A STUDY ON VOCATIONAL EDUCATION AND ITS ROLE IN SCIENCE, TECHNOLOGY, ENGINEERING AND MATH (STEM) EDUCATION

Investing in 21st Century Workforce
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A STUDY ON VOCATIONAL EDUCATION AND ITS ROLE IN STEM
Investing in a 21st Century Regional Workforce

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Introduction

As of August 2016, more than 11 percent of Americans aged 16 to 24 are unemployed.\(^1\) While some of the 2.6 million unemployed people in this cohort are mostly concerned about securing summer employment between academic semesters, 1.9 million are looking for full-time work.\(^2\) For high school graduates, workforce entry seems dire: among 18 to 19-year-old Americans, the August 2016 unemployment rate is a staggeringly high 15.2 percent, virtually unchanged from August 2015’s 15.8 percent.\(^3\) Additionally, college graduates face academic and financial barriers to entering today’s labor market. According to the National Center for Education Statistics, the six-year graduation rate for full-time students at four-year colleges is 60 percent, as college dropouts and graduates alike face an 8.1 percent unemployment rate among Americans aged 20 to 24.\(^4\)

Despite a seemingly impenetrable labor market, untapped opportunities do exist for young workers – with the right experience and education. The number of job openings, a metric of labor demand, increased by 228,000 to 5.9 million on the last business day of July 2016, as many businesses struggle to fill specialized positions with capable workers.\(^5\) An August 2016 survey from the National Federation of Independent Business finds that while 56 percent of small business increased hiring or attempted to do so, 48 percent claimed that few, if any, applicants were qualified for the positions they were attempting to fill.\(^6\) Additionally, 15 percent of small business owners ranked the challenge of finding experienced applicants as their “single most important business problem” they face. Among all small business owners, the challenge ranked third out of nine other issues, only behind tax policy and the regulatory environment. Most importantly, 30 percent of all small business owners reported open positions they are unable to fill, a metric that has returned to pre-recession levels. The talent gap employers are facing risks suppressing job creation, as more small businesses contemplate utilizing temporary workers and fewer plan to create new jobs compared to previous months. As a result, the current employer-employee mismatch, continued unabated, might not remain an untapped potential to prospective employees for much longer.

The reauthorization of Every Student Succeeds Act (ESSA) provides school districts flexibility to include career pathways for students in an effort to create awareness of future job growth especially in technical occupations. Since Career & Technology Education (CTE) has already been proven to increase (Science, Technology, Engineering and Math (STEM) workers, this a perfect opportunity to address career readiness at an early age. This however, is subject to change because at the time of publication, ESSA guidelines have not been finalized. The skills shortage gap many employers face, however, is not equally distributed across all industries and sectors. Throughout the United States, employers report an undeniably insatiable demand for workers in technical fields. According to Manpower’s 2015 U.S. Talent Shortage Survey,
employment vacancies in the skilled trades sector remain the hardest positions to fill for the sixth consecutive year. This list of extremely in-demand positions also includes machinists, information technology specialists, mechanics, technicians, nurses, engineers, and certified drivers. Many, if not most, of the foundational skills required to succeed in these industries are best learned not only in an academic setting, but also through hands-on application. Career and technical education, partnered with apprenticeship experiences, provide exciting opportunities for workers of all ages and backgrounds to reenter the workforce and begin rewarding careers in high-paying, rapidly-growing industries.

This study, a product of The Institute for Public Policy and Economic Development’s Education and Workforce Development Task Force, surveys the current state of vocational education and apprenticeships in the United States by examining the advantages of both programs to employees and employers alike and detailing the present support for such programs by policymakers and employers. Additionally, this report will include an appraisal of regional employment sectors and industries struggling to fill open positions. Finally, the report will provide case studies demonstrating the opportunities available to successfully expand vocational education and apprenticeship programs to grow these employment sectors.

Research Methodology
The Institute used statistics reported from a wide variety of federal and state sources, including the Bureau of Labor Statistics, the U.S. Department of Labor, the Pennsylvania Department of Education, and the Pennsylvania Department of Labor & Industry. For example, data on apprenticeships – including national and statewide enrollment, as well as return on investment – is reported from the U.S. Department of Labor’s Employment & Training Administration. Data on educational spending, both in per pupil expenses and vocational spending as a percentage of total instructional expenses, was obtained from the Pennsylvania Department of Education, which reported total expenditures, instructional expenses, and vocational education expenses by school district, as well as the number of participating students in each district as of 2015.

Per pupil education expenses were calculated by dividing total school district expenditures by the number of participating students in the given school district. County-level information was calculated by adding up all county-wide school district expenses and dividing them by county-wide participating public school student enrollment. To calculate school district spending on vocational education as a percentage of total instruction, instruction expenses for each school district was divided by allocated CTE instruction spending per school district provided by the Pennsylvania Department of Education. As with per pupil education expenses, county-level information was obtained by aggregating all instruction expenses and vocational education expenses for each school district in Lackawanna and Luzerne counties.
Surprisingly, scholarship detailing links between vocational/technical education and income gains has been somewhat underdeveloped, as very few studies have been conducted on the national level concerning any correlation within the last decade. As a result, most data presented in this report that pertains to the quantitative value of a CTE or apprenticeship experience is provided on the state level, and only from previous scholarship compiling and utilizing states that make their CTE and/or apprenticeship data available. California’s Center for Analysis of Postsecondary Education and Employment (CAPSEE) and Washington State’s Workforce Training and Education Coordinating Board are two examples. Both institutes have compiled, measured, and analyzed income growth and other relevant workforce development data tied to secondary and postsecondary CTE experiences to help quantify the value of such an education in their respective states, and their findings are elaborated upon later in this report. However, inconsistencies in previous research endeavors demand further research to examine other variables and expand the focus of study. Finally, to help policymakers, educators, and employers accurately assess the state of their region’s investments in vocational education, more states should strive to increase transparency in providing a quantitative return on investment of their secondary and postsecondary CTE programs.

The data presented in this report was selected based on the availability of the most-detailed information available for the most local geographic area. Simply put, different agencies use differing geographic lenses to measure workforce development. For some metrics, such as educational attainment by age, data available by county presented the most complete picture. Other agencies, such as the Pennsylvania Department of Labor & Industry’s Center for Workforce Information and Analysis (CWIA), present regional wage information for the fastest-growing occupations from 2012 to 2022 based on Workforce Investment Areas (WIA). Created by the 1998 Workforce Investment Act, approximately 600 WIAs throughout the nation develop region-specific reemployment services for unemployed or economically displaced workers.9 For the purposes of this report, there are two regional WIAs: Lackawanna WIA and the Luzerne-Schuylkill WIA. However, when wage information for a given occupation or industry was not available in a given WIA, the information was supplied by the Bureau of Labor Statistics’ own wage information for the Scranton/Wilkes-Barre/Hazleton metropolitan statistical area (MSA). Thus, when local data for a given metric was unavailable, the next most regional information was supplemented, or vice versa.

Finally, to draw attention to regional CTE institutes and apprenticeship opportunities, an “Available Resources” section has been added to this report detailing contact information for local organizations, as well as a list of relevant academic and career opportunities offered. This information was procured directly from the websites of various federal and state agencies, career and technical centers, community colleges, and for-profit institutions. The information
provided in this section, however, does not constitute an exhaustive list of regional resources available to students, parents, employers, or policymakers.

The State of Vocational Education and Apprenticeships

Vocational education and apprenticeship programs in the United States can adequately be summed up in one word, for better or worse: decentralized. On one hand, different state economies need different kinds of workforces, and active state-level involvement in crafting vocational education policies and apprenticeship program criteria has resulted in many innovative, flexible, and diverse approaches to meet the particular strengths and deficits in every state. On the other hand, employers and educators alike must navigate a highly complex maze of federal, state, and local programs, each with its own standards and requirements, in order to deliver access to high-quality career and technical education, as well as a productive apprenticeship experience. Additionally, as the Organization for Economic Cooperation and Development (OECD) notes in their 2013 report, A Skills Beyond School Review of the United States, credentials and certifications in most occupations are not as organized or uniformed domestically as they are internationally.10 According to the OECD’s review, while the lack of a national standard for industry certifications allows the domestic labor market to be maximally responsive to changes in demand, it also muddles the ability of both students and employers to match credentials to open positions.11

The fragmented nature of vocational education in the United States is primarily an issue of access – not outcome. A total of 87 percent of apprentices in the U.S. are employed upon the completion of their programs in positions with average starting wages above $50,000.12 CTE graduates can make nearly 30 percent more than high school graduates in programs that are just a fraction of the cost and time spent in a bachelor’s degree program.13 This section, however, will examine all facets of the issue, including the basic structure of vocational education and apprenticeships in the United States, their advantages to employees and the employers they work for, and the financial, social, and informational obstacles that institutions on all levels face in widening access to high-quality career and technical education.

Career and Technology Education (CTC) and Apprenticeships: The Current Landscape

The hybrid structure of many vocational education and apprenticeship programs, with their attention to both course-based and work-based learning, can prove challenging to distinguish for those interested. According to the Carl D. Perkins Career and Technical Education Act, the seminal legislation funding vocational education programs, vocational education is defined as “organized educational programs offering a sequence of courses which are directly related to the preparation of individuals in paid or unpaid employment in current or emerging occupations requiring other than a baccalaureate or advanced degree.”14 Vocational education,
more commonly known today as career and technical education (CTE), is provided through many different channels, including high schools, joint or part-time career and technical centers, statewide technical colleges, community colleges, and for-profit institutions. For high school students, CTE can be offered through “whole-school models,” such as high schools with internal vocational programs and technical high schools, or “pullout models,” where students are educated for part of the school day at an off-campus technical school. Additionally, many community colleges and universities collaborate with high schools to offer dual enrollment courses for high school students and adults alike. CTE programs include, but are not limited to: automotive technology, high-skilled manufacturing, computer information systems, early childhood education, physical therapy, medical technology, nursing, protective services, energy extraction, and cosmetology.

An apprenticeship is more broadly defined as a “program of courses, work-based learning, and productive employment in which workers achieve occupational mastery and industry-recognized credentials.” In the United States, apprenticeship programs last, on average, about three to four years and culminate in an industry-recognized credential testifying to their mastery of the relevant occupational skill. Unlike approaches in other countries, the United States apprenticeship system is a resource more utilized by adults, with very few connections to secondary education – in fact, as of 2012, only about 20 percent of apprentices are under age 25 and the average apprentice age is roughly 30. The apprenticeship experience is characterized by both educational development and work-based learning, separating such programs from traditional vocational education or on-the-job training. While apprenticeships are usually provided through private sector employers, the apprenticeship experience is being embraced more by CTE programs, which are partnering with prospective employers to provide internship or on-the-job experiences for their students. Today, apprenticeships and formal vocational education programs are more closely aligned than ever, collaborating whenever possible to prepare their students for the educational and experience-based deficits in a 21st century workforce.

While the experiences of both vocational education and apprenticeships are inextricably linked, the two arise from different contexts. Vocational education across the nation, whether in high school, postsecondary, or adult-focused programs, is primarily funded by the Carl D. Perkins Career and Technical Education Act of 1984. The Perkins Act evolved from the 1917 Smith-Hughes Act, which invested in educational opportunities for agricultural workers economically displaced by the Industrial Revolution. The Perkins Act continued to expand those opportunities further, creating five channels for federal funding: (1) basic state grants enabling states to distribute funds by formula to school districts and postsecondary programs; (2) Tech Prep, a school-to-work transition initiative with either a 2+2, 3+2, or 4+2 year sequence of
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study; (3) Tribally Controlled Postsecondary Career and Technical Institutions program for Native American students; (4) national research initiatives identifying best practices in vocational programs; and (5) the dissemination of occupational and employment information. In its 32 year history, the Perkins Act has undergone multiple modifications to reflect trends in career and technical education. For example, due to inconsistent effectiveness of outcomes across each state, the Tech Prep program was consolidated into the basic state grant, which now consumes over 90 percent of all Perkins funding. Today, due to the success of the Perkins Act, approximately 14 million students are enrolled in both secondary and postsecondary vocational education programs nationwide.

While informal apprenticeships have roots in colonial America, federal support for such initiatives started in 1937 with the National Apprenticeship Act, a New Deal-era effort to combat the Great Depression. Under this legislation, Registered Apprenticeship programs are sponsored by an individual employer, a consortium of employers, or an industry-wide association, occasionally in partnership with labor unions. Sponsors are tasked with designing apprenticeship programs that integrate classroom instruction with paid, on-the-job learning under supervision. Subsequently, sponsors register their programs and prospective apprentices with either the Department of Labor’s Office of Apprenticeship, or alternatively a State Apprenticeship Agency recognized by the Labor Department. Apprenticeship agreements cement the partnership between employer and trainee, with the latter agreeing to abide by all the requirements of the program. When the apprenticeship program is completed, apprentices receive an “industry-issued, nationally recognized portable certificate of completion.”

Within a decade of the National Apprenticeship Act’s passage, approximately 6,233 registered apprenticeship programs were established to educate 4,000 apprentices. Initially, Registered Apprentice programs were limited to manufacturing, utilities, and construction industries, but their scope expanded in the aftermath of World War II to include public safety officers, such as firefighters, police, and emergency medical technicians. As of 2016, approximately 20,000 Registered Apprenticeship programs serve nearly 600,000 active and new apprentices in a myriad of different industries, from ironworking to surgical technology to cosmetology. According to the Department of Labor and Glassdoor.com, there were 59,427 job openings for apprenticeship or trainee positions nationwide in September 2016 alone, with 3,739 in Pennsylvania and 166 in Lackawanna and Luzerne counties.
Economic Opportunities for Employees

By any metric of skills acquisition, CTE and apprenticeship programs provide a viable alternative to more traditionally pursued educational paths by many metrics. For example, numerous studies find that career and technical centers can boast a 90 percent average graduation rate, a 15 percentage point improvement from the national high school graduation average. In addition to academic mastery, students benefit from CTE and apprenticeship programs by coming into direct contact with the occupational work that they will be doing in the future. Under the guidance of a mentor, whether an employer or teacher, students learn how to perform not only the technical aspects of the job but also develop the professional behavior, interpersonal skills, and problem-solving abilities necessary in nearly every sector of a 21st century workforce. Finally, vocational education programs can contribute to higher rates of job confidence and satisfaction. Employees, for example, can start a high-paying, secure job with the confidence of knowing the height of the learning curve is sizably diminished due to the vocational education they’ve received.

