

# The Promise of High-Quality Career and Technical Education:

Improving Outcomes  
for Students, Firms, and  
the Economy

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## Abstract

High-quality Career and Technical Education (CTE) — as distinguished from older models of vocational education — has great potential to improve student educational attainment and worker earnings, as well as outcomes for firms and the U.S. economy.

We begin by making the economic case for high-quality CTE, based on the limited number of young Americans who currently achieve four-year college degrees and the relatively weak employment outcomes of most who do not, as well as relatively high job vacancy rates observed for some American firms and sectors. We describe the current state of CTE in America, in which overall outcomes have become fairly strong but high variation remains in the quality of programs around the country.

We highlight the most important characteristics of high-quality CTE programs — which include being part of career-oriented systems in secondary and postsecondary schools, with access for both youth and adults; an emphasis on strong career options for all students, including those bound for two-year and four-year colleges (to relieve the stigmatization of CTE programs and avoid the “tracking” of CTE students away from college paths); the integration of rigorous academic curricula into CTE, along with the teaching of rigorous technical and employability skills in project-based or work-based settings; professional development for staff and support services for students (especially the disadvantaged or those whose academic preparation has been weak); as well as the use of appropriate assessment tools and accountability based on them. A number of promising CTE models that incorporate these characteristics are described, along with the challenges that limit the extent to which these models have been replicated and scaled; additionally, the limited evidence from rigorous evaluations of high-quality CTE models to date is summarized.

We then discuss a number of federal and state policies that would encourage the expansion of high-quality CTE, along with continuing research and evaluation on their effectiveness.

## Introduction: Why CTE? Why Now?

In general, education reform is a very high-profile issue in the U.S. On a range of topics — such as curriculum development, accountability and assessments, funding, models of school choice, and teacher compensation and professional development — robust debates occur among scholars, practitioners and policymakers that greatly affect K–12 education policy at all levels of government.

In contrast, there is an area of potential reform that has a much lower profile: that of Career and Technical Education (CTE), which was formerly known as vocational education. The Obama administration has proposed some reforms in this area, and conversations on CTE are taking place here in Washington and in most state and local arenas. But these conversations generally have lower visibility and urgency than those on other K–12 reform issues.

In many ways, we think this is unfortunate. In an era when the academic skills and educational attainment of millions of Americans are not sufficient for them to gain high-paying jobs, many commentators think that CTE programs in high school prepare students for neither postsecondary education nor high-paying careers; accordingly, they focus only on narrowly defined academic achievement and participation in higher education as the

important outcomes of education reform. In this view, CTE programs provide students only with low-level technical skills that, at best, will get them low-paying jobs out of high school, rather than the technical skills and academic preparation of the highest quality. Minority and/or lower-income groups remain especially wary of CTE, and fear that these programs “track” their students away from higher education and good career options.

We believe that there is probably some validity to these concerns. Many CTE programs around the country still seem out of date, and do not adequately prepare students for the academic rigor and skill development needed to obtain high skill and high wage jobs that provide career options and growth in the 21st century.

At the same time, we believe that *high-quality* CTE has enormous potential to successfully prepare all Americans — including the disadvantaged — for college and careers. At a time when the U.S. labor market is providing relatively little opportunity for young workers to gain such critical experience and on-the-job training (because of how hard the Great Recession has hit young workers and the relative weakness of the recovery, which is expected to continue for a number of years), CTE might be particularly valuable by providing students with work experience tied to skill-building. In addition, CTE programs at the college level provide opportunities for adults who are entering or reentering the job market to obtain the critical skills in demand by employers.

CTE also has the potential to improve educational outcomes at both the secondary and postsecondary levels — especially the dismal rates of completion we observe for disadvantaged or minority students at both levels. By providing “contextual” learning that is grounded in real-world jobs and careers that students value, and by better preparing them in secondary school for the occupational and technical plans of study to follow in college, CTE can motivate students to take academics more seriously and show the relevance of knowledge in the context of the workplace. Rather than substituting for college, CTE can enhance the opportunities of all students to succeed there and in the labor market, including the disadvantaged and less-prepared students who would otherwise be “steered away” from higher education.

Because of the potentially close ties between local employers and CTE programs, CTE can also help employers find the skilled workers they sometimes have difficulty hiring on their own in growing sectors of the economy. At the state and national levels employers often work with CTE programs to provide resources and to serve in an advisory role to programs. High-quality CTE could thus help generate more such candidates, and generate a more skilled workforce for the U.S. economy as a whole.

