that high-performing pre-apprentices can enter apprenticeships that leads to a good-paying career. For example, while the Penn United and Oberger apprenticeships each connect to just a single manufacturer, in both cases it is a company with at least 50 apprentices currently, and that has invested heavily in apprenticeship for decades. Penn United Technologies, for example, hires some of the best students from the pre-apprenticeships it runs in partnership with school districts and the community “after what amounts to a two-month interview.” It gives pre-apprentice graduates credit for up to a year of apprenticeship related instruction. Oberger, for its part, has run about 25 students through its pre-apprenticeship program over the past four years, hiring about 13-14 of them.

Pre-apprenticeships aiming to connect to joint construction apprenticeships also illustrate the importance of tight linkages. In Philadelphia, for example, the “Vocational Intern Partnership” (VIP) is managed by one of the most respected apprenticeship programs in the county, the Finishing Trades Institute (FTI). It offers junior and senior high school students in public, charter and private schools a pathway into FTI apprenticeship programs (e.g., for glaziers, painters, drywall finishers, and wall coverers) and those for other building trades joint apprenticeship programs.¹⁰ While many participants do not enter apprenticeship immediately, some do, and others may enter a few years down the road.

⁹In most cases the listed entity is also the sponsor of the program.

¹⁰The program recently received funds to double its intake to 120 students per year and to transform its program for seniors from a once-a-week program to an “immersive, four-days-per-week experience.” <https://northeasttimes.com/2018/01/04/grant-will-expand-vocational-internship-program/>

In its response to the survey describing the VIP (and to the question “Do you have any...advice...for the state as it seeks to expand apprenticeship and pre-apprenticeship? (Don’t be shy)”), FTI highlighted the need for pre-apprenticeships to connect to apprenticeships—and to jobs: “Make sure that the pre-apprenticeships that are run by community groups lead to a career. Most of these groups receive training monies and don’t have jobs for the participants. Fund pre-apprenticeship programs where there are opportunities for finishers.”¹¹ The community-based construction pre-apprenticeship run by the Energy Innovation Center Institute in Pittsburgh (profiled in Appendix A) has connections to the operating engineers and some other trades and thus has a fighting chance to enable diverse community members to access union construction jobs and apprenticeships. Cementing this connection through increased ownership and buy-in from building trades unions, industry associations, and apprenticeship programs will determine whether access for diverse pre-apprenticeship to unionized construction can be institutionalized in the Pittsburgh area over the next several years.

Other pre-apprenticeship programs for which the primary goal is placement in a good-paying apprenticeship also recognize the importance of strong employer engagement and, more specifically, of employer input on decisions about who enters the pre-apprenticeship program. A consultant with the Central Montco Technical High School construction pre-apprenticeship says, “the dream has always been attachment to the workforce.” To make its participants more attractive, that program aims to limit invitation into pre-apprenticeship in the latter part of a construction CTE program to the most promising candidates, with employer partners committing to give pre-apprentices a real shot at jobs “so it’s a pull not a push system.” (As per the previous paragraph, even better would be committing to giving them a job if they show up to class and complete the pre-apprenticeship satisfactorily.) The German-American Chamber in Pittsburgh pulls company representatives into its vetting and selection process for apprentices, complete with factory tours, interviews, and opportunities for candidates to ask questions of real managers. (A related best practice used in pre-employment training programs that resemble community-based pre-apprenticeships include workers in teams that answer applicants’ questions in job orientations, interview applicants, and make hiring decisions.) The more buy in there is from companies (and incumbent workers) about the selection process for pre-apprentices, the more chance there is that successful pre-apprentices will get a leg up in applying for an apprenticeship, landing a job, and succeeding.

A third finding, critical not just for pre-apprenticeships but for apprenticeship and for Next Gen Industry Partnerships, is the value of identifying, and collaborating with employers who want to play roles in solving their own workforce problems in partnership with education and training providers. Scott Covert of Penn United Technologies said: “You talk to any manufacturer you will hear complaints about how hard it is to get people...You have to accept that it’s your problem. We’re manufacturers, we solve problems every day. If you look at it as your problem, you’re going to be able to fix it. Not if you look at it as the school’s problem.” The willingness of early employer adopters of pre-apprenticeships to help solve their own problems comes through in other examples. For instance, the German-American Chamber became more formally organized in 2015, in part, to dig into the workforce challenges faced by German companies in Southwestern PA. Tired of contrasting an inadequate U.S. industry training pipeline with Germany’s powerful apprenticeship system, these companies and the new Chamber wanted to help build a better education and training infrastructure in the region. Some of the early manufacturing partners of Penn College in manufacturing apprenticeships have included Japanese and Swiss companies with awareness of a wider range of approaches to workforce preparation than in the United States alone.

¹¹The late Eric Parker, the founding director of the Wisconsin Regional Training Partnership-Big Step—which places several hundred community members in the Milwaukee area in union construction, manufacturing, and utility jobs each year, respected training labor-management training partnerships in the country—used to quote the movie Dune, saying “he who controls the spice, controls the universe,” and then add, “and the spice is the jobs.”

Another theme that emerged from the manufacturing examples is the potential pre-apprenticeship has to change the image of manufacturing jobs and careers. According to Greg Chambers of Oberg Industries, “People think manufacturing is one way and manufacturing is not that way anymore. You use your head more than your hands. For us the pre-apprenticeship was a chance to educate people about manufacturing in the 21st century. Once parents’ understanding of manufacturing increases, they are on board.” Adds Covert from Penn United Technologies, “It’s not your father’s manufacturing anymore and there’s a whole new generation... [Manufacturing is] now high tech and clean.” Of course, manufacturing—like other sectors—is not monolithic, and jobs vary widely in terms of wages, benefits, and employer’s commitment to investing in workers. Manufacturing also remains more vulnerable to the ups and downs of the economy, with higher rates of displacement in recessions than other industries (including in and just after the recent Great Recession). More widespread apprenticeship and pre-apprenticeship programs could be an important step toward making manufacturing skills more portable and workers less vulnerable to layoff—because they can more easily find another good job at another manufacturer. But streamlined movement across employers won’t happen automatically and remains another challenge for Pennsylvania manufacturers who want to help solve their own workforce challenges, including retention of dislocated manufacturing talent within their sector.

Several additional themes in the interviews relate to the unfreezing of what has in the past been considered a hard choice between apprenticeship and college, and to the fact that pre-apprenticeship and apprenticeship can be the cheapest route to college—a powerful marketing message for working families struggling to pay for college. Oberg’s Chambers says: “There is more of an awakening now that there are opportunities other than college and that it’s not an either/or choice. You can go to work, and it will pay for college.” The marketing of apprenticeship as the cheapest route to college is used increasingly by building trades apprenticeships that work with the EIC, some of which provide an associate degree by the time apprentices become journey-workers. Most of the apprenticeship and pre-apprenticeship programs discussed in the interviews provide high-school and/or college academic credit in addition to developing occupation-specific skills.

The interviews also hint at an increase in the status of apprenticeship and pre-apprenticeship relative to a college education. Penn College, for example, noted that the Manufacturing Technician 1 certificate that pre-apprentices receive (as well pre-apprentices in the other manufacturing pre-apprenticeships) requires the same level of competency as advanced placement and international baccalaureate credentials.¹⁵ Linked with this, pre-apprenticeship in some cases may contribute to an unfreezing of the hard line between CTE and comprehensive, or non-CTE, education. Oberg Industries has worked closely with CTE programs for decades. “We don’t want to take away from CTEs because they are our primary source of new applicants,” but it saw its pre-apprenticeship as a way to fight for “STEM-capable” students who didn’t want to do CTE.