Credentials earned in a CTE or apprenticeship program, whether in a high school or postsecondary setting, provide opportunities for students to earn higher wages than high school graduates – or even some postsecondary degree holders. Georgetown University’s Center on Education and the Workforce, for example, finds that 43 percent of workers with CTE certificates or licenses earn more than associate degree holders and 27 percent will earn more than bachelor’s degree graduates. Additionally, among CTE-related associate degree graduates, 31 percent will earn more than graduates with a bachelor’s degree. According to the Urban Institute’s findings, apprenticeships increase earnings by 15 percent or more in the short term. In the long term, the Urban Institute finds that six years after starting a program, apprenticeship participants are likely to earn approximately 140 percent more than their peers who graduated high school without apprenticeship training.

In addition to efforts made to quantify the value of vocational education nationwide, many states have undertaken more detailed efforts of their own. The Workforce Training and Education Coordinating Board of Washington State, which conducted an employer survey in 2014, and found, among secondary CTE students, gains in post-graduation earnings are sizably
enhanced, even outweighing the public costs of funding such programs. For example, the survey found that during the first two-and-a-half years of employment, the average CTE graduate will earn $5,143 more than individuals who exited high school without completing a CTE program. That gain, extended and multiplied over the course of an average working life to age 65, increases to approximately $71,000 in earnings and $9,300 in employee benefits. These benefits, when compared to the average taxpayer cost for each CTE student of $921 over the course of their CTE enrollment, demonstrates that the gains in both earnings and employee benefits that secondary CTE students receive outweigh their public costs.

Similarly, the Center for Analysis of Postsecondary Education and Employment (CAPSEE) conducted a case study of California community colleges in 2015 to estimate average income returns from postsecondary CTE programs throughout the state. Examining data provided by the entire California Community Colleges system from 1992 to 2012, CAPSEE discovered that income returns generally increase as the length of program increases. A career/technical certificate of 6-18 academic credits generated an average 12 percent income increase; 18-30 credit programs an average of 14 percent; 30-60 credits an average of 20 percent, and an associate’s degree an average income growth of 29 percent. While the length of training generally corresponds with income improvement, such correlation is not monolithic. For example, short-term health services training has led to an approximately 14 percent increase in income growth, but completion of certificates requiring 30 or more academic credits led to an average 35 percent income increase. Short-term certificates in legal and protective services,
on the other hand, increase incomes by 26 percent, yet longer-term programs in that sector provide diminishing returns.43

But in what economic sectors and industries can opportunities for a CTE graduate or apprentice be found? Some of the best chances to put a CTE or apprenticeship experience to work exist in sectors demanding constant innovation and technological advances. Despite popular opinion, the domestic manufacturing sector is still abound with employment opportunities of this nature. Between 2009 and 2011, the U.S. manufacturing sector grew by 7.7 percent annually to $5.4 trillion.44 According to the Bureau of Labor Statistics, the number of available positions in manufacturing positions as of September 2016 is at its highest level in fifteen years.45 According to a 2014 Accenture study, over half of U.S. companies intend to increase their domestic manufacturing production by at least 5 percent through the next five years, with another half of those companies intending to increase production by at least 10 percent.46 Major multinational manufacturers, such as Lenovo, Caterpillar, and General Electric, have recently invested in new manufacturing facilities in North Carolina, Georgia, Kentucky, Indiana, and Alabama, and continue to expand in the coming years.47

While manufacturing has increased productivity through automation, there is still a need for highly- or semi-skilled workers who require years of training to adequately perform the role for which they are hired. Consider the welding industry, for example. Beyond refining the art of welding itself, prospective welders must also become versed in 60 credit hours’ worth of “basic trigonometry, geometry, metallurgy and blueprint reading” in order to command the $40,000-70,000 annual salary characteristic for skilled welders.48 Opportunities for manufacturing employment growth, however, have been met with a severe shortage in filling skilled manufacturing roles. According to Accenture, 80 percent of manufacturing employers, for example, report a need for employees that are skilled (candidates with an associate’s degree or 12-24 months of training/experience) or highly skilled (candidates with a bachelor’s degree or 36+ months of training or experience).49 Additionally, over 75 percent of manufacturing employers find a “moderate to severe shortage of skilled resources,” while 80 percent report a “moderate to severe shortage in highly skilled manufacturing resources.”50

Constant innovation and technological advances also require infrastructure workers to keep up-to-date on the latest developments and trends. Like manufacturing, careers in infrastructure and construction can provide many opportunities, as approximately 11 percent of the U.S. workforce is employed in the sector and open positions are projected to grow by 9.1 percent over the coming decade.51 Also like the manufacturing industry, infrastructure occupations can offer above-market wages. According to a 2014 survey by the Brookings Institute, while infrastructure wages may vary widely based on sector and training, infrastructure occupations on average pay 30 percent more to workers at the bottom half of the income scale, many of
whom include workers with high school diplomas or less. Unlike manufacturing careers, however, educational barriers to beginning an infrastructure career are low, as only 12 percent of workers hold a bachelor’s degree or higher. Rather, experience is accumulated through on-the-job training and competitive wages are paid for the work received – much like an apprenticeship program.

Defining what jobs fall into the wide-spanning infrastructure sector, however, requires a detailed and nuanced examination. Infrastructure jobs encompass not only construction, but also operation, design, and governance. Workers who engage in infrastructure careers use a wider range of equipment and technologies across a broad spectrum compared to the average American worker’s experiences. The Brookings Institute identified 11 content areas that many infrastructure workers must master in varying degrees: mechanics, public safety and security, transportation, engineering and technology, law and government, design, physics, building and construction, geography, chemistry, and telecommunications. For example, 92.3% and 71.4% of workers employed in infrastructure required above-average knowledge of transportation and public safety, respectively. To compare, only 20.1% of infrastructure workers must possess above-average levels of chemistry, and a mere 29.7% require similar levels of knowledge about law and government. Brookings then used these 11 content areas to create composite “infrastructure knowledge” scores for each occupation within the infrastructure sector. According to Brookings, employees working in the 25 occupations with the highest infrastructure knowledge skills commanded higher annual wages than the national average.

Incorporating more apprenticeships into both private and public sector infrastructure projects would provide a timely opportunity to build careers in this diverse, yet underfunded sector of the economy. Since the Great Depression, countless policymakers have called for greater public and private sector infrastructure investment in order to spur domestic job growth. Brookings continues this advocacy, calling on local, state, and regional leaders in both the public and private sectors to “highlight the variety of long-term employment opportunities available to prospective workers and create clearer pathways for training and recruitment.” Additionally, Brookings calls for state and local governments to partner with local community colleges and other agencies in order to promote information regarding infrastructure careers, along with the training and opportunity to succeed.

Economic Opportunities for Employers
One advantage of a CTE or apprenticeship experience is that they allow students not only to enter the workforce, but also to contribute to regional industries and employers facing a shortage of talented, experienced employees. As of August 2016, 5.9 million job openings await workers with the specialized, job-specific knowledge necessary to fill them. As these positions continue to remain unfilled, employers requiring more skilled labor expect to face serious
impediments in meeting their business demand, according to Manpower’s 2015 U.S. Talent Shortage Survey. Among these employers, 43 percent expect a diminished ability to serve their clients and 41 percent report decreased productivity and competitiveness. Additionally, 32 percent of employers share concerns that their skilled labor shortage will contribute to higher compensation costs, lower employee morale, and increasing employee turnover.

For many manufacturing firms, the sector most strongly hit by the skills shortage gap, expectations have become reality. According to Accenture’s 2014 study, the emerging manufacturing skills gap is costing domestic manufacturers nearly 11 percent of annual earnings in increasing costs of production and revenue losses. Specifically, 72 percent of manufacturers with a skilled employee shortage reported a five percent minimum increase in overtime costs, with 32 percent noting overtime cost increases of 10 percent or more. 66 percent of manufacturers reported an over five percent increase in production cycle time, and 62 percent of manufacturers asserted a minimum five percent increase in production downtime. The average employer surveyed also reported a 12 percent increase in employment overtime costs. In order to alleviate the manufacturing skills gap and maintain employee productivity, Accenture recommends that employers develop a “talent supply chain” with the requisite growth-building skills and experiences, as well as create incentives to retain skilled employees over time.

For some employers, a simple job posting will not suffice; rather, investment in cultivating talent is required in order to avoid losses and shortfalls. Among employers hiring CTE graduates, an overwhelming majority feel as though their sponsorships have enabled them to overcome many of the challenges and shortfalls addressed in both Manpower’s and Accenture’s employer surveys. According to a 2011 employer survey by Washington State’s Workforce Training and Education Coordinating Board, an overwhelming majority of employers in the state were either “very satisfied” or “somewhat satisfied” with both the job-specific and professional skills their new employees who recently completed a CTE program demonstrated on the job. Specifically, 94 percent of employers were satisfied with their employees’ overall work quality, and 93 percent with their overall productivity. 92 percent of employers expressed approval of their employees’ teamwork and communications skills, 91 percent with their employees’ job-specific skills, 87 percent with their employees’ adaptability to change, 84 percent with their employees’ work habits, and 82 percent with their employees’ problem-solving skills.

Employers who serve as sponsors of registered apprentices feel very much the same. According to the Urban Institute’s 2007 Survey of Apprenticeship Sponsors, employers sponsoring apprenticeships tend to be extremely supportive of the registered apprenticeship scheme.
When asked if they would recommend sponsorship to other employers, approximately 97 percent indicated they would (specifically, 86 percent would “strongly recommend” the program and 11 percent would recommend it “with reservations”). Nearly 97 percent of employers also indicated their apprenticeship programs help them meet their demand for skilled workers, with 83 percent considering this a “very important benefit.” In addition, among sponsors, 90 percent claim apprenticeships assist with employee recruitment and retention, 95 percent believe apprentices add to “productivity or high quality of services,” 94 percent assert apprenticeships increase worker morale and pride, and 92 percent noted apprenticeships lead to fewer on-site safety problems.

While few surveys documenting a specific monetary return to employers from apprenticeship programs have been conducted in the United States, results from countries with more comprehensive apprenticeship schemes quantify very positive returns. In the United Kingdom, an apprenticeship increases an employer’s economic output by approximately $366 per week. Additionally, over 40 percent of British apprenticeship sponsors found that such programs helped them gain new business. In Switzerland, employers earn $300 million annually from the output of apprentices who are training on the job. Finally, a 2009 Canadian study found that every $1 of investment in an apprenticeship program can generate $1.47 in return for employers of all sizes and in all provinces. It stands to reason that domestic employers can and should similarly benefit from a more comprehensive approach to apprenticeship funding.

Institutional Challenges: Reengaging CTE Stakeholders

With soaring employment in fast-growing occupations with above-market salaries, it stands to reason that CTE and apprenticeships would pique the interests of students, parents, educators, employers, and policymakers alike. Throughout Western Europe, apprenticeship positions are expanding and flourishing; however, less than one percent of the U.S. workforce is involved in any type of apprenticeship program. Additionally, from 1990 to 2009, the overall number of CTE credits earned by American high school students decreased from 4.2 to 3.6, while the average credit load in all other subject areas increased. By occupation area, high school student enrollment in repair and transportation courses shrank 2 percent, engineering technology by 3 percent, computer and information technology by 4 percent, manufacturing by 10 percent, and business by 19 percent.

With such optimistic outcomes in income growth and career development among CTE graduates and apprentices, why isn’t there more interest and investment in vocational education programs? There are many reasons. Parents, employers, educators, and guidance counselors alike face unique barriers to ensuring that students who are interested receive high-quality vocational and technical training. Employers, for example, do not always know the appropriate resource to develop partnerships and work-based placements at a given school.
Educators face a general lack of vocational and technical teaching certificate programs at colleges of education. Understaffed guidance counselors, dealing with the realities of an average 470:1 student-to-counselor ratio across public high schools as of 2013, have neither the resources nor time to comprehend and dispense all the available CTE options for prospective students. Parents and students alike face a social stigma linking vocational education and apprenticeships to low-growth, distinctively “blue collar” professions. Policymakers face diminished interest in funding vocational education and apprenticeships by federal, state, and local lawmakers and public officials. Despite the promise CTE and apprenticeship programs offer, all participants in the process must overcome a number of hurdles in order to maximize the reach of such programs nationally.

Promoting Employer Connections and Partnerships

As many state and local governments struggle to meet the increasing demand of CTE and apprenticeship programs, organizations like the National Association of State Directors of Career Technical Education (NASDCTE) call for new partnerships between educators and employers to bridge the gap and keep such programs vital to local and regional economies. Employers can play extremely valuable advising roles to CTE programs by using their industry expertise to keep CTE program curricula current and innovative. Additionally, any workplace exposure employers can provide to CTE students or apprentices enables them to understand the applicability of academic content to work-based settings. Yet, many employers, community colleges, and CTE programs find it daunting to identify partners to form the consortia necessary to deliver a strong, comprehensive vocational education experience.

One prominent hesitation impeding employers from greater engagement with CTE and apprenticeship programs concerns retention – both during and after the completion of training. Specifically, many employers share reservations about investing upfront in an apprentice who might not complete the program as specified, or an apprentice who is poached by a competitor in the industry. In their 2007 Survey of Apprenticeship Sponsors, the Urban Institute examined common hesitations that potential sponsors have about apprenticeships internships and asked then-current sponsors to indicate if each was a problem, and if so, whether the problem was significant or minor. A healthy majority of employers did not consider the cost of instruction, the potential use of experienced workers’ time, or program management to be a problem. Despite employer concerns about apprentices being poached by competitors, only one in four sponsors considered this prospect a “significant problem,” and among these firms, 85 percent still recommended apprenticeships to interested sponsors.