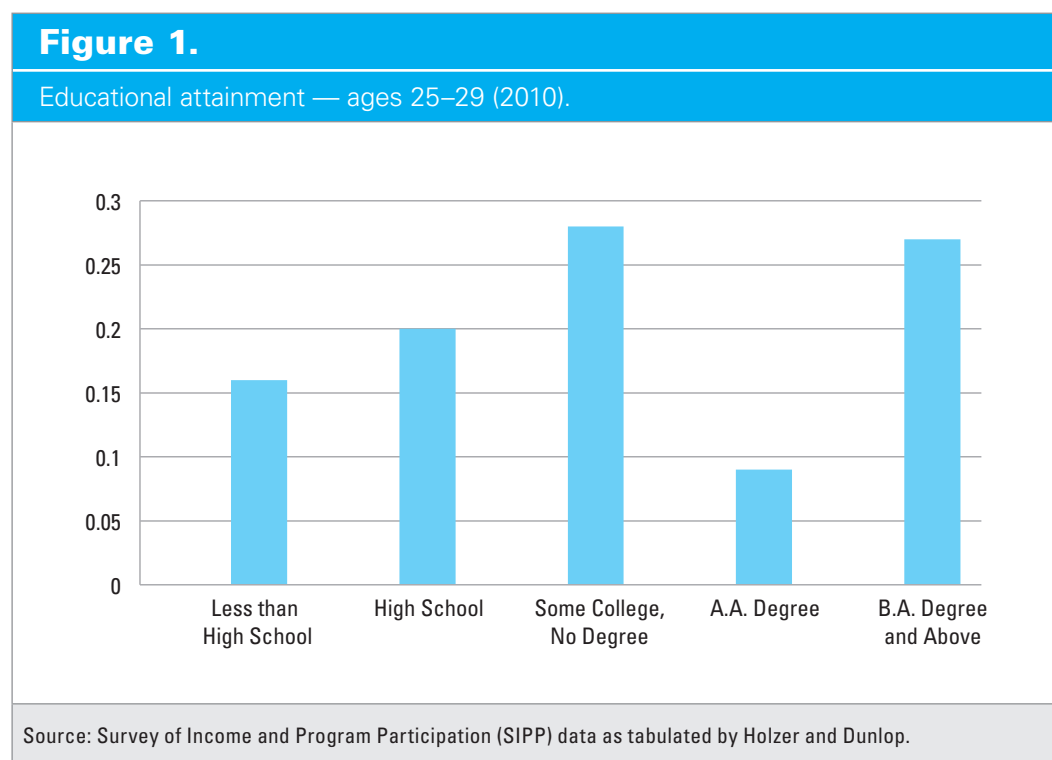
## The Economic Case for Strong CTE

A greater national investment in high-quality CTE programs would likely generate economic benefits for large numbers of American workers, especially those who do not obtain college credentials under current circumstances and therefore suffer from low employment and earnings levels. It would likely also benefit employers in many sectors who have difficulty hiring or retaining highly skilled workers in their firms and industries.

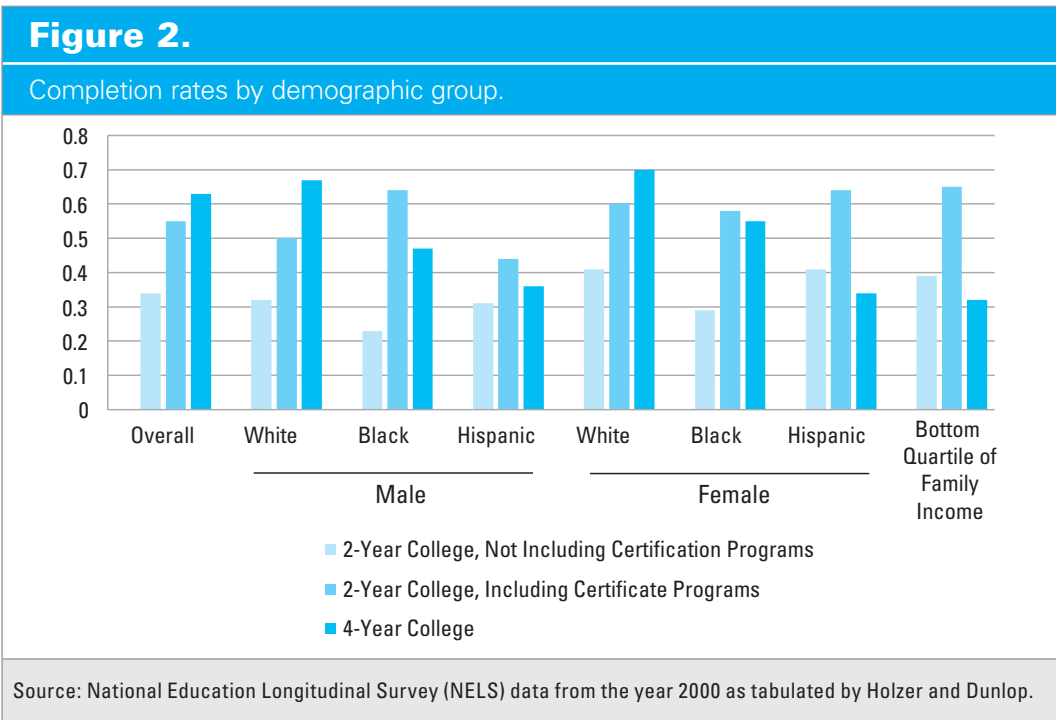
It is, of course, well known that the labor market rewards for obtaining a postsecondary degree or credential have grown a great deal over the past three decades. But many young Americans still do not attend college, at either the two-year or four-year level; and, among those who do, the percentages that complete a program and earn a credential are disturbingly low, especially among disadvantaged populations.