¹²In a survey of manufacturing establishments, contra conventional wisdom about pervasive skill shortages, Weaver and Osterman find that “demand for higher-level skills is generally modest, and that three-quarters of manufacturing establishments do not show signs of hiring difficulties...Of particular interest, high-tech plants do not experience greater levels of hiring challenges.” See Andrew Weaver and Paul Osterman, “Skill Demands and Mismatch in U.S. Manufacturing,” *ILR Review*, 70(2), March 2017, pp. 275–307.

¹³For data on displacement rates by industry over time in the United States and, to the extent that sample size permit, in Pennsylvania, see Stephen Herzenberg, Diana Polson, and Mark Price, “Building on the Strengths of Pennsylvania’s Rapid Response Program: Mediating Employment Transitions in a Changing Economy,” Keystone Research Center, revised February 2017, deliverable 3 for the Pennsylvania Department of Labor & Industry, BWDA Rapid Response Improvement Project.

¹⁴Available data suggest that a large amount of skilled manufacturing talent is lost to the sector when workers lose a job, an indication of the need for institutions that would help reemploy dislocated workers within manufacturing. Specifically, of U.S. manufacturing workers in skilled occupational families (precision machining and industrial maintenance) dislocated from 2001–09, only about one in five was reemployed in the same occupational family within manufacturing up to three years after displacement; a little over a third of such workers were reemployed in manufacturing (including in other occupation families). See Table 13 in Stephen Herzenberg and Mark Price, “Critical Shortages of Precision Machining and Industrial Maintenance Occupations in Pennsylvania’s Manufacturing Sector,” Pennsylvania Center for Advanced Manufacturing Careers, December 2010.

¹⁵Technical jobs in manufacturing, trades jobs, and other technical jobs make up most of what the Brookings Institution’s Jonathan Rothwell called in June 2013, “the Hidden STEM Economy,” with half of all STEM jobs accessible to workers without a four-year degree (see <https://www.brookings.edu/wp-content/uploads/2016/06/TheHiddenSTEMEconomy610.pdf>.)

The physics teacher who helped spark the Oberg pre-apprenticeship saw the program as having educational and pedagogical value—with hands-on applied learning strengthening students’ math skills. Penn College and Penn United Technologies, as well as Oberg, work with both non-CTE and CTE pre-apprenticeship programs. The incorporation of “Fab Labs” and “Makerspaces” into non-CTE schools—with (relatively) cheap computer-controlled machines—has facilitated a rejuvenation of interest in “learning by doing” among non-CTE students and parents across the income spectrum.¹⁶

A critical program design issue raised by the interviews relates to how customized pre-apprenticeship (and apprenticeship) programs should be to the needs of a particular employer or group of employers. Less customization to the unique needs of employers may reduce the value of the program relative to a more tailored to their specific needs; it may also make a pre-apprenticeship of some value to a larger number of potential future employers. A high degree of customization can work if there is a tight connection to employers with enough openings to absorb successful pre-apprentices. Some of Pennsylvania’s strongest manufacturing and construction pre-apprenticeships approach a “best of both worlds” design—these pre-apprenticeships provide pathways to any manufacturing or construction apprenticeship along with tight connections to specific employers or trades hiring apprentices.

The Northeast Equipment Dealers Association (NEDA) faces a more difficult balancing act as it builds a new agricultural equipment service technician apprenticeship and pre-apprenticeship. NEDA brings together member dealers at 460 locations, which sounds like (and is) a lot of locations. Yet these locations are dispersed across many states and a large geographical area, and each location may only have a few technician jobs. As a result, aggregating a cohort of 15-18 apprentices—and pre-apprentices—in any one area is difficult. The specialized mix of skills required in this work, including hydraulics, also makes it hard to find teachers at a single high school, college, or other trainer that can deliver the whole curriculum in one location.

The challenge of organizing apprenticeship and pre-apprenticeship in horizontal and widely dispersed occupations. The challenges NEDA faces reflect the nature of maintenance as what some sociologists call a “horizontal” occupation—as in agricultural equipment dealers, maintenance workers such as service technicians tend to represent a small share of the total workforce in many establishments and to be employed in small numbers at each employer. One approach to pre-apprenticeship in this context would be to explore partnerships with other groups of employers that need maintenance workers or service technicians—such as motor vehicle dealerships. With that approach, at least the first part of pre-apprenticeship, and possibly even the first part of apprenticeship, could be common to several maintenance/technician occupations. Towards the end of an apprenticeship, and possibly pre-apprenticeship, technical skills modules could become customized. For example, construction pre-apprenticeships linked with both union and non-union employers are common across most trades.¹⁷ A mix of common and customized elements echoes how the German American Chamber describes its development of apprenticeship curricula for its members. Chamber staff say that their employer skill needs assessment typically find that “every employer” wants “X and Y” in the curriculum, but that individual employers also tend to want “Z” which is unique to them (or perhaps to a small subset of employers).

¹⁶For an overview of the “Maker Movement” and its potential implications for schools and for the manufacturing pipeline, see Stephen Herzenberg and Diana Polson, “Pathways to Shared Prosperity: A Framework for Forging Next Generation Makers in Southwest Pennsylvania,” Remake Learning Network, Pittsburgh, PA, 2017; https://remakelearning.org/wp-content/uploads/2018/01/Pathways-to-Shared-Prosperity_Dec2017-1.pdf

¹⁷In a German example that informed the discussion in the text, 14 different “trowel trades” now part of a single union merged their first year of apprenticeship in the 1970s into common basic training for all workers. In the second year, workers specialize in building, finishing, or civil trades. In the third year, workers specialize in any of the 14 distinct areas. See Wolfgang Streeck et al. *The Role of Social Partners in Vocational Training and Further Training in the Federal Republic of Germany*, ILO/LMP 87-12, CEDEFOP Research Project No. 1236/1968, 1987, p. 55; online at file:///C:/Users/herzenberg/Downloads/DOC_1_en.pdf.

The modern economy’s paradigmatic horizontal occupation is information technology (IT), which constitutes a small minority of jobs in many industries and at many employers. The JEVS human services pre-apprenticeship profiled in Appendix A has sought to address the issue of small numbers of jobs dispersed across many employers by organizing a broad employer advisory group. The Philadelphia Information Technology Opportunities Collaborative includes representatives from government (e.g., the Philadelphia Water Department and Philadelphia Parks and Recreation), higher education, non-profit (including 1199c, a labor union, and the local chapter of ABC), and private industry representatives. JEVS and its partners have also defined the IT apprenticeship, “IT generalist,” broadly, which could make it a platform for multiple more specialized careers (including more advanced apprenticeships) in IT. To pilot the pre-apprenticeship that can lead to the IT generalist apprenticeship, JEVS has capitalized on the fact that it—and some of its partners—each have a few IT jobs. During a year-long pre-apprenticeship integrated into a year-long “earn and serve” AmeriCorps program JEVS pre-apprentices provide IT support too, and get work experience at, JEVS and employer partners.

Another issue surfaced by the interviews relates to the need to recognize and overcome the tension between apprenticeship and pre-apprenticeship as a means to promote more inclusive opportunity and a means to meet the skill needs of employers. Several of the manufacturing pre-apprenticeships aim to attract high-performing students that might not in the past have considered a manufacturing pathway instead of a traditional four-year college. At the same time, a central goal of Pennsylvania’s apprenticeship policy—and of the EIC, JEVS, and many other pre-apprenticeships—is to expand apprenticeship programs to enhance race and gender diversity. Quality pre-apprenticeship programs seek to reconcile these goals, not by sacrificing standards, but by enabling more diverse pre-apprentices to meet apprenticeship entry standards. This tension is not unique to apprenticeship but to the overall “dual customer” sector partnership movement. This movement aims to promote inclusive opportunity, by starting with a clear understanding of the soft and harder skills employers seek, and then enabling diverse community members to meet those standards. For community-based and social service organizations supporting the “hardest-to-serve” population, reorienting to prepare participants for an employers’ entry requirements—whether to an apprenticeship or job—can prove difficult.