While a slim majority of sponsors expressed hesitation on potential apprenticeship dropouts, apprenticeship completion rates paint a heartening picture. According to the Survey, nearly 44 percent of registered apprenticeship sponsored estimated a 90-100 percent completion rate.
among their apprentices, 54 percent of sponsors indicated a completion rate above 80 percent, and 71 percent report a completion rate above 50 percent.\textsuperscript{81} When asked whether they would recommend an apprenticeship sponsorship to others, 97 percent of employers said they would – among sponsors of programs operating for over ten years, that number increases to 99 percent.\textsuperscript{82} Despite hesitations about completion rates, employers widely recognize the value that a successful apprenticeship experience can bring to both employee and employer.

**Careers of Last Resort: Overcoming Social Barriers and Biases**

CTE and apprenticeship programs, and many students who utilize them, often face two challenging social barriers: professional stigma and popular misconceptions around workforce demands. Simply put, many parents and students regrettably see CTE programs not as a viable career choice, but rather a program of last resort. According to the Washington Post, a multi-decade national orientation toward professional, white-collar employment to the detriment of vocational/technical careers has generated an inaccurate socioeconomic bifurcation of the two.\textsuperscript{83} For example, today’s parents might still recall the unfortunate historical image of underperforming students being diverted into vocational coursework that unsuccessfully prepared them for postsecondary educational opportunities. But in countries more encouraging toward vocational education, such as Finland, 45 percent of students select a technical track over an academic one after completing their basic education.\textsuperscript{84} The Northwest Professional Educators (NWPE) affirms this notion, adding that public misconception about the long-term social mobility of technical professions in a globalized economy exacerbates the current lack of supply found in these fields.\textsuperscript{85}

These popular, yet outmoded conceptions of technical and manufacturing positions are being combatted by successful technical programs proving CTE and apprenticeship experiences are viable and rewarding career choices, such as the City Arts and Technology High in San Francisco, CA, and the Valley Vocational Technical Center in Fisherville, GA.\textsuperscript{86} These two institutes thrive by integrating technical, on-the-job training in various careers with traditional daily academic schedules. Implementation and expansion of similar programs on a regional level throughout the nation can generate greater public awareness about the value and demand for technical skills in today’s globalized economy. The extinction of these historical stigmas and misinformation will encourage students to meet the demands of a global economy by pursuing apprenticeships and vocational education as part of a non-traditional path to a four-year degree or an alternative to a four-year degree altogether.

**Bridging the Skills Gap: CTE and the Science, Technology, Engineering & Math (STEM) Challenge**

Beyond finding ways to attract students to today’s CTE programs, stakeholders must also draw their attention toward preparing tomorrow’s professionals. According to Georgetown University’s Center on Education and the Workforce, approximately 76 million older workers
will retire by 2020, yet only 51 million younger workers are available and qualified to fill those positions, creating a possible workforce deficit of nearly 25 million positions. To compound labor market difficulties, approximately 26 million jobs – or 20 percent of the labor force – requires a “high level of knowledge” in science, technological, engineering, or mathematical (STEM) fields. Additionally, STEM occupations have doubled as a share of the U.S. labor market relative to all other professions, from approximately 10 percent in 1850 to 20 percent in 2010. As a result, a general labor mismatch across the workforce as a whole risks exacerbation within exclusively STEM-focused occupations.

Insufficient emphasis on STEM-centric learning additionally threatens the global competitiveness of the U.S. workforce. According to findings in the 2012 report of the OECD’s Program for International Student Assessment, the United States is ranked 27th in science and 35th in mathematics performance. The Pew Research Center’s 2015 survey of scientists affiliated with the American Association for the Advancement of Science (AAAS) also found that only 16 percent ranked domestic K-12 STEM education programs as above average or best in the world, while 46 percent identify K-12 STEM as below average. Finally, the threat of global competition creates additional cause for concern, as China is projected to graduate 200 million students from college in 2030 – a number outpacing the entirety of the U.S. labor market.

In order to correct domestic workforce deficits, as well as remain internationally competitive, a national strategy to increase student interest and achievement in STEM fields is not just beneficial, but essential. One element of any such strategy must acknowledge that much of the recent STEM innovations are owed, at least in part, to high-quality CTE programs. According to the Brookings Institute, nearly half of all STEM professions are within reach for workers who do not possess a bachelor’s degree. Additionally, these jobs pay an average of $53,000, which is 10 percent more than jobs in other industries with similar educational prerequisites. These positions include but are not limited to: installation, maintenance and repair, construction, production, protective services, transportation, building and grounds cleaning and maintenance, healthcare support, personal care, and food preparation. The Association for Career & Technical Educators (ACTE), which divides the entire labor market into sixteen different clusters, identifies similar opportunities for CTE graduates with a STEM education across six clusters: Agriculture, Food, and Natural Resources; Health Science; Information Technology; Manufacturing; Science, Technology and Mathematics; and Transportation, Distribution and Logistics.

While entry into STEM professions does not necessarily require a bachelor’s or postgraduate degree, nearly every STEM-centric occupation demands at least some form of postsecondary training – in many cases, CTE experiences. Many CTE programs incorporate a scientific, mathematical, or technological core. For example, many surgical technology degrees require
coursework in pharmacology, anatomy and physiology, as well as microbiology.\textsuperscript{97} Computer information systems degrees often require coursework in data analysis and programming, and physical therapy assistant degrees require mastery of kinesiology.\textsuperscript{98} Finally, CTE programs and apprenticeships offer mentorship and work-based learning opportunities to provide students the chance to apply the STEM concepts learned in the classroom to real world circumstances.

Public and private organizations alike note that when CTE’s focus on real-world implications is applied to STEM course contents, students benefit both academically and professionally. In 2008, Virginia Governor Tim Kaine established the Governor’s Career and Technical Academies program, which partners schools, employers, and colleges to provide a STEM education coupled with career counseling.\textsuperscript{99} More recently, the National Research Center for CTE’s “Math in CTE” project, which employs both math and CTE teachers to create curricula that draw on both disciplines, has contributed to improved test scores and positive development in student learning outcomes.\textsuperscript{100} Additionally, the STEM Transitions Initiative, funded by the U.S. Department of Education, created 61 different curricula aligning academic content with CTE applications.\textsuperscript{101} Finally, Ford Motor Company’s Partnership for Advanced Studies has developed curriculum modules to help students apply math and science to practical job skills, such as financial planning, developing business plans, and using statistics for quality control.\textsuperscript{102}

Experts in every sphere of public life, including business leaders, educators, public officials, and policy advocates, acknowledge the importance of STEM expertise in driving the technological innovation required to spur economic growth. From President George W. Bush’s 2006 American Competitiveness Initiative to President Obama’s 2012 “Educate to Innovate” campaign, leaders on every side of the political spectrum clearly realize the importance of STEM education.\textsuperscript{103} While laudatory, the growing national emphasis on STEM education cannot exclude CTE and apprenticeship programs from the conversation, as both play a demonstrably valuable role in supplying trained, knowledgeable workers for middle-level STEM occupations. Yet policymakers have, at times, done just that. CTE stakeholders should aim to support STEM workers whose experience falls in between a high school diploma and a college degree and utilize the opportunities this workforce brings to enhance and enrich today’s labor market.

Reinvesting in Vocational Education

As CTE and apprenticeship programs have become more successful in serving as ladders to the middle class, some policymakers have started to reexamine their funding commitments. In June 2016, for example, the U.S. Department of Labor announced a $90 million investment to expand access to registered apprenticeship programs initiatives through ApprenticeshipUSA.\textsuperscript{104} This investment includes $50.5 million to fund 33 grants in varying amounts ranging from $700,000 to $3.2 million to help better align apprenticeship programs with state and regional
workforce structures.\textsuperscript{105} The funds are just part of the Obama administration’s broader apprenticeship funding initiative, which includes $175 million in apprenticeship investments in 2015, to counter somewhat lackluster funding in years past.\textsuperscript{106} Despite the substantial benefits that accompany an apprenticeship experience, the federal government’s annual support for such programs stood at less than $30 million as of 2010.\textsuperscript{107} Declining apprenticeship funding contributed to diminishing apprenticeship numbers, from a peak of nearly 489,000 in 2003 to a low of approximately 376,000 in 2011.\textsuperscript{108} Since federal apprenticeship funding has increased in 2014, the United States has added over 75,000 new apprenticeships from a decade low of 447,000 in that exact same timeframe.\textsuperscript{109}

The State of Apprenticeships, 2010-2015

\begin{center}
\textbf{Pennsylvania Apprenticeship Data, 2010-2015}
\end{center}

\begin{table}[h]
\begin{tabular}{|c|ccc|c|}
\hline
\hline
Active Apprentices & 11,938 & 15,547 & 14,569 & 12,487 & 4.6\%
New Apprentices & 2,656 & 3,783 & 3,667 & 4,332 & 63.1\%
Active Apprenticeship Programs & 881 & 933 & 873 & 762 & -13.5\%
New Apprenticeship Programs & 59 & 54 & 64 & 38 & -64.4\%
Completed Apprenticeships & - & 2,868 & 1,890 & 1,438 & -49.9\%
\hline
\end{tabular}
\end{table}

\textit{Source: U.S. Department of Labor}

Funding available for CTE programs is far less straightforward and a lot more fragmented across multiple programs with different application criteria. Overall, federal CTE funding through the Perkins Act consists of less than two percent of total U.S. Department of Education spending, yet affects over 14 million vocational/technical students nationwide.\textsuperscript{110} Since 2003, Perkins Act federal funding has diminished by approximately $188 million, a decrease exacerbated by the elimination of Tech Prep funding.\textsuperscript{111} In 2011, Perkins Act funding was slashed by another $140.2
million, leaving total appropriations at approximately $1.1 billion.\textsuperscript{112} On the state level, secondary vocational/technical training has only been maintained, and postsecondary training has decreased in half of all states.

Career and Technical Centers (CTCs) are funded primarily from a composite of federal, state, and local governments. Approximately five percent of a given CTC’s budget derives from federal funding through the Perkins Act, roughly 10 percent derives from State Career and Technical Education Subsidies, and over 85 percent comes from payments made by the school district of each CTC.\textsuperscript{113} In FY2016, Pennsylvania received $40,722,778 from the Perkins Basic State Grant, an amount unchanged from FY2015.\textsuperscript{114} The Pennsylvania Department of Education is then responsible for allocating Perkins funding based on the number of students between the ages of 5 and 17 who live within a local education agency’s (LEA) borders and also live in poverty.\textsuperscript{115} Postsecondary CTC funding is dispersed proportionate to the total number of students receiving Pell Grants or Bureau of Indian Affairs aid.\textsuperscript{116} Overall, Pennsylvania state funding for career and technical education has decreased slightly in real terms during the last ten fiscal years. In FY2007-2008, for example, career and technical education received $62,961,000 in budgetary support, comprising just 0.634 percent of the commonwealth’s K-12 education budget.\textsuperscript{117} Aside from a CTE Equipment Grant of $3 million added to the commonwealth education budget in FY2012-2013, basic CTE funding leveled at $62 million in FY2009-2010, where it remains to this day.\textsuperscript{118} In Governor Wolf’s 2016-2017 budget proposal, basic CTE funding now comprises just 0.552 percent of all K-12 spending.

In funding its secondary CTE programs, Pennsylvania utilizes a categorical funding model, providing a dedicated stream of funding for CTCs allocated to LEAs and postsecondary institutes to sustain career and technical education. Funding is dispersed through the Secondary Career and Technical Education Subsidy (SCTES), which provides a supplementary weight to student average daily membership for the purposes of CTE funding formulas.\textsuperscript{119} Under the category funding formula, estimated statewide 2016-2017 SCTES allocations stand at approximately $49,639,000.\textsuperscript{120} SCTES allocation in 2015-2016 for the CTC of Lackawanna County, which covers twelve school districts, totaled $471,182.64, with a projected decrease to $460,593 in 2016-2017.\textsuperscript{121} SCTES funding for Wilkes-Barre Area CTC, which covers ten school districts, totaled $637,375.41 in 2015-2016 with a projected decrease to $618,963 in 2016-2017.\textsuperscript{122} The overwhelming majority of a CTC’s funding, however, is comprised of payments made by its member school districts. For example, out of the CTC of Lackawanna County’s approximately $6.4 million in 2015-2016 revenues, nearly $4.5 million comes from local sources, roughly $1.1 million is derived from state support, and approximately $0.9 million from federal resources.\textsuperscript{123} Of its local revenue, approximately $4.2 million comes from payments provided by member
school districts, and only $79,000 from tuition. Vocational education expenses total approximately $2.9 million, including nearly $0.725 million for adult education.

For its postsecondary CTE programs, Pennsylvania distributes funding based on the total number of full-time equivalent students enrolled in the institution. Commonwealth CTE funding is allocated through the Economic Development Stipend, which is determined based on a given institution’s pro rata share of the state’s total full-time equivalent student CTE enrollment. The Economic Development Stipend weighs these allocations based on the CTE program’s cost, priority, or both. Programs considered “high cost” have expenses over 130 percent of community college course costs, based on “personnel, instructional supplies, and academic/instructional equipment.” “High priority” programs offer students opportunities to prepare for in-demand careers as determined by the state departments of Labor and Industry and Education. Programs considered to meet both metrics receive the highest formula weight: 1.5 times the state’s per full-time equivalent student allocation. Programs achieving just one metric receive a diminished weight, and noncredit courses in “high priority” industries are given the smallest weight. As a result, the Economic Development Stipend enables the commonwealth to allocate funding to CTE programs most aligned with statewide economic development priorities, but require high operating costs to do so.

Despite the maze of federal and state programs students interested in pursuing vocational education face, statewide initiatives exist to steer prospective students toward a relevant academic program. One such example is SOAR (Students Occupationally and Academically Ready), a program of study supported by the Pennsylvania Department of Education. SOAR is designed to help CTE students match their high school coursework to a regional college program to help them complete a degree or certificate program. Specifically, SOAR articulates the skills acquired through a secondary CTE course to course credit earned in a postsecondary academic program. As a result, SOAR can help students who are awarded SOAR credits save money on tuition costs, shorten the amount of time spent in college, steer them toward a career-ready educational track, and enter the workforce prepared. From 2010 to 2015, the number of SOAR-approved programs has increased from 256 to over 1500, and the number of secondary and postsecondary partnerships from 75 to 403 in the same period. Finally, the SOAR program is partners with a number of regional institutes, including Lackawanna College, Luzerne County Community College, and Wilkes-Barre Area CTC’s Practical Nursing Program.