Figure 1 shows the educational levels currently being attained by young Americans (ages 25–29). Just over a fourth of Americans in this age group have earned a B.A. degree or higher. Another 9 percent earn A.A. degrees. This implies that, despite the high labor market rewards for doing so, *nearly two-thirds of our young people still fail to earn a college degree of any kind*.<sup>1</sup>

One reason why degree attainment rates are not higher is that many of those who enter college in the U.S. fail to complete their programs. Figure 2 shows completion rates for American college students. We measure completion rates at two-year colleges, either including or not including those earning certificates at two-year colleges. The results are presented for all youth, and then separately by race and gender or for those who grew up in the bottom quartile of family income.



1. These computations do not include those earning certificates at community colleges among those who have completed a postsecondary degree.

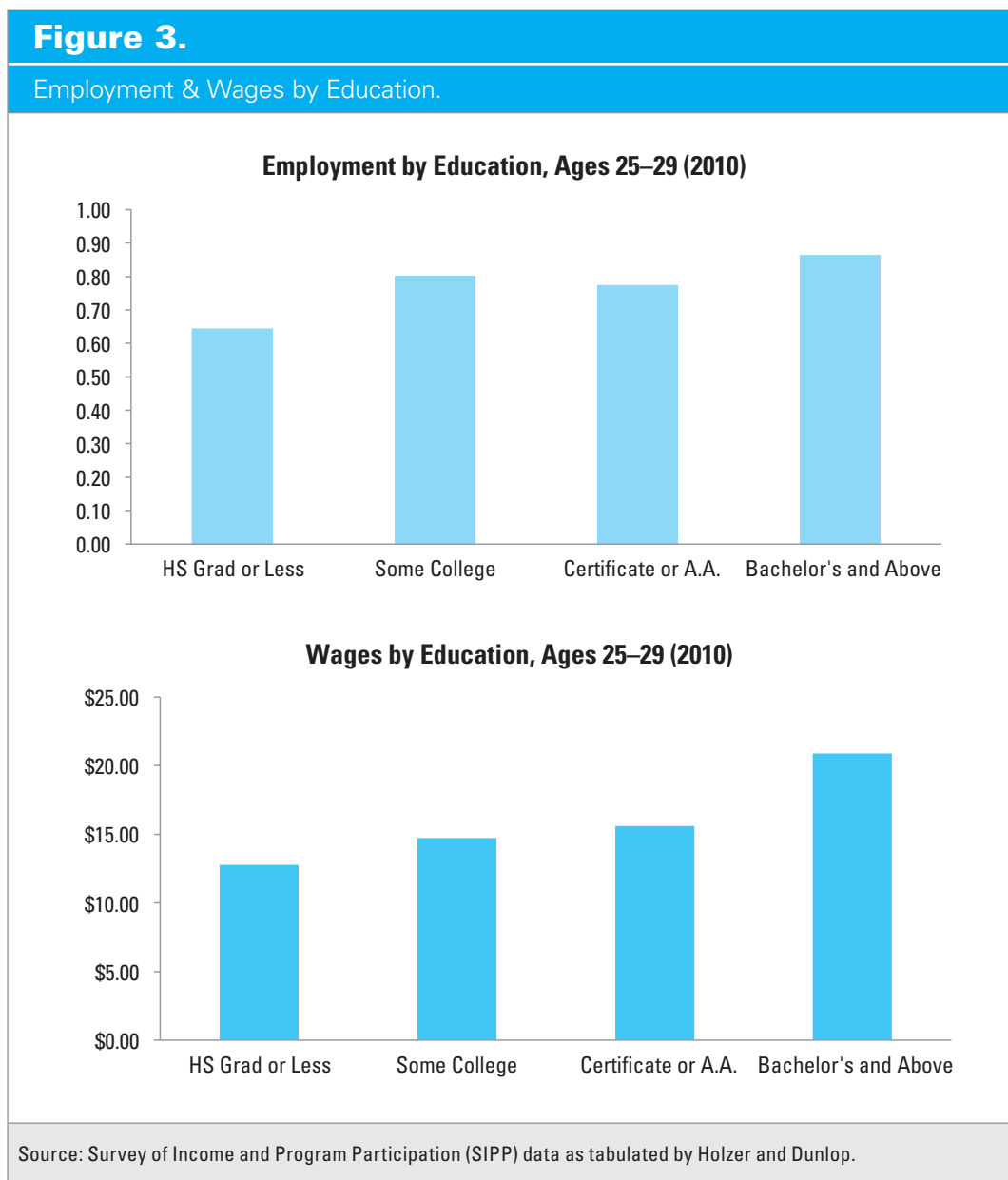


Overall, completion rates at four-year colleges (both public and private) are just over 60 percent, while those at two-year colleges are about 35 or 55 percent respectively (depending on whether we do not count certificates or we do). *But completion rates at four-year schools are much lower among minorities, males, and especially those from lower-income families.* The research literature indicates that there are many reasons why completion rates are low — including poor academic preparation, weak remediation programs, funding issues, a lack of supports and services for those who need them, and resource constraints at “nonelite” institutions. But our knowledge of how to improve these rates remains limited.<sup>2</sup>

What are the current labor market consequences for those who do not obtain college degrees? Figure 3 presents data on average employment rates (out of the population) and hourly wages of young workers by their educational attainment. The results show fairly low employment rates (under 65 percent) and low hourly earnings for those with only a high school diploma or less. Both employment rates and earnings are higher for those with some college, especially a credential of some kind but less than a B.A. Hourly earnings for them average about \$15, which implies annual earnings of about \$30,000 for those who work year-round and full time. On the other hand, the average employment rates for these groups imply considerably less than year-round work, and no doubt many (especially mothers of young children) work less than full time. Only among those with B.A.’s or higher do we see high rates of employment and relatively high hourly earnings. Furthermore, low employment and low wages now tend to reinforce each other for those without college degrees — as low wages make many jobs unappealing and thus reduce youth employment rates, while low work experience then further reduces the potential earnings of many unskilled young workers

2. See Barrow et al. (2013), Baum et al. (2013), Bound et al. (2009), and Haskins et al. (2009).

in these jobs.<sup>3</sup> In other words, the *earnings potential of those who fail to earn a B.A. — which is almost three-fourths of our young people — is currently quite meager, especially for those with no more than high school.*

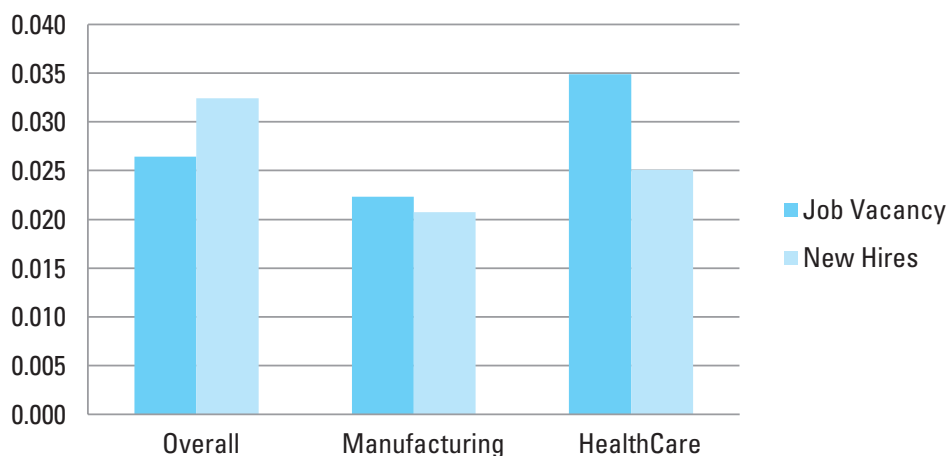


3. Economic models of “labor supply” imply declining employment in response to declining real (or relative) wages, which has been observed in recent years among less-educated men (Juhn, 1992). The importance of either general or specific (to a firm, occupation, or industry) work experience in raising workers’ wages has been frequently documented in the economics research literature (Ehrenberg and Smith, 2009).

These averages mask a great deal of variation in labor market rewards. Among those who earn B.A.'s, significant fractions often earn less than those who have attained A.A. degrees or even certificates in high-paying technical fields.<sup>4</sup>

**Figure 4.**

Average monthly job vacancy & new hire rates by industry, 2012.



Source: Job Opening and Labor Turnover Survey (JOLTS), Bureau of Labor Statistics.

And how well do our secondary and higher education systems meet the needs of American employers? One measure can be found in Figure 4, where we plot job vacancy rates and new hire rates in 2012 for all American jobs and in two particular industries: manufacturing and health care. By comparing job vacancy rates to new hire rates, we can infer something about how long jobs remain vacant in various industries before they are filled.