The final challenge identified in the interviews is the engagement of employers that want to solve their own workforce challenges: avoiding investment in pre-apprenticeship and apprenticeship programs are linked to employers that do not offer good jobs in either absolute terms or relative to their industry (measured by wages, benefits, employer investment in workers, opportunities to advance, etc.). With any state workforce investment, a danger exists that some of the employers most interested in training funding are those with the low-quality jobs, high rates of turnover, and thus an ongoing need for a new group of workers trained (at least partly) at public expense.¹⁸

¹⁸For a discussion of this issue in the context of workforce and industry partnership investments generally, see Laura Dresser, Hannah Halbert, and Stephen Herzenberg, “High Road WIOA: Building Higher Job Quality into Workforce Development,” Economic Analysis Research Network, COWS, Dec. 17 2015; online at https://www.keystoneresearch.org/sites/default/files/KRC_WIOA.pdf



Options for Strengthening Pre-Apprenticeship and Apprenticeship Programs

Pre-apprenticeship in Pennsylvania is one component of Gov. Wolf’s workforce strategy that seeks to advance economic and educational outcomes. Informed by the inventory of pre-apprenticeship activity analyzed in this report, and considering the additional forthcoming investment in pre-apprenticeship as a result of PAsmart, this last section lists some policy and program management options for the PWDA, ATO, and Wolf Administration to consider to further advance pre-apprenticeship efforts. A more detailed discussion of apprenticeship and pre-apprenticeship policy options is forthcoming in a separate report by KRC commissioned by the ATO.

Our first three options all relate to the performance management of the state’s pre-apprenticeship programs—defining goals, tracking outcomes and more sophisticated evaluation, and capacity building. Potentially, these options could be pursued for apprenticeship and pre-apprenticeship at the same time. To pursue these options, the ATO and PA WDB could form a working group that includes a leading pre-apprenticeship practitioner—CTE programs, labor-management partnerships, industry associations, community-based non-profits, labor-management partnerships, and employers—and a representative of the PA WDA.

1. In partnership with leading practitioners, continue to refine the goals of pre-apprenticeship (and possibly apprenticeship) and metrics for measuring outcomes.

The interviews and survey revealed several types of goals of pre-apprenticeship (these types overlap those used for Next Generation Sector Partnerships (NGIPs).

- Governance outcomes: e.g., measures of employer engagement (number of employers, attendance at meetings, investment in apprenticeship, funds leveraged from sources other than employers and the state—e.g., from the federal government and philanthropy).
- Employment outcomes: Do pre-apprentices enter apprenticeship? If they do, what is their wage and are they retained in an apprenticeship/job over time?
- Educational outcomes: e.g., pre-apprenticeship completion rates; high-school graduation rates; college credit; industry-recognized credentials; and the share of students who go on to further education, including college. Educational outcome measures also proxy for more subtle and difficult-to-measure outcomes—how much pre-apprentices develop their skills and competences, including soft skills.

One concrete way to move forward might be for the ATO to work with the PA WDB to replicate statewide metrics for apprenticeship and pre-apprenticeship programs, similar to those created for Next Gen Industry Partnerships (NGIPs). The exercise might begin by (a) reviewing existing measures used to track apprenticeships (by the National Registered Apprenticeship Partners Information Data System (RAPIDS), to track WIOA programs, and to track NGIPs; and then (b) considering what, if any, additional measures should be tracked for apprenticeship and pre-apprenticeships. The group responsible could also be tasked with recommending apprenticeship and pre-apprenticeship “dashboards” that might be used to present information in a transparent way on outcomes for apprenticeships and pre-apprenticeships individually and collectively.¹⁹

¹⁹At first blush, dashboards appeal as a way of gauging, at a glance, whether pre-apprenticeships and apprenticeships are doing a good job. In fact, however, real evaluation requires measuring performance relative to what it would have been without the program—which is very difficult. Therefore, dashboards are better thought of part of the “feedback loop”—giving programs information on their progress, including relative to other programs—that supports continuous improvement than as a “judgment” on effectiveness. A for individual programs could include this kind of statement prominently.

2. Further refine efforts to enhance the state's data bases to track apprenticeship and pre-apprenticeship outcomes using the measures developed in bullet 1.

The ATO is already at the leading edge nationally of efforts to integrate a state workforce development data base (in Pennsylvania's case the Commonwealth Workforce Development System, CWDS), with a state apprenticeship tracking system (which in Pennsylvania starts with the data in the national apprenticeship data base, RAPIDS) and then augments. Further, the state's pre-apprenticeship standards signal the state's intention to identify pre-apprentices so that it can track their future outcomes, including if they enter an apprenticeship. After the exercise in bullet 1, it could make sense to review the status of the ATO apprenticeship tracking-CWDS data integration effort and to consider whether any further augmentation of data collection from pre-apprenticeships/apprenticeships is needed.

3. Incorporate pre-apprenticeship as well as apprenticeship into the overall sector partnership performance management system outlined in the state's WIOA plan, including capacity building, peer learning, and evaluation.

The state's WIOA plan outlines a comprehensive performance management system (pp. 343-344) for Next Gen Sector Partnerships (NGSPs) and notes (pp. 341-342) that apprenticeship programs are "the oldest and best funded sectoral workforce partnerships in Pennsylvania." The components of the performance management system outlined in WIOA plan provide a check list with respect to pre-apprenticeship and apprenticeship performance management. Several of the components of that plan are already in place or being developed.²⁰ The state's "Ambassador Network" Request for Proposal could give the state additional consultant support to craft and implement another key component—capacity building and peer learning for apprenticeship and pre-apprenticeship.²¹

The collective experience of all apprenticeship and pre-apprenticeship programs—including some longstanding programs not yet registered but nonetheless serving as pipelines to apprenticeship—in Pennsylvania is impressive. Some of these apprenticeships already have peer learning networks (such as the Pennsylvania Apprenticeship Coordinators Association). Bringing apprenticeships and pre-apprenticeships together, including on a sector-specific basis (whether in stand-alone events or as tracks within a larger convening), could accelerate the spread of best practice. In unionized construction, for example, convening of apprenticeship and pre-apprenticeship programs could further distill best practices for placing diverse community members in apprenticeships. To provide another example, state and local government might come together around opportunities to expand apprenticeship and pre-apprenticeship. A convening of manufacturing apprenticeships and pre-apprenticeships—defined broadly to include unregistered CTE programs, at least initially—is a third, rich target of opportunity.

4. Include occupational groups and networks in grant solicitations to create or grow apprenticeships and pre-apprenticeships.

The discussion in the previous section highlights the existence of some occupations that span multiple industries. Even within industries, or parts of some industries—if employers are small and/or the

²⁰Two of the components of a performance management options in the WIOA plan have already been implemented for pre-apprenticeship: the development of standards and an explicit and public proposal-scoring system for grant proposals (which was incorporated in the PAsmart RFP). Pre-apprenticeship registration covers one of the other components: "a certification process for NGSP's." A fourth component is in progress: collective of quantitative data accessible on "quick turnaround" by partnerships which also allow them to evaluate performance relative to peers.

²¹The other WIOA plan NGSP performance management system components not discussed in the text are: an annual report (including qualitative as well as quantitative information) and providing competitive grants to develop industry-customized sector partnership performance benchmarking. It might be possible to raise federal and/or philanthropic funds to develop these components, especially the second—just for apprenticeship/pre-apprenticeship or for NGSP's as well.

number of people at any employer from the occupation are small—occupational networks (e.g., family child care provider associations, owner-operators or independent contractors in trucking, engineering associations or “makers” in start-ups and at other advanced manufacturers) may be another candidate for collaborating with employers to organize apprenticeships and/or pre-apprenticeships. (In the unionized trades, it is essentially the occupational group—each craft—that runs joint apprenticeships, with industry associations participating in joint governance.) An inventory of U.S. and national experience with occupational group participation in apprenticeships and pre-apprenticeships, and research on specific occupations and their networks or organizations in Pennsylvania, could help the ATO evaluate whether or how to include occupational groups and networks in future solicitations.