Although the cost of expanding CTE and apprenticeship programs might be considered daunting, the Urban Institute finds that the cost of expansion would be tame when compared to the $37 billion spent on Pell grants to attend college. In return, as observed in several Western European nations by the OECD, expanded CTE and apprenticeship programs have the
ability to suppress rising youth unemployment rates as they are considered a more mainstream pathway to career development than in the United States. For example, the Urban Institute estimates that every taxpayer dollar spent on apprenticeships can generate nearly $28 in social benefits.\textsuperscript{136} By enabling workers who are generally considered unskilled to learn the exact, most recent demands of employers, both CTE and apprenticeship programs clearly provide opportunities for meaningful social mobility. Increased government funding directed towards them would give people access to programs that provide broader employment opportunities, increase their skillset, support their productivity, and increase overall earnings.

A Tale of Two Americas: The Educational Divide

In the coming decade, high school graduates – whether nationally, statewide, or regionally – risk falling through the cracks of a job market bifurcated by educational prerequisites. From 2012 to 2022, total employment in the U.S. economy is projected to grow to 161 million, or roughly 11 percent, and add approximately 15.6 million jobs.\textsuperscript{137} But according to the Bureau of Labor Statistics (BLS), occupations requiring some form of postsecondary education for entry in 2022 will sizably outpace gains made by jobs requiring only a high school education or less. While industries requiring a master’s degree for entry are projected to increase the fastest, by 18 percent, industries requiring either an associate’s degree or a postsecondary non-degree award, such as a certificate or diploma, are projected to grow more rapidly than careers available to bachelor’s degree graduates and high school graduates or less.\textsuperscript{138} While positions for workers without a high school degree will outpace demand for high school graduates, many of these jobs will earn under median wage levels and offer very little, if any, opportunity for advancement, such as personal care and home health aides.\textsuperscript{139} Additionally, according to the Bureau of Labor Statistics, only 50% of workers with a high school diploma or less made more than $27,670; while workers with “at least some college” at the 50\textsuperscript{th} percentile made more than $57,770, an amount higher than the 90\textsuperscript{th} percentile of high school graduate workers.\textsuperscript{140}

| Employment by Educational Requirement, 2012-2022 (employment in thousands) |
|-------------------------------------------------|-------------------|-------------------|
| **Education Level**                             | **Employment**    | **% Change, 2012-2022** |
|                                                 | **2012**          | **2022**          | **Number** | **Percent** |
| Doctoral/professional degree                    | 4,002.4           | 4,640.8           | 638.4      | 16.0%       |
| Master’s degree                                 | 2,432.2           | 2,880.7           | 448.5      | 18.4%       |
| Bachelor’s degree                               | 26,033.0          | 29,176.7          | 3,143.6    | 12.1%       |
| Associate’s degree                              | 5,954.9           | 7,000.9           | 1,046.0    | 17.6%       |
| Postsecondary non-degree award                  | 8,554.2           | 9,891.2           | 1,337.1    | 15.6%       |
| Some college, no degree                         | 1,987.2           | 2,212.2           | 225.0      | 11.3%       |
| High school diploma (incl. equivalency)         | 58,264.4          | 62,895.2          | 4,630.8    | 7.9%        |
| Less than high school                           | 38,127.6          | 42,286.0          | 4,158.4    | 10.9%       |

Source: U.S. Bureau of Labor Statistics
A Study on Vocational Education and its Role in science, technology, engineering and Math (STEM)

Georgetown University’s Center on Education and the Workforce, which examines similar trends on a state level, finds a very similar trend in Pennsylvania. According to the Center’s findings, approximately 57 percent of all jobs in Pennsylvania will require at least some postsecondary education or training by 2018.\textsuperscript{141} Of the projected 1.8 million Pennsylvania job vacancies between 2008 and 2018, approximately 1 million will be for those with postsecondary training, 676,000 for high school graduates, and 139,000 for high school dropouts.\textsuperscript{142} Additionally, during this period, new jobs requiring postsecondary education will grow by 181,000, while jobs for high school graduates will grow by only 10,000.\textsuperscript{143} In sum, the trends presented by Georgetown’s findings clearly confirm the inequality of economic opportunity demonstrated by national trends, proving that Pennsylvania high school graduates not equipped with the skills to thrive in today’s workforce face a sizable risk of being locked out of the middle class.

As national and statewide labor market changes evolve to benefit the better educated, many stand to benefit. As of 2015, 32.5 percent of people in the United States age 25 and over has a bachelor’s degree or higher.\textsuperscript{144} Among younger workers aged 25 to 29, postsecondary education attainment rates are even higher, as the percentage who had completed a bachelor’s or higher degree stands at 36 percent.\textsuperscript{145} When associate’s degree holders aged 25 to 29 are included, the number expands to 46 percent.\textsuperscript{146} State and regional education attainment levels are no exception. In Pennsylvania, the proportion of people holding a bachelor’s degree has increased from 22.4 percent in 2000 to 29 percent in 2014.\textsuperscript{147} While the percentage of adults earning a bachelor’s degree or higher is lower in Lackawanna and Luzerne counties than Pennsylvania as a whole, a similar leap in higher education participation has been documented. In Lackawanna County, the proportion has increased from 19.6 percent to 25.7 percent in the same time frame, with Luzerne County increasing from 16.4 to 21.4 percent.\textsuperscript{148} In 2014 alone, approximately 9,000 degrees were awarded in just Lackawanna and Luzerne counties – a testament to the impressive ability of
Northeastern Pennsylvania’s institutions of higher education to equip their students for a 21st century workforce over the last decade.\(^{149}\)

For young high school graduates entering the workforce with no credentials, the picture is much bleaker. In May 2016, the Brookings Institute compiled data across every metropolitan statistical area (MSA) on “disconnected youth”: young people between the ages of 16 and 24 who are neither working nor in school.\(^{150}\) This cohort of young adults, by their alienation from formative educational and employment experiences, face increased risks of “long-term unemployment, poverty, criminal behavior, substance abuse, and incarceration.”\(^{151}\) Brookings divided the data they compiled into two categories: teens aged 16 to 19 and young adults aged 20 to 24. Because the rate of 16 to 19 year olds is far lower due to school enrollment, the measurement of young adults aged 20 to 24 is considered to be far more telling of regional socioeconomic health. In the Scranton-Wilkes-Barre-Hazleton MSA, 9.8 percent of young adults aged 20 to 24 are considered “disconnected” as of 2014.\(^{152}\) This figure falls roughly in line with the national average of 9.9 percent and is lower than Philadelphia’s 12.8 percent, but still is higher than New York’s 8.2 percent and Chicago’s 9.3 percent.\(^{153}\) Nationally, these “disconnected youth” constitute an 8.5 percentage drop in the labor participation of 18 to 24 year olds since 2000, leaving participation in that cohort at a total of 35 percent.\(^{154}\)

| Vocational Education as Percentage of Instruction Expenses (Excluding CTCs), 2015 |
|-------------------------------------------------|---------|----------------|----------------|
| **School District**                             | **Total Instruction Expenses** | **Vocational Education Expenses** | **Share of Vocational Education Among Total Expenses** |
| Pennsylvania Average                            | $17,217,980,991.97 | $318,163,788.60 | 1.85%           |
| Lackawanna County Average                       | $244,294,131.01  | $8,389,387.72   | 3.43%           |
| Luzerne County Average                          | $360,919,671.87  | $18,609,544.24  | 5.16%           |
| **Source:** PA Department of Education          |                     |                 |                 |

| Per Pupil Education Expenses, 2015              |
|-------------------------------------------------|---------|----------------|----------------|
| **School Districts**                            | **Total Expenditure** | **Participating Students** | **Per Pupil Education Expenses** |
| CTC of Lackawanna County                        | $5,939,443.00  | 665              | $8,931.49        |
| Wilkes-Barre Area CTC                           | $15,883,803.26 | 2,268            | $7,003.44        |
| West Side CTC                                   |                     |                 |                 |
| **Source:** PA Department of Education          |                     |                 |                 |

*Hazleton CTC data is not included in this PDE dataset.*

For educators, employers and policymakers, one way to stem the rising tide of disconnected youth through the region is to invest in a high-quality vocational education program that absorbs workers economically alienated from the workforce. The per pupil cost of a CTC
education is included in the school districts total cost per pupil. The cost per CTC pupil is relatively high in that it is only a half day program for a smaller percentage of students. Despite greater investment in vocational education than the state average, regional secondary and postsecondary CTE enrollment figures fall on both sides of the Pennsylvania average. According to the Institute’s own 2016 Indicators Report, there are approximately 3,000 students enrolled in Lackawanna and Luzerne counties’ respective career and technology centers, with the Hazleton Area, Wilkes-Barre Area, Wyoming Valley West, and Scranton school districts sending the largest number of students. CTC enrollment represents nine percent of Lackawanna County’s grades 9 through 12 enrollment, and 16 percent for Luzerne County.

<table>
<thead>
<tr>
<th>Sending District</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abington Heights</td>
<td>33</td>
<td>3.2%</td>
</tr>
<tr>
<td>Carbondale Area</td>
<td>47</td>
<td>10.2%</td>
</tr>
<tr>
<td>Dunmore</td>
<td>44</td>
<td>8.8%</td>
</tr>
<tr>
<td>Lakeland</td>
<td>53</td>
<td>11.2%</td>
</tr>
<tr>
<td>Mid Valley</td>
<td>62</td>
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</tr>
<tr>
<td>North Pocono</td>
<td>85</td>
<td>8.7%</td>
</tr>
<tr>
<td>Old Forge</td>
<td>52</td>
<td>17.4%</td>
</tr>
<tr>
<td>Riverside</td>
<td>63</td>
<td>13.3%</td>
</tr>
<tr>
<td>Scranton</td>
<td>244</td>
<td>8.5%</td>
</tr>
<tr>
<td>Valley View</td>
<td>79</td>
<td>10.1%</td>
</tr>
<tr>
<td><strong>County Total</strong></td>
<td><strong>762</strong></td>
<td><strong>9.0%</strong></td>
</tr>
</tbody>
</table>

Source: PA Department of Education

<table>
<thead>
<tr>
<th>Sending District</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crestwood</td>
<td>87</td>
<td>9.5%</td>
</tr>
<tr>
<td>Dallas</td>
<td>44</td>
<td>5.0%</td>
</tr>
<tr>
<td>Greater Nanticoke Area</td>
<td>93</td>
<td>13.1%</td>
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<tr>
<td>Hanover Area</td>
<td>143</td>
<td>24.3%</td>
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<tr>
<td>Hazleton Area</td>
<td>758</td>
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<tr>
<td>Lake-Lehman</td>
<td>44</td>
<td>7.3%</td>
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<tr>
<td>Northwest Area</td>
<td>55</td>
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<tr>
<td>Pittston Area</td>
<td>125</td>
<td>12.4%</td>
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<tr>
<td>Wilkes-Barre Area</td>
<td>409</td>
<td>19.2%</td>
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<tr>
<td>Wyoming Area</td>
<td>62</td>
<td>8.2%</td>
</tr>
<tr>
<td>Wyoming Valley West</td>
<td>340</td>
<td>27.6%</td>
</tr>
<tr>
<td><strong>County Total</strong></td>
<td><strong>2,160</strong></td>
<td><strong>16.0%</strong></td>
</tr>
</tbody>
</table>

Source: PA Department of Education

Lackawanna and Luzerne counties exceed Pennsylvania’s average percentage of associate’s degree holders among individuals age 25 years and over. While there is no available data identifying what programs these students are or were enrolled in, the vast majority of associate degree programs across the region focus on CTE-centric sectors of the economy, such as physical therapy, energy extraction, surgical technology, and others. Overall, Northeastern Pennsylvania’s secondary and postsecondary programs in vocational education remain a vital asset in cultivating a skilled regional workforce. (A list of regional CTCs and associate degree programs, along with the CTE-centric programs they offer, have been provided in the Resources section at the end of this report.)

The Path Forward: Regional Opportunities for CTE Students and Apprentices

For young workers armed only with a high school degree and no CTE background or apprenticeship, the prospect of finding a sector of the economy providing employment with
long-term social mobility and career advancement is quite daunting. And while the Bureau of Labor Statistics projects a healthy employment increase of approximately 11 percent over the 2012 to 2022 decade, young workers here at home face an exacerbated challenge in a sluggish regional economy. According to the Pennsylvania Department of Labor and Industry’s Center for Workforce Information and Analysis (CWIA), the average percent growth in all occupations from 2012 to 2022 is approximately 9 percent and 7 percent for Lackawanna and Luzerne-Schuylkill Workforce Investment Areas (WIA), respectively.\textsuperscript{157} As a result, the imperative to help workers find entry into the regional workforce becomes both stronger and more challenging.