The data show a monthly vacancy rate of about 2.8 percent, which is somewhat high for a labor market in which 7–8 percent of the labor force remains unemployed.<sup>5</sup> But there is also considerable variation in vacancy rates across industrial sectors. Comparing vacancy and new hire rates across industries indicates that manufacturing and health care have relatively high vacancy rates per newly filled jobs, compared to other industries. This is, indeed, consistent with both data and qualitative evidence from a variety of sources on the difficulties employers in these industries have in filling vacant jobs with skilled employees or in retaining them after hiring.<sup>6</sup>

4. See Carnevale et al. (2010) and Sawhill and Owen (2013).

5. For evidence on the rising job vacancy rate despite the recent period of high unemployment see Elsby et al. (2012) and Daly et al. (2012).

6. See Fletcher (2011) for a journalistic account of the difficulties small manufacturers experience in finding skilled employees. Barnow et al. (2012) describe the many ways employers can respond to tight labor markets and the difficulties entailed in measuring occupational shortages, with highlights from nursing and some other occupations.



How will these numbers trend over time in future years? As we proceed further into the 21st century, these trends will likely be exacerbated. Demand for workers with technical skills, particularly in the STEM fields (science, technology, engineering, and math), are projected to grow at all levels.<sup>7</sup> On the supply side, baby boomers will retire and will be mostly replaced by immigrants, who are concentrated at both the high and low ends of the education spectrum but less so in the middle-skill levels.

In sum, the current U.S. educational system leaves most young people without four-year college degrees and often with relatively weak employment and earnings prospects, while leaving many employers with difficulty filling their vacant jobs. Under these circumstances, it is not surprising that many employers choose to create fewer well paying positions in the U.S., and instead look to technological advances or off shoring to get their work done. In contrast, in Germany and other OECD countries with strong systems of career education among those without university degrees, such employment is more likely to be maintained.<sup>8</sup>

While raising B.A. degree attainment among American youth is an important goal, we are also skeptical that dramatic improvements in these attainments will occur anytime soon. Accordingly, what we need in the U.S. are *alternative mechanisms or pathways through which American workers can gain the skills sought and well-rewarded by employers*, especially for those who will not obtain B.A. degrees. But preparing more students for rigorous study and success in college remains a major goal as well.

## The Current Status of CTE

CTE programs have already undergone some changes nationwide, in response to changes mandated by the reauthorization of the Carl Perkins Act in 2006 (described more fully below) and other state and local developments. These changes are likely reflected in some observed outcomes of CTE students, relative to the overall student bodies, in American high schools.

Table 1 shows these results for CTE students compared to others in U.S. high schools. The data show that reading and math scores of CTE students are above those of high school students overall, as are their graduation and placement rates (though these differences might not be caused by CTE).<sup>9</sup>

But these averages likely reflect a great deal of variation across schools and districts in the quality of CTE programs and their students. High-quality CTE has great potential to expand opportunities for all students and adults, including the disadvantaged, and generate highly skilled and career focused employees for business, industry, and the economy. To ensure this, it is important to identify concerns about some CTE programs and confront them head-on.

7. See Carnevale et al. (2011). Strong future demand, relative to supply, in “middle-skill” jobs, which are defined as those requiring more than general high school but less than a bachelor’s degree, is documented by Holzer and Lerman (2007).

8. See Rinne and Zimmerman (2012).

9. “Placement” includes gaining employment or participation in the military within a specified time period. These data do not prove positive impacts of CTE on outcomes because they do not control for “selection” factors — in other words, the characteristics of those who enter CTE relative to those who do not.

<b>Table 1.</b>				
Outcomes of U.S. High School Students: CTE v. All				
Year	Reading — CTE	Reading — All	Math — CTE	Math — All
Academic Performance on State Assessments (Students meeting proficiency):				
2009–2010	71.97	70.40	62.56	57.50
2010–2011	72.38	71.60	63.46	62.10
Graduation and Placement Rates:				
Year	CTE Students	All Students	Placement Rates-CTE	Placement Rate -All
2009–2010	91.85	82	82.91	Not Available
2010–2011	91.32	82	81.84	Not Available
Source: Consolidated Annual Report U.S. Department of Education OVAE.				

But too many CTE programs in high schools and colleges around the country today still appear to fit the stereotype of having out-of-date practices that prepare students neither for college nor for well paying careers. In many cases, teachers and equipment have likely not kept up with labor market changes, curricula have not been revised nor integrated with better academic programs, and the highest academically performing students avoid CTE classes and concentrations. We acknowledge that the economy and budget cuts can lead to programs not having sufficient funds to sustain and improve programs, especially equipment. At the same time, some innovative models of high-quality CTE have been generated that can prepare all students for both.