5. Tap K-12 and post-secondary education funding streams for pre-apprenticeship and apprenticeship programs.

A challenge to expanding pre-apprenticeship and apprenticeship programs is the identification of sustainable funding. A lesson from other countries that have apprenticeship programs 10 times the scale of Pennsylvania’s is that the programs are embedded in the secondary and post-secondary educational system. Our Pennsylvania pre-apprenticeship inventory reinforces that lesson—highlighting that some of the biggest current pre-apprenticeships operate through CTCs in the Southeastern and South Central part of the state. A forthcoming KRC policy brief will echo this lesson for post-secondary education, pointing out that Pennsylvania public colleges currently under-draw federal Pell grant dollars by about \$250 million (relative to the funds Pennsylvania public colleges would get based on our share of the nation’s 19-34-year-old population). That \$250 million is real money: it roughly equals the state’s annual appropriation for public colleges and Pennsylvania’s annual WIOA allocation. While Pennsylvania won’t easily draw down all of the available funds, we could draw more if we expanded Pell-eligible apprenticeship (and pre-apprenticeship) programs in Pennsylvania’s rural higher education deserts (i.e., most of the “T” and north of Route 80 where there is no community college campuses currently).



The Emerging PA Vision of 21st Century Learning for College, Career, and Life

Stepping back to the big picture, integration of pre-apprenticeship and apprenticeship programs into Pennsylvania cradle-to-career education could generate major positive benefits for students, employers, and the state's economy. It could help overcome the longstanding separation between education and the economy. Particularly for students not on the traditional four-year college track—and/or disengaged from the classroom by the latter parts of high school—this integration could increase engagement, what students learn, graduation rates, and both educational and economic opportunities beyond high school. In conjunction with other PAsmart reforms to STEM education and CTE programs, and with filling the state's community college geographic absence, deeper integration of apprenticeship and pre-apprenticeship programs into the education system could lead to a literal reinvention of grades 11-14, higher educational attainment, and a higher economic payoff to that attainment.

Asked about their vision of education 10 years from now, some of the pre-apprenticeship programs interviewed conveyed some of the potential. Milton Hershey, for example, already integrates career exposure and CTE fully into its entire K-12 curriculum for all students, including the college bound. The school's career exposure begins in third grade, with an introduction to 11 broad career pathways in middle school and four-week exposures to four pathways in ninth grade. In the second half of ninth grade, after acquiring knowledge needed to make an informed choice, students select the pathway around which the rest of their high-school curriculum is built. The Hershey approach, though it begins at younger age groups, resembles the "guided career pathways" approach now seen as a best practice for community colleges.²²

Dave Curry, who oversees apprenticeship and pre-apprenticeship for Milton Hersey, sees the school as trying to achieve a "best-of-both-worlds" approach, combining great academic education and career education. This prepares students for success in college, career, and life, while also enabling them to find a career they love. Part of the magic—most important again for students that don't thrive in traditional classrooms—is finding a pathway and career that excites students, because that excitement can unlock the ability to learn in the classroom, and the motivation to self-learn. Curry stated, "We need to match kids' passion with the skills that allow them to be successful."

²²The approach by Milton Hershey resembled the guided career pathways approach recommended for community college students by Tom Bailey and co-authors, and now being implemented at Guttman College in New York. Thomas R. Bailey, Shanna Smith Jaggars, and Davis Jenkins, *Redesigning America's Community Colleges: A Clearer Path to Student Success* (Cambridge, MA: Harvard University Press, 2015).

APPENDIX A:

Profiles of 10 Pre-Apprenticeship Programs

Central Montco Technical High School Construction

In the 2018-19 school year, Central Montco Technical High School began operating a pre-apprenticeship that connects to construction apprenticeships affiliated with employer members of the Associated Builders and Contractors (ABC) of Eastern Pennsylvania. The high school serves the Colonial, Norristown, and Upper Merion school districts spanning wealthy and lower-income communities outside Philadelphia, with over 50 students in its construction program. Over 65 percent of the school’s students continue their education after high school at college or technical school.²³

The Eastern PA ABC Apprenticeship Trust and Central Montco negotiated a Memorandum of Understanding (MOU) to launch the construction trades pre-apprenticeship program. It will use curricula from the national education arm of the ABC, the National Center for Construction Education and Research (<https://www.nccer.org/>). Montco already used NCCER curricula in its construction CTE program. Now a Montco instructor will become a certified NCCER instructor, and the school will become a registered and certified NCCER training center. ABC member companies will engage with the program in a variety of ways, providing speakers for career awareness seminars, mock interviews, co-ops, internships, job shadowing, and a summer camp for girls interested in construction.

Tenth graders will receive career exposure to the trades through the school’s construction program, with promising candidates invited into the pre-apprenticeship program for 11th or 12th grade. “Students selected will have opportunities for job shadowing, a co-op, or a summer job, so it’s a pull not a push system,” notes consultant Michael Pahides. “We feel that there’s value in the fact that you are a pre-apprentice carries some swagger and weight. The dream has always been attachment to the workforce.”

The program aims to place a few students into ABC apprenticeships initially, and then to build up from there. One challenge will be that successful construction apprentices tend to be in their mid-20s or older. Some successful high-school pre-apprenticeships in the past—e.g., a Reading Pennsylvania program managed by United Community Services for Working Families—have enabled students to obtain their high-school diploma, with significant shares going on to college, but with only small numbers entering apprenticeship.

Students will receive advanced standing within ABC apprenticeships for any training modules completed through the pre-apprenticeship and credit for on-the-job training (OJT) of up to one-year, depending on their skills and abilities. Credentials gained by students will be logged in to the NCCER’s national registry, accessible to ABC employers across the country, potentially making it possible for students go to college or pursue other jobs for a few years and then come back to construction. In 2019-20, the program expects to bring Montgomery County Community College into the program so that students can also get some college credit.

One challenge for the program has been finding construction teachers with industry experience to replace recently retired teachers, in part because potential teachers may earn more in the industry. Montco did recently hire a teacher in his 30s with 15 years industry experience. Another challenge common to any industry and occupation in which experienced employees work with expensive equipment or tools is covering the cost of equipment similar enough to the job site, so students can learn by doing at school.

²³<https://www.cmths.org/>

Community-based pre-employment training programs that target unionized construction jobs have a checkered history across the United States and in Pennsylvania. Common challenges have been the lack of adequate connections to the unions and apprenticeship programs that make hiring decisions, an insufficient appreciation of the requirements to land union jobs and enter apprenticeship (such as a high-school degree, a driver’s license in most cases, and testing drug-free), and inadequate screening of participants to make sure they will be able to meet these basic entry requirements by the end of their pre-employment training. This can result in low shares of community members getting construction jobs and entering apprenticeship, in some cases exacerbating tensions between communities and unions. If the economy and construction demand remain strong, high-quality Pennsylvania pre-apprenticeship programs with tight links to apprenticeship programs have a great chance to overcome past challenges with community pipelines to family sustaining union construction jobs in the next few years.

The Energy Innovation Center (EIC) Institute in Pittsburgh operates “Intro to Construction Trades” (<http://www.eictraining.org/introduction-to-trades>), a six-week pre-apprenticeship program for adults, including adults reentering the workforce after incarceration. An African-American member of the Operating Engineers, Ronald Sapp, founded the program and helps deliver the training. He structures the program as if it were a job. Students learn that 15 minutes early is “on time” and that they won’t get a letter of recommendation unless they remain drug-free.