When it comes to economic growth in the future, it appears not all sectors of the economy are created equal. According to the CWIA, employment sectors involving construction, distribution, transportation, and utilities represent 19 of the top 50 fastest growing industries in Pennsylvania from 2012-2022.\textsuperscript{158} Similar to state figures, most of the fastest-growing regional occupations center around trade, transportation, and utilities, with heavy and civil engineering construction growing the quickest, by nearly 31 percent, between 2012 and 2022 – over three times the average growth for all occupations in Lackawanna and Luzerne counties.\textsuperscript{159} A career in the heavy and civil engineering construction industry, for example, requires either a postsecondary CTE degree or an apprenticeship for entry, and includes many occupations, including utility system construction – one of the fastest-growing industries in the Scranton/Wilkes-Barre/Hazleton metropolitan statistical area. Utility system construction, which comprises “establishments primarily engaged in the construction of distribution lines and related buildings and structures for utilities (i.e. water, sewer, petroleum, gas, power, and communication),” is projected the third-fastest growing industry in PA with an estimated three percent annual growth over the decade.\textsuperscript{160} Another prominent occupation in this industry is highway, street, and bridge construction, the fastest-growing career in the Luzerne-Schuylkill WIA. Still another is waste collection, which is more complex and profitable than popular opinion. Waste collection, which consists of “establishments primarily engaged in (1) collecting hazardous waste, nonhazardous waste, and/or recyclable materials within a local area and/or (2) operating hazardous or nonhazardous waste transfer stations,” is projected the ninth-fasted growing industry in PA with an estimated 2.5 percent annual growth over the coming decade, and pays an average weekly wage of $975, or approximately $50,700 annually.\textsuperscript{161}
But what specific positions are open in these industries? How much do they pay? What training do they require? To answer these questions and others, the CWIA has also compiled the occupations with the highest estimated annual job openings in both the Lackawanna and Luzerne-Schuylkill Workforce Investment Areas (WIA) from 2012-2022. These projections also include educational requirements and average annual wages (when available). The occupations in this projection are considered “high priority” as they meet three criteria: (1) high employer demand; (2) higher and more complex skills requirements; and (3) family-sustaining wages. The information provided by the High Priority Occupation Projections aims to coordinate workforce development with high priority industries. Reported below are the high priority professions experiencing above average growth in job openings in Lackawanna and Luzerne-Schuylkill WIAs. (Wage data not available on a regional or local level was supplemented by PA state wages or, if necessary, national wage data.)
One interesting fact to note is that many of the high priority occupations presented above would not have been categorized in any of the occupations listed in the earlier Long Term Occupation Projections table. In fact, the three fastest-growing high priority occupations all concern medical technology, and would therefore likely be categorized as healthcare-centric occupations. This discrepancy explains the difference between the two metrics and the importance of using both to identify CTE-centric openings in the regional economy.

Additionally, it is important to note that all but one of the top 20 high priority occupations earns a salary significantly higher than the median earnings among Lackawanna and Luzerne county high school graduates in the past 12 months, which are $30,092 and $28,697, respectively. In fact, the average salary of these top 20 occupations totals $46,716 – a 55 to 63 percent improvement from starting salaries for regional high school graduates.

In sum, the economies of Lackawanna and Luzerne counties offer a host of openings across multiple high-paying industries for candidates with CTE or apprenticeship experience. Both
counties, for example, dispel the notion that a career in advanced manufacturing is limited in demand, with Lackawanna County showing above-average growth in architectural, structural, and fabricated metal manufacturing and Luzerne County growing in wood product manufacturing. Additionally, there is a regional demand for investigative and security services, which includes security guards and security systems services. Protective services degrees enabling entry into this field, whether in police science or criminal justice, are offered by a wide range of institutions, including the Career Technology Center of Lackawanna County, Lackawanna College, or McCann School of Business & Technology. Finally, Northeastern Pennsylvania suffers from a nursing shortage reflected nationwide. Depending on what track of nursing a student is interested in – licensed practical, vocational, or registered – entry into this rewarding, high-growth industry can require as little as a diploma offered at a career and technical school, like the Licensed Practical Nursing program offered by the CTC of Lackawanna County and the Wilkes-Barre Area CTC. Regardless of the industry, Northeastern Pennsylvania has a suitable program ready to assist any prospective student in entering the workforce equipped with the skills and experience necessary to succeed.

Case Studies

In recent years, a number of high-quality CTE programs throughout the United States have adjusted their curricula to meet industry trends and workforce demands. Some programs have been educator-driven, such as Pennsylvania’s Youth Apprenticeship Program, while others have been established by employers looking to harness the potential of an internal talent supply chain. But while the CTE and apprenticeship programs highlighted in this section differ in their sponsorships, contexts, and approach, they all share the overarching objective of implementing groundbreaking models that integrate the needs of students, educators, and employers. The programs discussed achieve this goal with three strategies: tailoring CTE and apprenticeship credentials to specific industry demands, engaging all prospective CTE stakeholders at the program’s creation, and aligning academic and CTE requirements to encourage a holistic appreciation of education by students.

The Model CTE Experience: Pennsylvania’s Youth Apprenticeship Program

Statewide initiatives to expand CTE and apprenticeship experiences to students have been proven successful. The Pennsylvania Youth Apprenticeship Program (PYAP), operating through the North Montco Technical Career Center (NMTCC) in Lansdale, is just one example. Buoyed by federal apprenticeship investment to ease a skilled machinists shortage, PYAP hit the ground running in 1993 by engaging all potential CTE stakeholders – parents, employers, workforce investment boards, non-profits, and educators – in its very creation. PYAP’s founding consortium, for example, included the Pennsylvania Departments of Commerce, Education, and
In designing PYAP’s structure and curriculum, NMTCC made sure to incorporate a myriad of factors, including national industry surveys, state apprenticeship program requirements, and the needs of businesses, parents, and students.166 Developed on the German “dual-system apprenticeship model,” PYAP emphasizes socializing youth apprentices into the workforce to ease student transition into the labor market.167 PYAP also takes the classic apprenticeship model available to adults and refines the experience for high school students. Students and prospective employers are contractually bound to a two-year program in which the rights and responsibilities of each party is clearly delineated.168 When the two-year program is completed, the PYAP student will receive both academic and occupational credentials.169

From its formation, PYAP has strived to consolidate both academic and CTE elements into its curriculum. Specifically, the nature of PYAP’s instruction becomes progressively more work-based as students progress through the program. Sophomores, for example, attend school for the entire week, where they take both academic and CTE classes.170 “Exceptional sophomores,” however, can participate in an apprenticeship for one day out of the week.171 Juniors perform work-based apprenticeships on Mondays and Tuesdays and take classes on Wednesdays through Fridays.172 Seniors’ schedules are reversed, with Monday and Tuesday coursework and Wednesday through Friday apprenticeships.173 After graduation, PYAP sends its students either into postsecondary CTE programs or directly into employment.174

PYAP’s instruction methods emphasize linking academics with real world pragmatism. For example, a historical lecture on local battle landmarks from the Revolutionary War and Civil War was followed by a mathematical discussion on calculating cannon balls’ trajectories.175 Finally, a third teacher demonstrated how to construct a makeshift catapult firing a golf ball.176 The students were then charged with gathering data on where the ball landed, and in the process, draw upon the same skills required to design statistical control charts in factory operations.177 By integrating work-based learning with traditional coursework and labs, students are best positioned to understand the connections between their academics and the trades they are pursuing – and teachers agree. According to PYAP’s CTE teachers, student interest increases with the strength of the connections made between academics and their subject matter.178 Additionally, CTE teachers note the importance of sharing the campus with academic teachers and instructors, as the proximity assisted them in designing curricula that are deeply integrated with academic study.179 As a result, CTE and academic teachers alike praise the program’s resounding success in helping students develop the skills necessary to enter today’s competitive labor market.180
PYAP’s reputation for employment success has attracted more students, as enrollment has increased from five students in 1993 to a yearly average of 130 since 1998. Additional programs of study were added in computer information technology, health occupations, cosmetology, and industrial electricity. Today, PYAP houses approximately 10 percent of the regional school population. In addition to higher enrollment figures, PYAP is also deepening its relationships with alumni, many of whom now occupy management positions in their fields and want to give back. Some of these former graduates are even offering current PYAP students apprenticeship opportunities at their respective companies, and others hold positions on NMTCC’s Occupational Advisory Committee. As a result, the PYAP experience turns alumni into stakeholders themselves, enabling them to offer their perspectives to enhance the delivery of high-quality vocational education in Pennsylvania. By similarly engaging all potential CTE stakeholders at the earliest stages of development and aligning academic and CTE curricula, PYAP has created a uniquely-positioned alternative education track for students that enables them not only to survive in today’s workforce, but thrive.

Employer-Driven Apprenticeship Experiences
Nationally, many employers are creating in-house training networks or initiating partnerships with local institutions to develop a skilled workforce uniquely trained to meet industry standards. In California, for example, Pacific Gas & Energy (PG&E) created the PowerPathway Program, which has trained over 450 students since its inception in 2008. Over 80 percent of PowerPathway students have obtained careers with either PG&E or the larger utility industry. The PowerPathway training network consists of “community colleges, community organizations, workforce investment boards, university and educational partners” who are partnered with PG&E to create an apprenticeship system for prospective line workers, welders, and electrical technicians.

In South Carolina, BlueCross BlueShield has partnered with state technical colleges and universities to train students in information technology since 1997, including fields such as programming analysis as well as Web systems and network support. The apprenticeship program has four tracks of study: host application development, non-host application development, systems support, and infrastructure communications technology. In order to complete the program, apprentices must undergo 400-800 hours of education as well as three or more years of on-the-job training. Apprentices must work a minimum of 60 hours per month after coursework completion. BlueCross BlueShield itself even acknowledges that this program is a fundamental way to cultivate and enhance in-house talent, claiming that “apprenticeship programs are a great way for us to develop our own experts, who become knowledgeable in our company’s needs in information technology.” This partnership, which was registered as a Registered Apprenticeship program with the U.S. Department of Labor’s
Employment and Training Administration in 2009, has led to a 68 percent employee retention rate over the last five years.\textsuperscript{194}

**Eyes on the Future: Pennsylvania’s SHINE Program**

By building a workforce development pipeline as early as possible in a student’s formal education, educators can preserve the diversity of the workforce by equipping students with the STEM skills necessary to participate and succeed in a 21\textsuperscript{st} century labor market. However, educators hoping to introduce STEM education earlier face a monumental challenge, as less than 5 percent of time spent in formal early childhood education is currently allocated toward STEM learning and questions abound concerning teachers’ preparedness to teach such subject matter.\textsuperscript{195} Locally, the School and Homes in Education (SHINE) program is just one illustration of how this challenge can be met. Through the last decade, SHINE has operated as an afterschool program in Schuylkill and Carbon County school districts.\textsuperscript{196} SHINE focuses on a core curriculum of project-based STEAM (Science, Technology, Engineering, Arts, and Mathematics) education in students from grades K-8.\textsuperscript{197} In Schuylkill and Carbon counties, an average of 64 percent of all SHINE students made improvements in homework completion, a 97 percent average grade promotion rate, and improvements in both reading comprehension and fluency.\textsuperscript{198}

In December 2014, a consortium consisting of state Senator John Yudichak, U.S. Congressman Lou Barletta, Wilkes University Patrick Leahy, and Luzerne Intermediate Unit #18 Executive Director Anthony Grieco, along with various educators, employers, and students, found success in expanding the SHINE program to Luzerne County.\textsuperscript{199} The Luzerne County SHINE program currently operates through the Wilkes-Barre Area Career & Technical Center, as well as two Hazleton Area locations.\textsuperscript{200} Annual operating costs, estimated to range between $1 million to $1.7 million, will be funded by a consortium of federal, state, and private sector sources.\textsuperscript{201} Since its Luzerne County establishment during the fall of 2015, SHINE is hoping to expand its reach. After educating more than 200 students in its first year, the program is hoping to gain 200 more through afterschool programs, as well as another 100 through weekly home visits.\textsuperscript{202}

Credible research suggests that the quality and depth of early childhood education, with or without STEM education, indisputably shapes the nature of the workforce for the better. Access to a high-quality pre-kindergarten program, for example, sizably cuts incidences of teen pregnancy, grade repetition, and juvenile delinquency.\textsuperscript{203} Students attending early childhood programs are also markedly less likely to need special education services than those who did not attend such programs.\textsuperscript{204} Additionally, a high-quality early childhood education program can harness the young mind’s receptivity to math and logic between the ages of 1 and 4, and build a strong foundation for primary school development.\textsuperscript{205} Among all skills taught in early childhood education programs, math competence is consistently the most predictive metric of
future academic success. For example, children constantly struggling with math in elementary school were found to be 13 percent less likely to graduate from high school and 29 percent less likely to attend college. Scholars and practitioners agree that early childhood education programs, especially programs incorporating STEM curricula like SHINE, create the groundwork for future successes, both in school and in the workplace.

Recommendations
In order to deliver maximum access to high-quality, affordable, and transparent vocational education, a multi-faceted strategy must be implemented that engages all stakeholders – employers, educators, students, parents, and policymakers. The recommendations presented below are drawn from the data and previous scholarship presented in this report. While the implementation of these recommendations depend on ambitious change across the domestic education system, broadening the access of a quality vocational education to students touches all aspects of the domestic economy by providing students meaningful entry into high-paying, rapidly-growing careers and enhancing both workforce development and workplace productivity. These recommendations constitute not merely an investment in education, but a down payment on a stronger economy.

Bridge the CTE and Industry Credential Mismatch
Licensure and certification are two demonstrably important means to verify the acquisition of job-specific skills. As of 2015, nearly 18 percent of the civilian workforce aged 16 and over held an active license or certification, and median weekly earnings of workers with such a designation are, on average, 34 percent higher than workers without them. Additionally, certification and license holders are less likely to be unemployed than non-holders, by 2.7 percent to 6.1 percent, respectively. Among workers with an associate’s degree or less, holding a certification or license in a given industry becomes even more necessary for employment in CTE-centric fields. Among associate’s degree credential holders in 2012, for example, nearly 53 percent of graduates had a work credential in either the healthcare or trade industries. In essence, certifications and licensure enable rapid adjustment to constantly-changing industries in the labor market, such as information technology, while avoiding the need for “seat time” qualifications that accompany educational programs.

The importance of licensure or certification to workforce entry underscores the need to streamline certification offerings and construct industry-wide standards. For example, in Germany, which is considered a model for integrating apprenticeship and CTE programs into their workforce, industry exams are federally regulated, with criteria determined jointly by leading employers and trade unions. In the United States, however, regulation for occupational licensure is one of the most decentralized in the OECD. According to the U.S.
Department of Labor, tour guides can choose between nine different credentials, chemical technicians between 22, and computer network support specialists between 179 credential options. Because encouraging the United States to embrace a German model of occupational licensure would be unrealistic, organizations like the OECD advocate the adoption of a “national quality standard for certifications...based on industry support,” in order to encourage postsecondary CTE programs to align their degree and certification programs with those standards. Adopting such a standard would not only mitigate the challenges school counselors face in disseminating information, but would also expose the students who rely on them as advice to emerging career opportunities and the pathways necessary to enter those fields.