Below we review the characteristics of the best models for high-quality CTE and list a number of them, and we also review the research evidence to date. In general:

- The best CTE programs do not “track” students away from college, but in fact help prepare students for postsecondary studies;
- They can attract the best academic students and challenge them with rigorous academic and technical work;
- They provide opportunities for students of all socioeconomic backgrounds and racial/ethnic groups, for both males and females, and in urban and rural as well as suburban settings; and
- They do not force young people to specialize in a particular career path too early, but instead allow much flexibility and choice and provide a good mix of both general and career-specific skill development.<sup>10</sup>

10. The clearest statement of these ideas in the past few years appear in Symonds et al. (2011), which discusses “career and technical” programs internationally. Among the key features of successful CTE programs that prepare students for learning and the workplace are: extensive employer engagement, ample apprenticeships, and other opportunities for work-based learning, comprehensive career counseling, high-quality teachers, and comprehensive youth policies. See also Nancy Hoffman (2013).

## The Characteristics of High-Quality CTE

Before considering specific program models, we review the components of high-quality programs that (ideally) characterize most or all such programs.

### 1. Career-Oriented Educational Systems

When students leave high school, if the pre-K–12 *system* has served them well, they will be both college and career ready. This means their education has given them the academic skills to be prepared for their next step after high school, whether they will move on to higher education immediately or into the workforce. Rather than existing as separate programs, CTE programs need to be an integral part of the secondary school systems and recognized as such at the district and state levels.

High-quality CTE is not limited to programs in high school. It also includes effective programs at both two- and four-year colleges and at workplaces (like internships and apprenticeships). High-quality CTE should be accessible to students and adults at different stages of life, and together these options should constitute a coherent educational system. Students, as either youth or adults, should be able to move seamlessly across different parts of this system while obtaining high-quality education and work experience in all parts.

The traditional “silos” in the education world that often disconnect CTE from broader academic and labor market programs should be broken down as well. No longer can education and learning be designed to assign students to “tracks” that prepare them only for a single opportunity after graduation.

Critical to the success of any CTE program, or any career-oriented system, in preparing students for the workplace and related further education is the involvement of local, state, and/or regional employers. Most programs at the school/district level have advisory committees that may be mandated for state program approval. The committees are made up of employers who have a direct interest in ensuring that students have access to quality programs that will meet the needs of the local economy. Collaboration with local and state workforce development agencies and organizations can involve business in program planning, and may also include postsecondary and other educators. But the actual levels of business involvement, and their influence on academic programs, vary from one location to the next around the country.

### 2. Strong Options for All Students

High-quality CTE options need to be accessible to secondary and postsecondary students of all levels of academic ability. Students need to be presented with different options and provided with the guidance to plan and select a pathway that prepares them not for college or career but for both, and with excellent information to make their decisions along the way. And no decision should ever lock a student into a particular path and prevent changes to his or her plan.

Creating high-quality programs that provide students with the opportunity to be prepared for both college and the workplace would keep CTE from being stigmatized as a program only for the academically less-talented. It would also provide important career skills to even the highest ability students. The information on the skill and knowledge levels required to be successful in a range of career pathways would be useful to all students, even those who move on to liberal arts colleges afterwards.

### **3. Rigorous Academic Curricula**

To ensure that CTE curricula are rigorous academically, they should be consistent with the rigorous state standards in core content areas, including the Common Core State Standards that most states are now implementing. The National Association of State Directors of Career Technical Education Consortium (NASDCTEc) has developed a set of Common Career Technical Core standards, which apply the Common Core State Standards to CTE curricula. CTE programs can thus play a key role in ensuring that all students achieve their state's standards.

What really distinguishes CTE from more traditional academic programs is the strong emphasis placed on “contextualized learning,” in which even academic material is presented in the context of projects or workplaces. As much as possible, high-level academic courses and material should be integrated into project-, work-, or community-based learning. Many CTE administrators and researchers have found that contextualized learning generates more motivation to study, a better understanding of traditional academic content, and more successful pedagogy, especially for students who have been less successful in traditional classrooms.

CTE programs can also provide direct pathways into postsecondary education. For instance, NASDCTEc and the College Board have shown how Advanced Placement® (AP®) courses are relevant to concentration in a range of “career clusters” (which we define more fully below). Dual and concurrent enrollment options (where students can receive college credit while still in high school), tests accepted by postsecondary institutions that demonstrate competency, and articulation agreements between secondary and postsecondary schools can provide students with the opportunity to show that they have completed college-level work.<sup>11</sup> All of these options support postsecondary achievement and have been built into the best CTE programs to date.

### **4. Rigorous Technical Skill Development**

CTE programs are designed to meet the technical skills and knowledge required by business and industry. States and local districts can adopt/adapt/develop standards and curricula in collaboration with local businesses. Students must demonstrate competency in these skills in order to be competitive in the workplace and to move to more advanced postsecondary programs. Successful demonstration of these competencies can lead to apprenticeship opportunities, industry-recognized certifications, as well as associate and bachelor's degrees and beyond. Work-based learning also provides important on-the-job training and experience that enhances the technical and employability skills that further the career readiness of CTE students. It is important that these standards reflect a level of technical skill that will prepare students for good-paying careers and not just lower-level jobs.

11. The appendix provides more information on a program used by the U.S. Department of Education to encourage the formation of statewide articulation agreements between secondary and postsecondary institutions in particular industries.