EIC’s curriculum is aligned with a pre-apprenticeship (or “apprenticeship readiness”) curriculum developed by the North American Building Trades Unions (NABTU)—the Multi-Craft Core (MC3) curriculum. (For details on this curriculum, visit <https://nabtu.org/apprenticeship-and-training/apprenticeship-readiness-programs/>.) The program exposes participants to many different trades. Students learn about carpenters and sheet metal workers, plumbers and laborer, electricians and other crafts. They also learn that they will get a job by becoming part of a trade and a union, not in most cases by going to a contracting company and asking for a job (although some companies do hire and then refer new employees to the union).

The pre-apprenticeship program includes about 120 hours of classroom training with additional hours on the days that participants visit the Operating Engineers Local 66 Training Center in New Alexander or the laborers training center in Saxonburg. The curriculum teaches safety, basic job readiness, and 32 hours of math. Some students lobby for “more math, more math” once they appreciate the career opportunities that higher skills can unlock. Students also receive 24 hours of life skills training including financial literacy enhanced through a partnership with Dollar Bank that gives students a free checking account. The average age of participants is about 30. One alumnus, an ex-offender aged 40 now entering his third year as an electrical apprentice, told a cohort of pre-apprentices in fall 2018 “I want to do something with my life, be an example to my children and my family, to have a house and a car.”

Absenteeism is the number one reason for people dropping out of the program and failing to complete apprenticeship if they enter. If individuals have doctor’s appointments or a court appearance, they can’t just be a “no show”—they must call in. Six weeks of showing up to the course on time aims to get participants to internalize responsibility for—and pride about—showing up on time every day.

In its first 30 months, says program manager Chaquita Barnett, 98 percent of 180 participants have completed the program. Over 90 percent of the participants have been minorities and 15 percent women, with about three quarters obtaining some work in construction, in both union and non-union companies.

Some students lack financial resources to get a new driver's license or to pay off an old fine for traffic violations. This can create a catch-22 since most positions require a valid driver's license—students can't get a license without the income from a job, but they can't get a job without the license. Some trades also have an initiation fee. Many trades also let in new apprentices only one week a year, which could be many months after pre-apprentices complete their program. Some trades do hire non-apprentices to meet project needs at other times of the year, with the possibility of workers hired becoming apprentices later. Learning who is hiring and when, and any specific skills certifications required for the positions available, requires close working relationships with union business agents.

Financial sustainability also poses a challenge—with the program currently cobbling together funding from the Pittsburgh Workforce Development Board, foundations, building trades unions and employers (e.g., the Builders' Guild in Pittsburgh). Even so, the program is now in its 12th cohort of 15-18 participants per class and “not one person has had to pay out-of-pocket” for tuition.

The EIC pre-apprenticeship program is a step forward towards expanding access to apprenticeship and unionized construction jobs for Western Pennsylvania minorities and women. With sustained high demand and a team effort to achieve sustainable funding, the program has a chance to help institutionalize more inclusive access to well-paid construction careers while enabling construction employers to access high quality new trades workers from all communities.

German-American Chamber of Commerce Manufacturing

The German-American Chamber of Commerce in Pittsburgh has launched a Registered Pre-apprenticeship Program in manufacturing that can lead to an apprenticeship for mechatronics technicians, polymer process technicians, sales engineers, and, beginning in 2019, welders. The Pittsburgh-based group, an affiliate of the chamber in Germany, formally established in April 2015, but has roots in a regional “German-American Business Circle” that goes back three decades. The Pittsburgh Chamber has more than 100 members and organizes networking events, hosts delegations from Germany, represents SW Pennsylvania in Germany, and now takes the lead in growing apprenticeship and pre-apprenticeship.

The decision to establish a more formal organization with a two-person staff reflected in part the tightening labor market and member companies’ growing challenges finding skilled workers. “Why can’t we have a skilled workforce like in Germany?” was a familiar lament. Three years ago, the Chamber and its employers decided to do something about it.

The Chamber first established its apprenticeship program in mechatronics and then the one for polymer process technicians. As of July 2018, the programs had 16 apprentices, all selected by and employed at German Chamber employers after a thorough vetting including factory tours, interviews, and opportunities for candidates to ask the companies questions. Establishing a pre-apprenticeship for high-school seniors as a feeder program seemed a natural next step. Both apprenticeship and pre-apprenticeship capitalize on and leverage Germany’s massive apprenticeship infrastructure. For example, the Chamber started with apprenticeship curricula from Germany and asked the companies which hired the first apprentices if they needed the curricula customized. “Typically, the company says, ‘If the apprentice has X, Y, Z skills we’ll hire them,’” says Rachel Mauer, Pittsburgh chapter President. “Usually the whole cohort needs X and Y and then each company needs something more specific.” The Community College of Allegheny County will provide the classroom related instruction and work with Chamber and participating companies to make sure apprentices can apply their classroom learning on the job to deepen and cement their understanding. The apprenticeships are about 30 months in length, with 450 hours of classroom training and 2,700 on the job.

Pre-apprenticeship is expanding fast, from three participating schools as of the September 2018 (Riverside, South Fayette, and Nazareth) to eight as of December 2018. Some of the participating schools have “amazing internal tech labs,” including South Fayette that has a multi-million dollar “Fab Lab.” These schools have “strong educational programs in the lab. The pre-apprenticeship is just a bonus. Students get an academic degree and credit towards an apprenticeship.”

Successful pre-apprentices get a credential as a Manufacturing Technician Level 1 (from the MSI Institute). They will also get six college credits from CCAC. Pre-apprentices get paired with a company that provides job shadowing opportunities and a paid internship and summer employment. Eight companies currently partner on the German-American Chamber apprenticeships (VEKA Inc, Ensinger, AUMA Actuators, Hennecke Inc., Rose Plastic, Almatiss, Pleiger Plastics, and MSA Safety).

JEVS Human Services IT Generalist

In Philadelphia, JEVS Human Services sponsors an IT pre-apprenticeship (registered May 14, 2018) linked with a new IT generalist apprenticeship which requires a minimum of 2,000 hours on the job and 525 hours of classroom related instruction delivered by JEVS, Community College of Philadelphia, and the employer. Orleans Tech, a subsidiary of JEVS Human Services and an accredited college, manages the pre-apprenticeship in Philadelphia, piloted as a one-year AmeriCorps program called “TechServ.”²⁴ Orleans Tech delivers STEM education and information technology training to up to 20 out-of-school youth 17-24 to help bridge the digital divide. Pre-apprentices serve as IT support and STEM ambassadors with employer partners also providing work experience. Education and training are coupled with community service in an “earn and serve” model, and participants earn an industry recognized COMPTEA A+ IT credential.

The pre-apprenticeship pilot year concluded in August 2018. Seventeen of 20 participants graduated with two going into apprenticeship (one at JEVS itself and the other at Philadelphia Parks and Recreation), two coming back for a second year, and the rest going on to post-secondary education or employment. The Philadelphia Information Technology Opportunities Collaborative (PITOC) sponsors the affiliated IT generalist apprenticeship and serves as the advisory board for the pre-apprenticeship. Reflecting the cross-cutting nature of the IT occupation, PITOC employers span multiple sectors, including government, higher education, other non-profits, and the private sector.²⁵

In the pre-apprenticeship program’s second year, it plans to expand to Harrisburg and Camden. In Harrisburg, the expansion will take place through a partnership with TranZed Apprenticeship Services (<https://tranzedapprenticeships.com/>). Looking forward five years, JEVS and TranZed hope to expand the apprenticeship and pre-apprenticeship to multiple states.