Increase the Quantity and Quality of Partnerships among CTE Stakeholders

Just as there is an information deficit among students and educators about the potential of apprenticeships, employers are often unaware or reluctant to embrace the opportunity to invest in such training. Like expenses on facilities and equipment, apprenticeship costs require an immediate investment by employers in exchange for long-term returns. Employers may fear losses in investment if apprentices are lured away by competitors after investing in their career development. A dearth of quantitative information and studies ensuring gains for employers only reinforces such concerns. Of such studies conducted, benefits of apprenticeships include high retention and lower turnover rates. Additionally, studies generally find that the cost of apprenticeship programs to employers are, in most cases, offset by the production that comes from apprentices.

Despite the overwhelming majority by which current employers of CTE graduates and apprentices would recommend others following suit, these employers still identify many opportunities to improve the strength of their apprenticeship programs. According to the 2007 Survey of Apprenticeship Sponsors, 51 percent of sponsors identified a need for greater assistance in finding and screening applicants, 37 percent requested a simpler process for establishing a new apprenticeship program, and 32 percent asked for an easier multi-state apprenticeship registration policy. Additionally, the survey found that most sponsors, 66 percent, relied on current employees as a source for recruiting new apprentices, with less than 20 percent using the Internet, community-based organizations, pre-apprenticeship programs, unions, or a One-Stop Career Center system for recruitment. Only 41 percent of sponsors recruited from community colleges or technical schools, and a mere 22 percent used private vocational schools as an option.

All of the employer hesitations and suggestions for improvement identified speak to the importance of a mechanism or intermediary that attracts, informs, and introduces them to the world of CTE and apprenticeships. One possible solution in the United States is to encourage
high schools, as well as CTCs and other interested partners, to hire or allocate one staff member to a dedicated position focused only on building and improving relationships with regional employers and educators to create new opportunities for students. In the United Kingdom, a nation that has just recently made sizable investments and improvements in their private sector apprenticeship initiatives, approximately 40 percent of participating sponsors cited their reason for involvement was “being approached by a training provider,” with very few knowing anything about apprenticeships before this first contact. But, once those companies became involved in an apprenticeship scheme, nearly 80 percent offered such opportunities in the years afterward.

Regionally, local institutions have taken advantage of the rapidly growing energy sector, fueled in no small part by Marcellus Shale exploration and development. Lackawanna College, for example, converted its New Milford satellite campus to a new School of Petroleum & Natural Gas in 2009, and has since partnered with regional energy companies to further develop the program. In 2014, Cabot Oil & Gas Corporation announced a $2.5 million gift to Lackawanna College to provide continuing support for program scholarships, equipment updates, faculty retention, and student internships. Additional companies, such as Williams Talisman Energy Inc., Exterran Holdings Inc., and Team Oil Tools donated equipment for students to practice skills development. Lackawanna College’s embrace of the growing regional natural gas sector has led to very promising outcomes, with a roughly 90% job placement rate for School of Petroleum & Natural Gas graduates. The successful outcomes presented above, along with countless others, demonstrates the importance of effective, supportive, and communicative intermediaries in engaging private sector employers and accelerating employer engagement in strengthening the current workforce.

Utilize the Opportunities of Future Educational Reforms to Increase CTE Awareness

In order to equalize opportunities for students seeking college acceptance, as well as career and technical education, the core content taught in all high schools must be deeply integrated with CTE program standards through cooperative relationships between policymakers and leaders through all institutions of secondary education. Yet, at a time when statewide education policy is at its most flexible, nearly half of all states have not attempted to collaborate with their CTE leaders and policymakers as part of their Common Core implementation teams. Many states are pursuing new assessment methods, through the Partnership for Assessment of Readiness for College and Careers, as well as the Smarter Balanced Assessment Consortium, to emphasize the application of knowledge and skills, as opposed to memorization. To engage CTE students in meeting this goal, the College & Career Readiness & Success Center at the American Institutes for Research suggests states adopt performance-based assessments, thereby allowing CTE students to demonstrate the abilities they have refined through their educational
A Study on Vocational Education and its Role in science, technology, engineering and Math (STEM experiences.\textsuperscript{226} For example, while one prominent method to measure CTC success is the Industry Standards-Based Competency Assessments, such exams are neither mandatory nor aligned with every CTE-centric industry, hindering its helpfulness in measuring a student’s success at skills acquisition.\textsuperscript{227} As a result, regional school district scores fluctuate widely, and not all districts are able to provide data because of the small sample sizes of students sitting for these exams.

Further, ESSA (the interpretation publicly available at the time of this publication) offers the flexibility for districts to help students with career pathways. This encourages the introduction of comprehensive career readiness learning that will help direct students to CTE curriculum. Therefore, school districts can evaluate job growth in STEM fields within their footprint and demonstrate career pathways for elementary and middle school students to encourage participation in CTE programs. Further, school district analysis of the data is instrumental in developing new programs as well as realigning existing programs with industry job growth.

Today, 46 states – including Pennsylvania – are aligning their respective education systems with Common Core State Standards (CCSS), a development which will fundamentally transform the nature of school curricula, professional assessment, and instructional materials. A joint survey of Achieve and the Meeder Consulting Group consulted state career/technical education (CTE) directors and CCSS coordinators to examine just how state education departments are integrating CTE programs into their CCSS implementation initiatives. While 22 states were consulted, eight were consulted for additional information.\textsuperscript{228} Survey responses indicated a
troubling gap between the potential for meaningful CTE expansion and the current reality, as approximately half of the 22 states surveyed had no CTE representation in their CCSS planning teams, despite interest from CTE directors to be included.  

The survey findings recommend a multilayered approach, as implemented by the eight states surveyed for additional information. The first strategy is to create a comprehensive definition of college and career readiness by including CTE directors and business partners. Secondly, states should form a team of stakeholders including CTE representatives to oversee CCSS implementation. Thirdly, states must improve information sharing efforts between academic and CTE directors through awareness sessions, conferences, and multimedia presentations. Additionally, states should engage CTE directors to update their standards to reflect those implemented by CCSS, specifically enhancing current CTE literacy and math standards. Finally, states should encourage the collaboration of CTE and academic instructors to create instructional resources and develop clear expectations for CTE involvement in CCSS. Efforts to do so are being led by the National Association of State Directors of Career Technical Education Consortium (NASDCTEC), which hopes to develop a common set of high-quality CTE standards, integrate them into the CCSS framework, and allow states to adopt and implement those standards individually.

**Conclusion**

Many of the above recommendations are congruent with findings from a November 2016 report of the Pennsylvania House of Representatives Select Subcommittee on Technical Education and Career Readiness. That report also recommended strengthening partnerships between CTE and business and industry stakeholders, raising awareness and addressing misperceptions about CTE, and better aligning CTE with meaningful industry credentials.

A 21st century economy requires an educated workforce endowed with the complex, job-specific skills necessary to fill the 5.9 million jobs open today, and prepare for the jobs of tomorrow. By the year 2020, nearly two-thirds of jobs created in the United States will require postsecondary education in some form. To meet the demand of this new workforce, and thereby remain economically competitive, every American must be provided the access of a high-quality vocational education program. Increasing this access requires a multipronged strategy, including but not limited to: (1) better integrating academic and CTE program standards in light of the changes brought about by Common Core; (2) increasing transparency and clarifying national industry standards to enable students to learn about career readiness requirements; (3) encouraging the formation of employers and educational partners into consortia to provide students the opportunity to experience careers; and (4) streamlining the decentralized maze of federal, state, and local CTE programs to unleash the potential of vocational education programs to access every interested student.
Despite the promising outcomes in vocational education programs and the number of rewarding unfilled jobs, many policymakers and stakeholders alike have only recently focused their attention toward vocational education. In 2011, former Obama administration Education Secretary Arne Duncan correctly called vocational education the “neglected stepchild of education reform.”234 While rates of bachelor’s degree attainment have tripled from 11% in 1970 to 33% in 2015, only one out of every two Americans by the age of 25 have a postsecondary credential allowing them to enter a skills-based, high-demand career.235 Without the assistance a certificate, associate’s degree, or apprenticeship can provide, young workers face long-term alienation from the job market, confined to low-wage, low-skilled employment and forced to rely more on social services.

To counter the looming socioeconomic crisis that could accompany youth unemployment nearly double the national rate, CTE stakeholders across the nation are making up for lost time. Today, the Obama administration is leading the effort to increase support for state apprenticeship agencies and invest in adjusting CTE programs to workforce demands, reversing a decade-long reduction in CTE investment. Likewise, many employers and educators alike are now forming the partnerships necessary to provide high-quality vocational education opportunities for students. In January 2016, for example, JPMorgan Chase & Co. announced a $75 million initiative to combat youth unemployment through workforce development, allocating $35 million toward bolstering state CTE programs.236 State CTE leaders confirm this trend, as well. According to a recent survey, over 80 percent of state CTE directors note an increased level of employer engagement over the last decade, and all but three predict this engagement to continue over the next five years.237

Despite such substantive progress, some obstacles still impede the delivery of high-quality vocational education. For example, while the Obama administration’s $175 million investment in apprenticeship programs is a necessary step, it stands at just a fraction of the $1.7 billion investment in the Department of Labor’s means-tested Job Corps program, which provides vocational education and training to young men and women between the ages of 16 and 24.238 Additionally, as previously mentioned, nearly 95 percent of all CTE investment is derived from support at state and local levels.239 In Pennsylvania, CTE spending counted for just 0.5 percent of overall education spending over the last ten fiscal years, effectively frozen in real terms.240 And while both Luzerne and Lackawanna County school districts spend more on vocational education as a percentage than the Pennsylvania average, the two counties combined spend only 4.5% of their total budgets on such measures.241 Across the nation, many states divert funds allocated for vocational education toward special education budgets, leaving many CTCs underfunded and understaffed. Additionally, many employers and educators are still reluctant or uncertain to form the partnerships necessary for strong vocational education programs.
Finally, many parents and students yield to lingering social and professional stigmas classifying CTE and apprenticeship programs as an option of last resort or a sign of academic failure.

As shown in this report, multiple job opportunities are available across multiple fast-growing, high-skilled industries throughout Northeastern Pennsylvania. With greater access to high-quality vocational education programs, interested students throughout the region can begin promising careers in a wide variety of industries, including but not limited to high-skilled manufacturing, nursing, medical technology, cosmetology, and carpentry. Their opportunities can multiply because CTE and apprenticeship programs enable those who complete them to advance toward higher salaries more easily and quickly than those who do not complete such programs. By providing the opportunity to master complex, job-specific skills, vocational education programs increase their students’ human capital and, consequently, decrease their barriers to workforce entry.

In essence, vocational education works for everyone involved in its creation and delivery. Students benefit by a profoundly increased social mobility. Employers benefit by filling long-open positions with talented candidates, thereby preventing impediments in meeting business demand, as well as remaining productive and competitive. Policymakers benefit by building a more resilient workforce more able to withstand an evolving labor market, thereby protecting the solvency of social programs used to support those who would otherwise be un- or underemployed. Successful CTE and apprenticeship programs in other countries, as previously discussed, can generate $1.47 in economic output for employers and $28 in social benefits for every $1 of public investment in such programs.\(^{242}\) When all stakeholders collaborate to build a high-quality vocational education infrastructure, the result is an environment that enables everyone to succeed.

The overarching challenge facing vocational education in the United States, as discussed earlier, does not concern the outcomes from CTE or apprenticeship programs, but rather a student’s opportunity to access them. Previous scholarship consistently finds that vocational education delivers increased earnings, greater job satisfaction, secure employment, and a ladder to the middle class for students and adults whose strengths lie beyond white-collar professional skills. The hurdles that educators, employers, and policymakers are not just budgetary, but also intellectual, as vocational education in the United States is decentralized and stigmatized. Implementing policy change requires awareness from vocational education stakeholders on all levels of government. Regionally, the most important step forward is for policy and program leaders to discuss with regional employers and policymakers the merits of a vibrant, high-quality vocational education system in Northeastern Pennsylvania. This report, a product of the Institute of Public Policy and Economic Development’s Education and Workforce Taskforce, hopes to start that very discussion.
CTE Graduate Profiles

The following section was created to identify local leaders in STEM fields with a CTC education. The Institute received a number of interesting profiles to include in this section, however, given the nature of the research, has chosen to identify those engaged in STEM fields.

It is important to note The Institute’s Education and Workforce Development Task Force identified many successful regional leaders not in STEM fields as well. For example, Kevin O’Donnell, President and CEO of CAN DO, Inc. is a leader in economic development. He has been instrumental in the successful attraction of a number of businesses creating jobs for northeastern Pennsylvania residents. Linda Zembrzycki, third generation owner and operator of Zembrzycki Dairy Farm, has grown the business to include a recreational area for picnics, parties, hayrides, and developed a seasonal corn maze for fall visitors. Susie Prisk is a licensed Special Effects Makeup Artist at the LA Institute, and Alyssa Murray is the Regional Manager of JC Penney Salons.

It is important to note that the profiles received has demonstrated that many CTC graduates have risen to senior management positions or started their own successful companies – in both STEM and non-STEM related fields.

Energy & Infrastructure Industries

While a changing workforce brings new opportunities for trained workers, many industries that have withstood the test of time continue to provide meaningful careers for workers with a CTE or apprenticeship experience. One industry-wide example remains energy and infrastructure-centric occupations, where construction and utilities companies alike remain prominent employers, regardless of business size and geographic reach. According to the Bureau of Labor Statistics, these construction and extraction-based occupations are projected to grow by ten percent from 2014 to 2024, surpassing the average projected job growth rate for all other occupations. Regional demand for construction and extraction workers enabled the success of two model businesses leading this sector today: UGI Utilities and Joyce Electrical.
Joyce Electric Inc.