“Programs of study” must be carefully aligned with the skill requirements of particular occupations within the 16 “careers clusters” of major industries that are now widely used in CTE.<sup>12</sup> If the disconnect is too great between the skills in the school and the workplace, students who choose to go straight into the workforce will find they do not have the skills to be a successful employee. This is true whether the student is coming from a high school program, a community college, or a four-year college program. Partnerships between CTE programs and local employers (as well as community-based institutions) can help ensure that any credentials provided in CTE at secondary and postsecondary schools are recognized by the industry and will have labor market value.

### **5. Employability Skills**

The third leg of a rigorous CTE program that promotes career readiness is the development of employability skills to be successful in the workplace. These skills are critically important for labor market success. While technical and academic skills may result in being hired, the employability skills are necessary to keep the job and advance in a career. These skills include communication, reasoning, problem-solving, the ability to work in teams, and other skills and behaviors deemed essential by most employers. Having appropriate opportunities for work-based learning and work experience more generally in CTE are the best ways for these skills to be developed.

### **6. Professional Development for Teaching Staff and Leaders**

To ensure that both the curricula taught and pedagogical techniques used by CTE teachers are fully up-to-date, professional development for CTE teachers is important. Many CTE teachers come straight from business and industry. They usually have the necessary technical skills and understand the employability skills demanded in the workplace, but they may need support to integrate academic skills into their instruction, and they may also need support in developing pedagogical skills that are developmentally appropriate for the age group they are teaching. Administrators, academic teachers, and counselors would also benefit from a greater understanding of the purpose and design of each CTE program and the content that students are exposed to and measured on. In this way students can receive high-quality guidance and support, while their teachers can better understand how to contextualize their content to real life situations.

### **7. Support Services for Students**

Support services are critically important for all students, and especially for disadvantaged students or those with weaker academic preparation, if they are to handle more rigorous academic and technical work. Such services can include contextual remediation, small learning communities, career counseling and information, and involvement with Career and Technical Student Organizations (CTSOs), a list of which is included in the appendix. CTE instructors tend to have a strong influence on their students and, in practice, serve as mentors and counselors. They also are the students’ connections to the employers in the community. Providing these instructors with training and resources to support their students

12. The 16 career clusters, as defined by the National Career Clusters Framework of NASDCTEc, include Agriculture, Food, and Natural Resources; Architecture and Construction; Arts, A/V Technology, and Communication; Business Management and Administration; Education and Training; Finance; Government; Health Science; Hospitality and Tourism; Human Services; Information Technology; Law, Public Safety, Corrections, and Security; Manufacturing; Marketing; Science, Technology, Engineering, and Math; and Transportation, Distribution, and Logistics.

academically, and in goal-setting and developing educational and career plans, should be advantageous to students who may be struggling to determine their next step.

## 8. Assessment and Accountability

In the current era of standards-based education with accountability, it is critically important that assessment tools measure all of the relevant skills — technical, academic, and employability — that CTE students are developing. Assessments must serve multiple purposes, such as improving student learning and teacher/school accountability. The assessments also need to indicate to employers and postsecondary institutions that the student has successfully demonstrated the skills to be successful in both academia and industry. To accomplish this, CTE programs now tend to use both technical skill assessments, based on industry standards, and the state’s academic assessments for accountability. Furthermore, postsecondary programs are also beginning to be held accountable for placement in the workplace or further education.<sup>13</sup> Educational institutions and federal or state departments of labor should work together to facilitate the sharing of data in order to accurately report the success of CTE programs at all levels.

## Promising Models and Practices

A number of academic models of high-quality CTE have been developed and implemented around the country. These incorporate many of the characteristics listed above — such as rigorous academic content, active engagement with employers and industry, work-based learning, and integration of academic and technical material. While most of these models have not yet been rigorously evaluated, we regard all of them as promising, based mostly on the scale they have achieved and the outcomes data we see among student participants.

Some of the models below appear at the level of individual schools, and they constitute either “within-school” or “whole-school” reforms. Others have been implemented at the district or state level. These and other examples are described more fully in the appendix to this report.

Among the most promising of these models are the following:

### 1. Career Academies

According to the National Career Academy Coalition, a membership organization of career academies, they are schools within schools that link students with peers, teachers, and community partners in a structured environment that fosters academic success. The career academy concept has three key elements:

- A small learning community (SLC);
- A college-prep sequential curriculum with a career theme; and
- An advisory board that forges partnerships with employers, higher education institutions, and the community.

13. Many states are beginning to explore performance-based subsidies to higher education institutions, where performance measures include both degree completion rates and employment outcomes after graduation. See National Governors Association (2010–2011).