²⁴For more on “TechServ,” see <https://www.jevshumanservices.org/program/techserv-scholars/>; and <https://www.jevshumanservices.org/wp-content/uploads/2017/08/TechServ-Fact-Sheet-May-2018.pdf>

²⁵For a brochure on PITOC, go to <https://www.jevshumanservices.org/wp-content/uploads/2018/06/JEVS-Sponsored-Apprenticeships-PITOC-Fact-Sheet.pdf>

Hanover Area Chamber of Commerce Manufacturing

The Hanover Area Chamber of Commerce, spanning 11 municipalities in rural York County and neighboring Adams County, sees workforce development as increasingly important to many of its members. It has stepped up in part because of a gap in the education and training infrastructure serving businesses—Hanover is an hour’s drive from York Technical College. In addition, in the “snack capital of the world,” which has a concentration of food processing companies and other manufacturers, developing skilled workers for manufacturing is a top priority. The first four manufacturers that partnered with the Hanover Chamber to create Pennsylvania’s first chamber-sponsored group apprenticeship, and aligned pre-apprenticeship, program (Elsner Engineering, UTZ, KLK welding, RH Shepard) expect nearly half of their workers to retire within five years.

For 15 years, the Chamber had collaborated with local manufacturers and school districts on an 18-week “introduction to manufacturing” career pathways programs to increase awareness of local job opportunities. Students visit businesses and learn that these are high-tech and technology jobs, not just baking pretzels and frying potato chips. They also learn that, as well as jobs for students out of high school, there are jobs for technicians, engineers, and managers for students who attend two-year and four-year colleges.

In fall 2016, the four manufacturers approached the Chamber seeking to add more structure to the collaboration to strengthen the pipeline to good-paying manufacturing jobs. Pennsylvania’s newly created ATO suggested the Chamber move to a group model apprenticeship, approved by Feb. 2017. The Chamber simultaneously launched a pre-apprenticeship to provide candidates for apprenticeship. The pre-apprenticeship, built around the “Right Skills Now” curriculum which leads to a nationally recognized NIMs credential, launched in the fall of 2017 in the Hanover and South Western school districts and had seven pre-apprentices by its second year.

Students start the pre-apprenticeship in their junior year of high school. The curriculum is synchronized with high school graduation requirements and provides academic credit. In those two years, students learn in their school shop class, instructed by a teacher who works closely with businesses and with business-designated mentors. Students also engage in work-based learning at partner businesses. Pre-apprentices can earn industry recognized NIMs and American Welding Society credentials, with plans to add credentials in mechatronics. Students graduate with a credential and a two-year relationship with a local business and are guaranteed an interview. If hired, they become an apprenticeship (e.g., in machining, welding, or mechatronics). In June 2018, Elsner Engineering hired a pre-apprentice graduate as the first apprentice in the Hanover Chamber’s group apprenticeship.²⁶

Pre-apprenticeship has now expanded to a third school district (Conewago Valley) and the number of partner businesses has grown to six (with the addition of Abbottstown Industries and Precision Cut Industries).²⁷ The Chamber facilitates monthly meetings of the companies and school districts. Other interested employers can attend the meeting and get input from a peer company about the benefits of apprenticeship and pre-apprenticeship. Another expansion opportunity may come through a partnership to link the pre-apprenticeship with the robust group manufacturing apprenticeship operated by the York-based Manufacturers Association of South Central Pennsylvania for about 15 years, and anchored in the more urban parts of the county and region.

²⁶<http://hanoverchamber.com/elsner-hires-first-graduate-chamber-apprenticeship-program-2/>

²⁷For short profiles or quotes from three participating students, see <https://southernpamagazine.com/the-pre-apprentice/>. See also <http://hanoverchamber.com/hanover-chamber-apprenticeship-program/>

Gary Laird, President of the Hanover Chamber stated, “We’ll have students graduating with no debt making \$40,000, \$50,000, even \$60,000 and good benefits and opportunity to continue to advance.” Businesses largely self-finance the apprenticeship and pre-apprenticeship currently—with the Chamber “passing the hat” when it needs to—and provide significant in-kind support as well, supplementing school district investment and start-up funds from the state. For both programs, the Chamber estimates its start-up expenses at \$150,000—for equipment, training manuals, a trainer from NIMs who trains high-school instructors and mentors. Conewago Valley School District invested in a new machine shop and welding lab in anticipation of entering the pre-apprenticeship program.

Laird continued, “We expect to grow over the next two or three years. With our group model we can expand outside of the three occupations. We have a lot of flexibility. Additional businesses can be added with a two-page form.” For its group apprenticeship, and for pre-apprenticeship, the Chamber relieves partner employers of administrative responsibilities—entering data into the RAPIDS data base for example—and allows “employers to focus on what is important,” managing their businesses and their workers. The Chamber has also contemplated sponsoring apprenticeships in other sectors where it has many members, such as health care and hospitality.

Elsner Engineering Business Development Manager, Gordon Laabs, salutes the ease with which educators and business leaders have worked together and emphasizes that workforce and academic goals do not need to be mutually exclusive.²⁸

Laird adds that the pre-apprenticeship can give students a broad perspective on careers. “People in our community think of very specific jobs. But there’s a range of careers—for example, you can be a flavor chemist after going to Penn State University (PSU)...Our vision for this program is that you may graduate and become a machinist, but that should only be the beginning. Each of our partner companies has tuition assistance: it can be what you want it to be. Most of the people in lead positions in these businesses started on the shop floor 30 years ago. At Southwest high school, there’s a young man accepted into PSU as an engineer—and he’s taking pre-apprenticeship classes. The program is demanding academically and it’s a differentiator for him.”

²⁸https://www.starttheconversationhere.com/workforce_spotlight/2108/Elsner_Engineering_Winter_2017/

Milton Hershey School Culinary Arts and Construction

Milton Hershey School in Hershey, Pennsylvania has a long, proud tradition of high-quality education that includes substantial hands-on learning and exposure to different careers. Today it is a private no-cost residential school for 2,100 students in grades K-12 from across the country. Students live in groups of 10-12 with “house parents,” and have incomes below 200 percent of the poverty line, with 91 percent below the poverty line.

Founded in 1909 as the Hershey Industrial School for orphan boys, the school embraced the “college for all” approach in the 1990s to the consternation of many alumni. It has since reestablished an academically rigorous curriculum that emphasizes career and technical education (CTE) and prepares students for success in careers and/or college. A total of 2,100 students spanning K-12 get exposed to CTE in grades three and four: exposure to hands-on learning linked with 11 CTE pathways in middle school;²⁹ explore four of the pathways for four weeks in 9th grade; and then pick a pathway in the second half of ninth grade. The curriculum is organized around the selected pathway for the rest of high school and includes hands on learning and authentic work experience (e.g., in internships and co-op programs); paid summer jobs; and the opportunity to earn up to \$95,000 for college. Some students enter careers immediately, others attend college, in some cases at elite universities.

Milton Hershey’s CTE programs have robust advisory committees that advise on best practices in industry and lead to two-to-four industry certifications. The school also has an alumni base of 7,000 to 8,000 alumni in the Capital Region.

Pre-apprenticeship builds naturally on established relationships with employers and fits organically into the school’s CTE-based pedagogical approach. A significant minority (about 15 percent) of Hershey students don’t want to go to college. Pre-apprenticeship enables the school to offer these students alternative pathways to the middle class. Students who go to college can also gain access to good-paying apprenticeships that also enable them to earn some credits towards a degree.

The school began its exploration of apprenticeship in early 2017, starting with culinary arts and a partnership with Hershey Entertainment and Resorts. The company had already provided internships, job shadowing opportunities, and coops for some seniors. Encouraged by the Pennsylvania ATO, the school decided to certify its culinary arts pathway as a pre-apprenticeship leading to an existing 6,000-hour apprenticeship for which Lebanon County CTC provides the related instruction. Successful students can reduce by 700 the hours needed to complete their apprenticeship. The school is also negotiating with Harrisburg Area Community College (HACC) to provide students who complete the pre-apprenticeship with 42 credits toward an Associate Degree in Culinary Arts.