Established in 2003, Joyce Electrical, Inc. is a full-service electrical contracting company, offering round-the-clock services and is located in Eynon, PA. The company’s inside division specializes in industrial, institutional, educational, healthcare and commercial wiring focusing on lighting, power and special systems operating at voltages up to 600 volts. The outside division focuses on construction, maintenance, testing and repairs of systems operating at voltages over 600 volts and up to 765 kV. Additional services provided include, but are not limited to, bucket truck service, fire alarm and security systems, infrared scanning, street lighting service and repair, switchgear services and installations, transformer oil sampling, repair, and analysis, as well as ultrasonic testing.

John J. Joyce is the vice president, treasurer and project manager of Joyce Electrical, Inc. He helped start the company and has been in the electrical field for 28 years, he is also the head of the inside division of the company. Mr. Joyce has been working in the electrical field since 1983 and in 2003 he spent most of his career working in a supervisory capacity for several large electrical contractors in the Scranton, Pennsylvania area. Mr. Joyce is a CTC graduate.

UGI Utilities, Inc.

UGI Utilities, Inc. is a natural gas and electric utility company reaching nearly 700,000 customers across 45 counties in Pennsylvania. Founded in 1882 as United Gas Improvement Company, the company grew both in customer base and services offered, becoming UGI Corporation in 1968. UGI operates under two separate divisions. The natural gas division first designs gas service routes for residential and commercial clients, and then installs the service lines from the street to the client’s home or business. After a third-party HVAC contractor installs the client’s chosen natural gas appliance and connects it to the meter, UGI employees then activate the gas service.

Don Brominski, Director of Business Development, began his career at UGI Utilities after pursuing a Bachelor of Science (B.S.), in Electrical Engineering at Lehigh University. Don is serves on a number of local and regional boards of directors and invests much of his time volunteering with UGI and the United Way to help elementary students develop proficient reading skills. Mr. Brominski is a CTC graduate.
Auto Repair & Service Industries

Rewarding job opportunities exist in the automobile repair and service industry, where projected job growth is slated to reach 9 percent from 2014 to 2024, also surpassing all economy-wide job growth projections.

Total Collision Repair Company

Total Collision, a Scranton-based business, provides repair and recovery services for automobile owners throughout Northeastern Pennsylvania. Founded in 2003, Total Collision provides automotive body, paint, and collision repair services. Trained and certified by the National Institute for Automotive Service Excellence, the Inter-Industry Conference on Auto Collision Repair, and refinishers such as PPG, Standox, and Waterborne, Total Collision employees use computerized paint mixing systems, advanced straightening equipment, as well as environmentally-safe paint to maximize quality and accuracy in the company’s 4000 square-foot facility.

Total Collision Repair Company is owned by Matt Gray.

Redline Towing Inc.

Redline Towing, established in 1983 by Mike Murphy, is a leading towing and recovery service provider, employing wreck master certified experts who offer 24 hour emergency roadside assistance, as well as on-site repairs, such as filter changes and freeze-ups. Mr. Murphy, a successful entrepreneur, also serves as President of Red Line Leasing Corp., Red Line Truck and Trailers Sales and is a Partner in Elite Warehouse, LLC.

Mr. Murphy serves on the board of NBT Bank and its predecessors and is a former Trustee of Lackawanna College. Mr. Murphy is a graduate of a CTC program.
Fargione Auto Service, LLC

Fargione Auto Service, LLC was established in 1994 and is located in Scranton, PA. The company offers full-service auto repair services, computerized wheel alignment, and general maintenance. Other services provided include air conditioning and heating service, brake repair, and cooling system flush, among others. Services rendered at Fargione Auto Service LLC are at affordable prices, and the quality parts, filters, oils and components are used by the experienced and award-winning wheel alignment technicians and automotive technicians at the company.

This company is owned by John Fargione. An automotive technician with nearly 40 years of experience, he has worked for Cadillac, Oldsmobile, Chevrolet, GMC and Chrysler, with numerous awards over the years. Mr. Fargione is a CTC graduate.

Metal Fabrication Industry

While automation might have lessened the need for unskilled positions of previous decades, local businesses of all ages and sizes have harnessed the potential of the emerging technological revolution to bring new and promising opportunities for regional workers with the right training. The fabricated metal products manufacturing industry, for example, harbors many job opportunities for those interested in starting their career. According to the Bureau of Labor Statistics, this manufacturing subsector converts raw metals into end-stage products “other than machinery, computers, and electronics.” Processes regularly used within this industry include forging, stamping, bending, coating, machining, and engraving. Locally, the demand for skilled metals fabricators helped to build two businesses now leading this sector regionally: Pleasant Mount Welding and Quality Perforating, Inc., both of Carbondale.
Quality Perforating Inc. (QPI)

Quality Perforating Inc. (QPI) is a leading manufacturer of perforated sheets, coils and component parts. Quality Perforating, Inc. was incorporated in 2001 and is based in Carbondale, Pennsylvania. QPI specializes in perforation, fabrication and tooling operations. Full range secondary operations and value-added services are also offered. High-speed computer controlled perforating pressers are used to convert raw materials (steel, metal, aluminum and plastic) from coil or sheet into perforated sheets or parts. QPI makes its own tools with CNC machinery and over 3,000 tools are used in their operations. Value-added services provided includes; shipping, CAD capability, greasing and welding. The company’s products can be used in mining, decorative, industrial and architectural applications.

Robert Farber is the President/ Chief Executive Officer and owner of QPI. He started the company in 2001. He also started a computer consulting company in 1989, which he owned for 11 years before starting QPI. After graduating from a CTC in 1984, Mr. Farber went on to earn degrees in Electrical Engineering and Business Information Systems from Penn State University. After graduation he attended Marywood University, completing a MS in Business administration.

Pleasant Mount Welding Inc.

Established in 1983, Pleasant Mount Welding is a leader in the regional fabricated metals industry. In 1994, the company relocated its facility to Carbondale, where it has since expanded into two facilities spanning 120,000 square feet, enabling its employees to shape, design, prime, and paint their clients’ metal products with the latest fabrication equipment and technology. The company’s projects range from creating guardrails and staircases for local businesses to a recent waste water treatment plant expansion for PC Construction in Washington, D.C. Whether shearing, sawing, plate bending, or drilling, Pleasant Mount Welding fabricates its metals in compliance with industry codes established by the American Institute of
Steel Construction, the American Welding Society, and the American Society of Mechanical Engineers.

This company is owned by Robert Non. Mr. Non is a CTC graduate pursued his higher education at Penn State University.

Machinery Manufacturing

Another industry standing to benefit from a CTE-educated workforce is machinery manufacturing. In this sector, manufacturing businesses create products that, according to the Bureau of Labor Statistics, “apply mechanical force, for example, the application of gears and levers, to perform work.” Machinery manufacturers utilize many different methods of metal forming to create various parts of the machine they are building. Additionally, machinery manufacturers must be cognizant of complex assembly instructions and operations within the manufacturing process. Regional successes within this industry range vastly in business size, from Lockheed Martin’s Archbald location to Medico Industries in Hanover Township and Wilkes-Barre.

Lockheed Martin

Formed out of a merger between Lockheed Corporation and Martin Marietta in 1995, Lockheed Martin is a pioneering security and aerospace company employing nearly 98,000 people worldwide across 590 facilities in 70 nations and territories. As a defense contractor, Lockheed Martin’s predominant client is the U.S. Department of Defense, and 2015 sales total $46.1 billion. Headquartered in Bethesda, Maryland, Lockheed Martin conducts research and development across four business areas: aeronautics, missiles and fire control, rotary and missions systems, and space systems. Lockheed Martin’s 350,000-square-foot facility in Archbald, PA is a leader in the company’s missiles and fire control division, supporting both precision-guided systems and nuclear systems.

Tom Frable, a Machining Supervisor, has been with Lockheed since 1978. Mr. Frable is a CTC graduate.
Medico Industries

Since 1967, Medico Industries of Hanover Township has been a supplier and subcontractor of metal equipment and armament supplies for the Department of Defense and various defense companies, including Lockheed Martin, Alliant Tech Systems, and the Israeli Military Defense. Additionally, Medico serves as a supplier for companies involved in the natural gas extraction and automotive industries. In July 2010, Medico expanded its manufacturing division with a move to Hanover Industrial Park. Operating out of a 120,000 square foot building, Medico utilizes advanced industrial machinery, such as hydraulic and mechanical presses, induction heaters, and CNC lathes, to mass-produce military shells and roughly 8,000 sets of oil and gas-related tool joints monthly.

Mr. Bob Mitvalsky serves president of Medico Industries. Mr. Mitvalsky earned a Bachelor of Applied Science in Business Administration and Management from Mount Mercy University, and he is also the President and CEO of Builders Automation Machinery. He is a CTC graduate.

Computer and Electronic Products Manufacturing

Another sector set to benefit from potential workforce changes is the computer and electronic product manufacturing industry, which builds and creates not only computers, but also peripheral and communications equipment as well as other electronic products. One prominent regional example of such a business is Mayfield-based JAM Works, LLC.

JAM Works, LLC

John Mele officially formed JAM Works, LLC in 2007. It specializes in programming and equipping material handling robots to increase the productivity of today’s manufacturing businesses. Specifically, JAM Works employees customize the robots they purchase to meet
their clients’ demands, programming them to handle, position, pick up or even pack products on the factory floor, as well as stack them onto a pallet. In addition to industrial machinery programming, JAM Works offers a host of engineering, consulting, and project management services to interested clients. In essence, the automation services JAM Works provides, whether in production or consultation, do more than just save their clients from higher production costs. Rather, automation helps create a safer work environment and enables employees to focus on other workplace priorities beyond simple, repetitive tasks.

Mr. Mele is navy veteran and CTC graduate. He is a control systems engineer by trade and has served as an engineer in various organizations in Northeastern Pennsylvania before starting JAM Works. Mr. Mele pursued higher education at both Penn State University and the University of Scranton.

Conclusion

In sum, all of the businesses mentioned span a wide variety of industries and sectors, contributing to Northeastern Pennsylvania’s diverse and growing workforce. At the same time, they also have one commonality among them: they are all run or staffed by individuals educated and trained by local CTE institutions or apprenticeship providers. This reality shows that regional businesses in STEM and advanced manufacturing industries, both large and small, have succeeded and now seek to expand by hiring employees in a labor market that seems wide open. Additionally, their success is owed, at least in part, to secondary or post-secondary CTE schools that are open today and accepting new students every academic year. As a result, the availability of rewarding jobs providing meaningful career development in Northeastern Pennsylvania is not a theoretical prospect, but a tangible reality. Furthermore, these professionals also represent a variety of career paths. Some have entered the workforce after completing their CTC education, while others have used CTC education as a springboard towards further education in institutions both regionally and elsewhere.

Data was procured from individual company websites and LinkedIn profiles and the industry information is from the U.S. Bureau of Labor Statistics.
Appendix A – Available Resources

There are many regional programs committed to providing a career and technical education that exposes students to the combination of academic development and work-based competencies necessary to prepare them for the demands of a 21st century workforce. The following organizations are just a few of those providing such opportunities.

**Apprenticeship Databases:**

*Registered Apprenticeship Program Sponsor Database (U.S. Department of Labor):*
http://oa.doleta.gov/bat.cfm

*Pennsylvania Apprentice Coordinators Association – Northeast Chapter:*
http://www.apprentice.org/northeast.html

**Regional Career and Technical Centers:**

*Career Technology Center of Lackawanna County, Scranton, PA*

**Relevant Programs:** Automotive Technology, Building Mechanics, Carpentry, Computer Systems, Cosmetology, Culinary Arts, Construction & Maintenance, Healthcare, Protective Services, Visual Art, Welding
http://ctclc.edu/ctclc

*Hazleton Area Career Center, Hazle Township, PA*

**Relevant Programs:** Automotive Technology, Child Care, Computer-Aided Drafting, Construction, Cosmetology, Culinary Arts, Diesel & Electrical Technology, Computer Systems Networking, Healthcare, Law Enforcement, Practical Nursing, Welding
http://www.hasdk12.org/Page/5897

*West Side Career & Technology Center, Kingston, PA*

**Relevant Programs:** Automotive Repair & Technology, Carpentry & Building Construction, Child Care, Computer Information & Maintenance Technology, Cosmetology, Culinary Arts, Electrical Occupation, Healthcare, Police Science, Technology & Multimedia
http://wsctc.net/index.html

*Wilkes-Barre Area Career & Technology Center, Wilkes-Barre, PA*

**Relevant Programs:** Computer Information Technology, Graphic Arts, Construction & Maintenance, Healthcare, Cosmetology, Culinary Arts, Police Science, Manufacturing, Transportation & Logistics
http://wbactc.org/index.html
Regional Associate Degree Programs:

Johnson College, Scranton, PA

Tuition: $16,610 (excluding fees)
Relevant Programs: Animal Sciences, Business, Construction & Design, Electronic & Industrial, Health Science, Transportation
http://www.johnson.edu/

Lackawanna College

Regional Locations: Scranton, Hawley, Hazleton, Towanda, Covington Twp., New Milford
Tuition: $6,935 (excluding fees)
Relevant Programs: Aviation Management, Business Studies, Computer Information Systems, Culinary Arts, Emergency Medical Services, Environmental Science, School of Petroleum & Natural Gas, Physical Therapist Assistant, Sonography, Surgical Technology
http://www.lackawanna.edu/

Luzerne County Community College

Regional Locations: Nanticoke, Berwick, Hazleton, Kulpmont, Scranton, Shamokin, Wilkes-Barre, Elk Lake, Hazleton
Tuition and Fees: $2,520-$6,000, depending on residency.
Relevant Programs: Automotive, Business, Computer Information Systems, Dental Health, Health Emergency Medical Services, Computer Science, Technology, Construction & Utilities
http://www.luzerne.edu/

Regional For-Profit Institutions:

McCann School of Business and Technology

Regional Locations: Dickson City, Hazleton, Wilkes-Barre
Tuition: Varies by program, from $4,000 to $12,745 (excluding fees).
Relevant Programs: Legal & Protective Services, Healthcare, Beauty & Wellness, Business, Technology, Trade & Construction, CDL Certification
https://www.mccann.edu/