Pre-apprenticeship also led the school to reimagine how to use \$95,000 in scholarship money for students who do not want to go to college. Now those funds can pay for housing, food, books. “This is huge for us—kids don’t feel they wasted their scholarship money now,” says Milton Hershey’s Dave Curry, who oversees the school’s apprenticeship and pre-apprenticeship. The school only expects to place one or two graduates in each apprenticeship annually. But doing that for apprenticeships linked with all 11 pathways can provide good options for a big share of students that do not go onto college or

²⁹For a list of the pathways, see <https://www.mhskids.org/academics/mhs-career-technical-education/cte-pathways/>

the military. The company's second pre-apprenticeship links with a construction apprenticeship for which the school is the sponsor, placing students initially with Pyramid Construction. HACC will also provide 30 credits for students completing the construction pre-apprenticeship.

Apprenticeship and pre-apprenticeship provide additional flexibility for students who go to college but struggle to get a professional job or find they don't like their chosen pathway. For example, a Penn College graduate in construction management found construction apprenticeship a way to break into the industry. A highly successful college graduate with a philosophy degree now wants to be a paralegal, but to get paid as she earns a new skill set rather than sit in a classroom for another two years.

Curry sees these programs as part of a way to reorient education towards the practical goals of success in college, career, and life. "Education across the country needs to begin with the end in mind. Is it to pass a test or be successful in life? We need to match kids' passion and skill set with what allows them to be successful...Start with the end in mind and prepare kids for careers...Here we are teaching the basics more purposefully."

Northeast Equipment Dealers Association (NEDA) Agricultural Technician

The Northeast Equipment Dealers Association (<https://www.ne-equip.org/>) brings together sellers of agricultural and some construction, excavation and landscaping equipment at 460 locations from Pennsylvania to Maine. The association is developing an agricultural technician apprenticeship and pre-apprenticeship because the average age of technicians in the workforce is 52 today. Like car dealerships, agricultural equipment dealers rely on their service departments today to generate revenue and help cover overhead costs.

NEDA first attempted a traditional time-based apprenticeship. When dealers had little interest, the company switched to a competency-based approach that dealers have more confidence will “let them know what they are hiring.” Dealers specified the skills needed by agricultural technicians, and NOCTI (originally the National Occupational Competency Testing Institute, online at <https://www.nocti.org>) grouped these skills into four levels. The pre-apprenticeship will teach the first two levels and NOCTI will validate that students that students have mastered each competency. The development of written and performance-based tests for each competency level has proved grueling—eight hours for groups of 10 people or more at each level. The apprenticeship is registered in Pennsylvania and the goal is to register it throughout the northeast then nationally once the competency testing is finished. The same could be done with the pre-apprenticeship.

The dispersal of dealers may make it difficult to assemble a group of at least six to eight apprentices in one geographical area for classroom instruction. The mix of technical skills required on agricultural equipment, including hydraulics, diesel engine technology, and electronics, may also make it hard to find instructors in one place who can teach the whole apprenticeship curriculum. For the pre-apprenticeship, challenges also exist with recruiting enough participants and qualified teachers in any local area.

NEDA aims to enroll its first apprentices and pre-apprentices in Lancaster by the first part of 2019. State grants will cover the first cohort of students. It remains unclear who will pay for tuition and tools for apprentices and pre-apprentices on a sustainable basis. (Tools cost \$20,000 to \$30,000 for a senior technician; pre-apprentices need fewer tools and tools can also be used for multiple cohorts, lowering costs.) Apprentices will earn a salary and employers may offer tuition reimbursement that phases up by year three, once employers have confidence that apprentices will graduate. For pre-apprentices, costs will be lower and participating schools may have to bear most of the cost.

As implementation moves forward, NEDA sees mentors—and mentor training—as critical for successful apprenticeship and pre-apprenticeship. Experienced mechanics and technicians would be identified who communicate well and who can overcome the age gap with new recruits.

Oberg Industries Manufacturing

Oberg Industries, headquartered in Armstrong County, Pennsylvania, and with production facilities in neighboring Butler County, first established an apprenticeship in 1971 and now has over a dozen Registered Apprenticeships, most of which are variations on four main ones—toolmaker, grinder, CNC operator, and press operator.³⁰ An employee-owned company, Oberg makes medical devices and is a contract manufacturer of precision metal components for many industries, including aerospace, energy, automotive, metal packaging, housing/construction, and consumer product sectors—“we make things to print.” The company has 700 employees in Pennsylvania, over two-thirds of its global workforce.

Oberg’s apprenticeships are all “single company,” but at a scale that dwarfs many group apprenticeships, with about 50 apprentices in the second half of 2018 and 30-50 in each of the past several years.³¹ Oberg’s apprentices have a stunning record of success in the classroom, partly because of rigorous up-front screening and testing of applicants. The company accepts only 5 percent to 10 percent of apprenticeship applicants. Apprentices must receive at least an 80 percent grade in all their classes and only two apprentices have failed to do that in the past 34 years.³² A U.S. Department of Commerce study found that Oberg is one of the few U.S. companies that conducts internal return-on-investment (ROI) calculations on its apprenticeship, based in part on tracking individual productivity data for apprentice and non-apprentice hires. While Oberg did not share details of its ROI estimates because of confidentiality concerns, “...Oberg finds a wide-range of consistently positive ROI for its apprentice graduates on average.”³³ For example, Oberg estimated the ROI for apprentice graduates in 2016 as ranging from 131 percent to 326 percent.³⁴

Oberg created its pre-apprenticeship in partnership with local high schools in 2014, in response to concerns about a growing skill shortage, and formally registered the pre-apprenticeship in 2018. “Multiple industries were all fighting for the same, STEM-capable students, and we couldn’t find enough of them,” says Oberg’s Greg Chambers. John Malobicky, a local physics teacher at Highlands high school in Natrona Heights triggered the creation of the pre-apprenticeship program when he reached out to Oberg about creating an “academy” that would develop STEM competences. Oberg partnered with him to create a program that would expose students to manufacturing while also teaching math, metrology (measurement), and machining.

“The difference was that this was for academic kids. We always have had our career and technical education (CTE) kids. We didn’t want to take away from CTEs because they are our primary source of new applicants. But we had such a need for smart kids, and those who didn’t want to go to college but also didn’t want to go CTE didn’t have too many options. We started this program because it was a great idea, then pre-apprenticeship came along after that. It was a natural fit. We didn’t have to change anything.”

³⁰This profile is based on an interview with Greg Chambers, Director of Corporate Compliance for Oberg Industries and on two other case studies of Oberg’s apprenticeship programs: Sue Helper et al., “The Benefits and Costs of Apprenticeship: a Business Perspective,” U.S. Department of Commerce and Case Western Reserve University, November 2016, pp. 67-69; Keith Rolland, “Apprenticeship Guide,” Federal Reserve Bank of Philadelphia, 2017 pp. 33-38; https://www.philadelphiafed.org/-/media/community-development/publications/special-reports/apprenticeship-guide/apprentguide_web_full.pdf?la=en

³¹According to the Philadelphia Federal Reserve Bank, Oberg had 61 apprentices as of February 1, 2017, 9% of its U.S. workforce. That figure may include some apprentices in Illinois. See Rolland, “Apprenticeship Guide,” p. 33.

³²Rolland, “Apprenticeship Guide,” p. 35.

³³Helper et al., p. 69.

³⁴Rolland, “Apprenticeship Guide,” p. 36.

Teachers and the company created a curriculum that starts in junior year and lines up with Oberg's specific needs and apprenticeships. Oberg's apprenticeships switched from "time-based" to competency-based at the turn of the century. (Apprentices must still complete at least 2,500 hours of on-the-job learning as well as 144 hours of related instruction each year.) The pre-apprenticeship includes sections on drawings, computer-aided design (CAD), 3-D design, metrology, and math as well as opportunities to use grinding, machining, milling, and turning machines, and to inspect manufactured parts. The program includes a paid (\$11 or \$12 per hour) internship at the plant that starts in the summer after junior year, and job-shadowing opportunities. Students may earn at least two and up to five National Institute of Metal Standards (NIMS) credentials. The program will connect to its third high school in the 2018-19 school year.

Over four years, 23-25 students have been through the program with 13-14 of them hired at Oberg as apprentices. "The hired people are doing very well—just as well as our CTC students." The company rigorously assesses progress by having apprentices and pre-apprentices demonstrate what they have learned multiple times. The company also uses NIMS, which has designed performance standards for the metalworking industry, as a third-party validator of participant progress.

Oberg's Greg Chambers says "Manufacturing needs to overcome a stigma in our society. People think manufacturing is one way and manufacturing is not that way anymore. You use your head more than your hands. For us the pre-apprenticeship was a chance to educate people about manufacturing in the 21st century. Once parents' understanding of manufacturing increases, they are on board. There is more of an awakening now that there are opportunities other than college and that it's not an either/or choice. You can go to work and it will pay for college. Young people also need more education than just high school—whether you get it at work or in college—to get a life-sustaining job."

Penn College of Technology Manufacturing

Penn College of Technology is one of the powerhouses of technical education and training in Pennsylvania, with 5,500 students, many specializing in applied technology education, and with the school claiming a 96 percent graduate placement rate.³⁵ “Everything is hands on with one hour of lecture to three hours of lab/hands-on time, project-based learning, equipment and labs everywhere, and close relationships with companies, especially in health care and industrial fields,” says Shannon Munro, vice president for workforce development. Penn College has another 5,000-plus people in workforce development programs, many customized to the needs of companies investing in their current workers.

Penn College’s educational approach made it a natural candidate for the Pennsylvania embrace of apprenticeship—and now of pre-apprenticeship. The catalyst for the school’s first apprenticeships came out of industry. A human resource manager in Bloomsburg from Toronto familiar with Canadian auto apprenticeship programs pulled together a consortium of three companies to launch a mechatronics apprenticeship. Two of the companies started locally (one since bought by a Swiss company, Autoneum, and the other Conair/Arconic), and a Japanese company SEKISUI SPI (<https://sekisui-spi.com/>) is the third. The apprenticeship had 51 participants at the beginning of its third year in fall 2018, with Penn College coordinating the classroom instruction. Based on the success of this consortium, Penn College decided to sponsor its own apprenticeships, approved in fall 2017 in Mechatronics and Computer Numerical Control (CNC) machining. Fourteen employers connect to one or Penn College apprenticeships, with 23 apprentices in mechatronics and 15 in CNC as of summer 2018.

In December 2017, Penn College received a state grant to start a manufacturing pre-apprenticeship that projected 72 pre-apprentices by the end of its third year. The College engaged 14 school districts in four counties to jointly design a pilot being implemented in 2018-19 in two school districts, Jersey Shore and Keystone Central. The design aims to help students see how the pre-apprenticeship and apprenticeship can open the door to a wide array of careers in manufacturing—including as engineers and managers—while also enabling students to graduate from high-school, acquire some college credit and move into higher education if they choose. The program includes ongoing assessment so that completing students can receive a Manufacturing Skills Institute “Manufacturing Technician 1” certificate (<http://manufacturingskillsinstitute.org/>), an industry recognized credential endorsed by the National Association of Manufacturing that signals competences at the same level as Advanced Placement (AP) courses and IB (International Baccalaureate) credentials for the four-year college bound. The pre-apprenticeship was also broken down into modules short enough fit into year-round classes in regular high-schools as well as CTE schedules with longer teaching and “lab” blocks that permit pre-apprenticeship completion in short periods of time (e.g., eight weeks).

Another innovation was the establishment of an advisory board of students for the pre-apprenticeship. These advisors may help attract future pre-apprentices, partly by marketing the program but also by offering input on program design that makes it more attractive to students generally.

³⁵<https://news.psu.edu/story/400504/2016/03/29/record-number-employers-vie-penn-college-students>

Penn United Technologies Manufacturing

Penn United Technologies is a precision metal manufacturer in Butler County, 30 miles north of Pittsburgh, offering a wide range of specialized capabilities to industries including the energy, oil and gas, fluid handling, defense, and medical device industries, including precision stamping dies. A diverse customer base protects the company against downturns: “if it’s slow in one area, we’re busy in another” says Penn United’s Scott Covert.

The company launched its first apprenticeship in 1973. It brought its classroom instruction in house to a new “Learning Institute for the Growth of High Technology” in 1999, allowing for curricula customized to the company’s skill requirements and use of its own experienced workers as instructors.

The company currently has 75 apprentices—twice as many as two years ago although not yet the 100+ of the late 1990s—in 12 different programs, with starting wages around \$13 to \$13.50 and wages of \$18 to \$18.50 by apprenticeship completion. Penn United also trains customers’ tool-and-die makers and design engineers as far away as Mexico and Puerto Rico. “Most engineers have never spent hands-on time building tools. It’s hard to design when you don’t know how it’s built.”

The company’s pre-apprenticeship program, “Students Acquiring Technical Skills,” now registered with the state, started in 2012. At a countywide business and educators meeting, companies complained “you’re not teaching what we need people to know” and educators shot back “we have to teach to the core curriculum.” A Penn United observer went to his department manager and said “this is not an education problem, it’s a manufacturing problem. We are the ones in desperate need of employees with basic manufacturing skills. We can develop the skills our company and all 285 manufacturers in our county need.”

The pre-apprenticeship program started online and on-site. It spread through word-of-mouth and the company now delivers it to nine different school districts and some cyber-charter students. In partnership with Butler Community College (CC), the company also turned the program into an eight-week non-credit class taught at the company’s training center four days a week for four hours a day. In partnership with a local manufacturing consortium, the company has run 15 classes of this program in the past two years, including at Butler CC branch campuses in Mercer and Lawrence. Students earn two NIMS credentials. The company itself hires some of the best students “after what amounts to a two-month interview,” giving students credit for up to a year of apprenticeship related instruction. The overall placement rate is 70 percent and all students get the opportunity to interview with area manufacturers.

“Our future workforce is sitting in our HS classes right now, very smart, very tech savvy. I don’t find it hard to find good people. You have offer them something. Our apprentices earn a year of college credit and, with tuition reimbursement, they can get an associate degree at little or no cost. It’s no longer go to work or go to college. You can earn your journeyman’s certificate and your first degree and not be \$200,000 in debt.”

“You talk to any manufacturer you will hear complaints about how hard it is to get people. We’re a stubborn breed—we used to have people flocking to us. You have to accept that it’s your problem. We’re manufacturers, we solve problems every day. If you look at it as your problem, you’re going to be able to fix it. Not if you look at as the school’s problem.”

Now the company is implementing the eight-week program as a year-round course for non-CTE students at Freeport and Butler Area School Districts, with the hands-on component delivered in Fab Labs and metal labs. The company will establish coop programs for these students and give them credit for the first year of apprenticeship.

“It’s fairly easy to put together a pre-apprenticeship program with a local high school. Kids are embracing it. For kids going to college, our pre-apprenticeship can help them to become an engineer. It’s not your father’s manufacturing anymore and there’s a whole new generation. The perception of manufacturing is changing. It’s now high tech and clean.”



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