Fortis Institute

Regional Locations: Scranton, Forty Fort
Tuition: Varies by program, from $14,191-$55,155 (excluding fees)
Relevant Programs: Nursing, Medical Technology, Dental, Healthcare, Business & Professional, Information Technology, Skilled Trades, Beauty & Wellness, Commercial Driving
https://www.fortis.edu/
### Appendix B – Detailed Vocational Education Expense Data Tables

#### Vocational Education as Percentage of Instruction Expenses (Excluding CTCs), 2015

<table>
<thead>
<tr>
<th>School District</th>
<th>Total Instruction Expenses</th>
<th>Vocational Education Expenses</th>
<th>Share of Vocational Education Among Total Expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pennsylvania Average</strong></td>
<td>$17,217,980,991.97</td>
<td>$318,163,788.60</td>
<td>1.85%</td>
</tr>
<tr>
<td>Abington Heights</td>
<td>$29,209,162.14</td>
<td>$354,490.34</td>
<td>1.21%</td>
</tr>
<tr>
<td>Carbondale Area</td>
<td>$16,479,409.32</td>
<td>$636,153.69</td>
<td>3.86%</td>
</tr>
<tr>
<td>Dunmore</td>
<td>$12,348,227.65</td>
<td>$638,135.55</td>
<td>5.17%</td>
</tr>
<tr>
<td>Lakeland</td>
<td>$12,849,243.53</td>
<td>$828,938.69</td>
<td>6.45%</td>
</tr>
<tr>
<td>Mid Valley</td>
<td>$13,752,237.37</td>
<td>$684,437.76</td>
<td>4.98%</td>
</tr>
<tr>
<td>North Pocono</td>
<td>$26,344,250.38</td>
<td>$1,594,100.87</td>
<td>6.05%</td>
</tr>
<tr>
<td>Old Forge</td>
<td>$7,591,878.51</td>
<td>$572,673.18</td>
<td>7.54%</td>
</tr>
<tr>
<td>Riverside</td>
<td>$13,645,740.71</td>
<td>$231,208.35</td>
<td>1.69%</td>
</tr>
<tr>
<td>Scranton</td>
<td>$94,366,360.40</td>
<td>$1,697,063.29</td>
<td>1.80%</td>
</tr>
<tr>
<td>Valley View</td>
<td>$17,707,621.00</td>
<td>$1,152,186.00</td>
<td>6.51%</td>
</tr>
<tr>
<td><strong>Lackawanna County Average</strong></td>
<td>$244,294,131.01</td>
<td>$8,389,387.72</td>
<td>3.43%</td>
</tr>
<tr>
<td>Crestwood</td>
<td>$22,422,717.23</td>
<td>$1,382,012.47</td>
<td>6.16%</td>
</tr>
<tr>
<td>Dallas</td>
<td>$20,362,633.80</td>
<td>$850,115.52</td>
<td>4.17%</td>
</tr>
<tr>
<td>Greater Nanticoke Area</td>
<td>$16,883,207.69</td>
<td>$730,488.70</td>
<td>4.33%</td>
</tr>
<tr>
<td>Hanover Area</td>
<td>$16,574,047.41</td>
<td>$1,127,729.93</td>
<td>6.80%</td>
</tr>
<tr>
<td>Hazleton Area</td>
<td>$84,733,983.79</td>
<td>$2,090,473.29</td>
<td>2.47%</td>
</tr>
<tr>
<td>Lake-Lehman</td>
<td>$16,215,344.66</td>
<td>$751,219.56</td>
<td>4.63%</td>
</tr>
<tr>
<td>Northwest Area</td>
<td>$11,746,302.17</td>
<td>$976,632.81</td>
<td>8.31%</td>
</tr>
<tr>
<td>Pittston Area</td>
<td>$27,386,139.56</td>
<td>$1,255,170.95</td>
<td>4.58%</td>
</tr>
<tr>
<td>Wilkes-Barre Area</td>
<td>$75,267,288.47</td>
<td>$4,146,381.13</td>
<td>5.51%</td>
</tr>
<tr>
<td>Wyoming Area</td>
<td>$19,984,173.64</td>
<td>$861,697.95</td>
<td>4.31%</td>
</tr>
<tr>
<td>Wyoming Valley West</td>
<td>$49,343,833.45</td>
<td>$4,437,621.93</td>
<td>8.99%</td>
</tr>
<tr>
<td><strong>Luzerne County Average</strong></td>
<td>$360,919,671.87</td>
<td>$18,609,544.24</td>
<td>5.16%</td>
</tr>
</tbody>
</table>

*Source: PA Department of Education*
## Appendix C – Fastest Growing High Priority Occupations

<table>
<thead>
<tr>
<th>Profession</th>
<th>Salary (Average)</th>
<th>Training/Education + Experience</th>
<th>% Annual Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lackawanna and Luzerne-Schuylkill WIAs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgical Technologists</td>
<td>$42,180</td>
<td>Postsecondary certificate/associate's degree</td>
<td>40.0%</td>
</tr>
<tr>
<td>Health Technologists/Technicians</td>
<td>$45,070</td>
<td>Postsecondary certificate/associate's degree</td>
<td>33.3%</td>
</tr>
<tr>
<td>Cardiovascular Technologists/Technicians</td>
<td>$51,850</td>
<td>Postsecondary certificate/associate's degree</td>
<td>31.3%</td>
</tr>
<tr>
<td>Medical Secretaries</td>
<td>$43,375</td>
<td>High school/some college + 1 year experience</td>
<td>31.2%</td>
</tr>
<tr>
<td>Physical Therapist Assistants</td>
<td>$42,980</td>
<td>Associate's degree</td>
<td>28.6%</td>
</tr>
<tr>
<td>Plumbers, Pipefitters &amp; Steamfitters</td>
<td>$56,860</td>
<td>High school + apprenticeship</td>
<td>26.9%</td>
</tr>
<tr>
<td>Licensed Practical/Vocational Nurses</td>
<td>$43,080</td>
<td>Postsecondary certificate + license</td>
<td>24.7%</td>
</tr>
<tr>
<td>Diagnostic Medical Sonographers</td>
<td>$64,730</td>
<td>Postsecondary certificate/associate's degree</td>
<td>23.1%</td>
</tr>
<tr>
<td>Radiologic Technologists</td>
<td>$56,170</td>
<td>Associate's degree + certification</td>
<td>22.6%</td>
</tr>
<tr>
<td>Registered Nurses</td>
<td>$58,588</td>
<td>Nursing bachelor's/associate's/diploma</td>
<td>21.2%</td>
</tr>
<tr>
<td>Medical Equipment Repairers</td>
<td>$51,650</td>
<td>Associate's degree</td>
<td>21.1%</td>
</tr>
<tr>
<td>Industrial Machinery Mechanics</td>
<td>$44,560</td>
<td>1-4 yr. apprenticeship/certificate</td>
<td>20.9%</td>
</tr>
<tr>
<td>Emergency Medical Technicians/Paramedics</td>
<td>$32,954</td>
<td>Postsecondary certificate + license</td>
<td>20.6%</td>
</tr>
<tr>
<td>Carpenters</td>
<td>$39,004</td>
<td>Apprenticeship</td>
<td>18.7%</td>
</tr>
<tr>
<td>Computer User Support Specialists</td>
<td>$42,201</td>
<td>Postsecondary certificate/associate's degree</td>
<td>16.7%</td>
</tr>
<tr>
<td>Maintenance Workers, Machinery</td>
<td>$44,916</td>
<td>Postsecondary certificate/associate's degree</td>
<td>14.7%</td>
</tr>
<tr>
<td>Hairdressers, Hairstylists &amp; Cosmetologists</td>
<td>$26,621</td>
<td>Postsecondary certificate</td>
<td>13.8%</td>
</tr>
<tr>
<td>Electricians</td>
<td>$58,060</td>
<td>Postsecondary education/apprenticeship</td>
<td>12.5%</td>
</tr>
<tr>
<td>Construction Equipment Operators/Engineers</td>
<td>$49,386</td>
<td>Postsecondary certificate/apprenticeship</td>
<td>11.4%</td>
</tr>
<tr>
<td>Bus &amp; Truck Mechanics/Diesel Engine Specialists</td>
<td>$40,094</td>
<td>Postsecondary certificate</td>
<td>9.6%</td>
</tr>
<tr>
<td><strong>Lackawanna WIA</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical Technicians</td>
<td>$35,711</td>
<td>Associate's degree</td>
<td>50.0%</td>
</tr>
<tr>
<td>Audio/Video Equipment Technicians</td>
<td>$41,780</td>
<td>Postsecondary certificate/associate's degree</td>
<td>50.0%</td>
</tr>
<tr>
<td>Installation, Maintenance &amp; Repair Workers</td>
<td>$51,204</td>
<td>On-the-job training/apprenticeship</td>
<td>50.0%</td>
</tr>
<tr>
<td>Plant &amp; System Operators</td>
<td>$53,630</td>
<td>Postsecondary education/apprenticeship</td>
<td>50.0%</td>
</tr>
<tr>
<td>Telecommunications Equipment Installers/Repairers</td>
<td>$55,327</td>
<td>Postsecondary education/apprenticeship</td>
<td>28.6%</td>
</tr>
<tr>
<td>Paralegals/Legal Assistants</td>
<td>$36,684</td>
<td>Postsecondary certificate/associate's degree</td>
<td>27.6%</td>
</tr>
<tr>
<td>Machinists</td>
<td>$42,063</td>
<td>Postsecondary education/apprenticeship</td>
<td>25.0%</td>
</tr>
<tr>
<td>Mobile Heavy Equipment Mechanics</td>
<td>$49,434</td>
<td>Postsecondary education/apprenticeship</td>
<td>25.0%</td>
</tr>
<tr>
<td>Heavy &amp; Tractor-Trailer Truck Drivers</td>
<td>$43,737</td>
<td>Postsecondary certificate + license</td>
<td>20.6%</td>
</tr>
<tr>
<td>Healthcare Practitioners &amp; Technical Workers</td>
<td>$73,250</td>
<td>Postsecondary certificate/associate's degree</td>
<td>20.0%</td>
</tr>
</tbody>
</table>
### Medical Records & Health Information Technicians
- **Salary**: $35,230
- **Training**: Postsecondary certificate/associate's degree
- **Percentage**: 15.4%

### Medical & Clinical Laboratory Technologists/Technicians
- **Salary**: $42,060
- **Training**: Postsecondary certificate/associate's degree
- **Percentage**: 14.3%

### Bookkeeping & Accounting Clerks
- **Salary**: $34,796
- **Training**: On-the-job training + certification
- **Percentage**: 10.6%

### Luzerne-Schuylkill WIA

<table>
<thead>
<tr>
<th>Field</th>
<th>Salary</th>
<th>Training</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life, Physical &amp; Social Science Technicians</td>
<td>$46,290</td>
<td>Postsecondary certificate/associate's degree</td>
<td>40.0%</td>
</tr>
<tr>
<td>Occupational Therapy Assistants</td>
<td>$48,205</td>
<td>Associate's degree</td>
<td>37.5%</td>
</tr>
<tr>
<td>Pipelayers</td>
<td>$50,370</td>
<td>On-the-job training/apprenticeship</td>
<td>33.3%</td>
</tr>
<tr>
<td>Crane &amp; Tower Operators</td>
<td>$43,556</td>
<td>On-the-job training/apprenticeship</td>
<td>33.3%</td>
</tr>
<tr>
<td>Veterinary Technologists/Technicians</td>
<td>$35,750</td>
<td>Associate's degree</td>
<td>28.6%</td>
</tr>
<tr>
<td>Cabinetmakers &amp; Bench Carpenters</td>
<td>$37,020</td>
<td>On-the-job training/apprenticeship</td>
<td>28.6%</td>
</tr>
<tr>
<td>Woodworking Machine Operators</td>
<td>$30,930</td>
<td>On-the-job training/apprenticeship</td>
<td>26.7%</td>
</tr>
<tr>
<td>Nuclear Medicine Technologist</td>
<td>$69,910</td>
<td>Postsecondary certificate/associate's degree</td>
<td>25.0%</td>
</tr>
<tr>
<td>Millwrights</td>
<td>$53,450</td>
<td>On-the-job training/apprenticeship</td>
<td>25.0%</td>
</tr>
<tr>
<td>Electrical Power-Line Installers/Repairers</td>
<td>$70,270</td>
<td>Postsecondary education/apprenticeship</td>
<td>25.0%</td>
</tr>
<tr>
<td>Cement Masons &amp; Concrete Finishers</td>
<td>$45,880</td>
<td>Postsecondary education/apprenticeship</td>
<td>24.0%</td>
</tr>
<tr>
<td>Heating/AC &amp; Refrigeration Mechanics/Installers</td>
<td>$48,757</td>
<td>Postsecondary education/apprenticeship</td>
<td>20.9%</td>
</tr>
<tr>
<td>Computer-Controlled Machine Tool Operators</td>
<td>$37,756</td>
<td>On-the-job training/apprenticeship</td>
<td>16.7%</td>
</tr>
<tr>
<td>Environmental Science &amp; Protection Technicians</td>
<td>$48,314</td>
<td>Postsecondary education/apprenticeship</td>
<td>16.7%</td>
</tr>
<tr>
<td>Transportation Security Screeners</td>
<td>$39,310</td>
<td>On-the-job training/apprenticeship</td>
<td>16.7%</td>
</tr>
<tr>
<td>Pharmacy Technicians</td>
<td>$29,900</td>
<td>On-the-job training/apprenticeship</td>
<td>14.3%</td>
</tr>
<tr>
<td>Packaging &amp; Filling Machine Operators</td>
<td>$33,170</td>
<td>On-the-job training/apprenticeship</td>
<td>13.6%</td>
</tr>
<tr>
<td>Automotive Services Technicians &amp; Mechanics</td>
<td>$37,690</td>
<td>Postsecondary certificate + license</td>
<td>7.8%</td>
</tr>
</tbody>
</table>

*Source: PA Department of Labor & Industry*
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References

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