Teams of teachers (grades 9–12 or 10–12) work across several academic and technical subjects, grouping students in cohorts for these classes and following a program of study. The advisory board helps to identify a sequential set of experiential components that show students the applications of academic subjects to the career and college field and deliver work-based learning experiences (e.g., shadowing, community service, mentoring, internships, and apprenticeships). The career theme can be any of the 16 in the national “career clusters” taxonomy or variations on these (e.g., “green” industries, health sciences, media arts, etc.).

Career Academies offer one of the few models that has been rigorously evaluated (using random assignment methods) and shows strong impacts on participant outcomes, as we note below. The academies have proliferated in recent years. By some counts, as many as 5,000–7,000 exist nationwide, though there is some variation in their fidelity to the original model.

Academies have also been incorporated into broader models, like the Small Schools of Choice program in New York City and the Talent Development model in several dozen high schools around the country.<sup>14</sup> These efforts suggest that Career Academies can be replicated and scaled in many different contexts.

## **2. “High Schools That Work” and “Technology Centers That Work”**

High Schools That Work (HSTW) and Technology Centers That Work (TCTW) are initiatives established by the Southern Regional Education Board (SREB). As whole-school reforms, they focus on redesigning high schools and technology centers with the goal of having all students be college and career ready at graduation. The programs are based on the belief that most students can master complex academic and technical concepts if schools create an environment that encourages students to make the effort to succeed. The initiatives have the same 10 key practices on which the work is based, which stress the integration of rigorous academic material into technical training and project-based learning.

## **3. Linked Learning**

Linked Learning is an approach where whole-school CTE is implemented at an entire school district level in California. Formerly it was referred to as Multiple Pathways. Each school in Linked Learning districts chooses from a variety of models, including Career Academies and California Partnership Academies, and each school focuses on a major California industry. Within that industry, all students focus on a self-selected career pathway. Schools engage each student in project-based classroom activities and small learning communities. The approach incorporates four essential components for every Linked Learning student: a) a college- and career-preparatory academic core curriculum; b) a comprehensive career technical core curriculum that is integrated with the academic curriculum; c) a series of work-based learning opportunities; and d) a comprehensive range of student support services.

14. Small Schools of Choice is a program in New York City where large comprehensive high schools were replaced by smaller schools with themes into which students sorted themselves. At least a few of these schools were either Career Academies or others with strong career themes. Talent Development is a program that begins in the 9th grade with intensive student support in small communities; many of them then offer Career Academies to students, beginning in grade 10. See Kemple et al. (2005) and Bloom and Unterman (2012).

#### 4. Apprenticeship Programs and Schools

Apprenticeship programs combine on-the-job training and more formal related instruction, often at postsecondary institutions.<sup>15</sup> While there may be age and high school diploma requirements to qualify for a full apprenticeship program, many states have established pre-apprenticeship programs. Partnerships are organized between industry associations representing employers and schools at the secondary or postsecondary level. Apprenticeship Schools in several states are postsecondary institutions that usually grant A.A. degrees and also provide instruction in a particular career cluster or for a particular industry — such as the one in Newport News, VA that specializes in shipbuilding skills, or those in South Carolina that focus primarily on information technology (IT) careers.

#### 5. Illinois Pathways Initiative and Learning Exchanges

Every state receiving federal funding for its CTE programs through the Perkins Act (which we describe more fully below) must now establish programs of study with standards for academic quality and linkages to key industry sectors and clusters of jobs. Among the states where progress has been particularly noteworthy is Illinois, whose Learning Exchanges create partnerships between employers and schools in nine (mostly STEM) career clusters and industries. Other states where CTE options have been broadly developed include Massachusetts, where each school district offers CTE options on their own or as part of a regional network, and where CTE students must meet the same rigorous academic requirements statewide as those preparing for college; and Tennessee, where employers (such as Volkswagen) have generated partnerships with community colleges and Tennessee Technical University for programs of study closely related to major career clusters.

### Challenges that Limit Expansion of the Best Models

While many promising or proven CTE models can be found, there are a number of challenges that might limit our ability to replicate and scale these efforts nationwide.

As noted earlier, many traditional CTE programs remain in place in schools across the country. In many cases where CTE is weak and out-of-date, it is very likely that the academic programs are also weak. Because of their poor reputations, they continue to be avoided by the highest academically performing students, and therefore stigmatize those who do participate.<sup>16</sup> “Tracking” away from pathways to college appears to be a reality in many such programs. And this kind of reputation makes it much harder to introduce newer and higher-quality CTE models among students (and their parents) who are used to thinking of CTE as “vocational education” and being second-rate academically.

A number of other challenges also limit our ability to rebuild CTE. For instance, public funding environments will be tight for the foreseeable future at all levels of schooling. Since successful CTE often requires high-cost equipment and professional development, it will be more difficult to implement nationwide. In addition, there continues to be some tension between the desire for strong general academic preparation and the focus on specific careers

15. See Lerman (2010).

16. To be a state-approved CTE program (eligible for Perkins funding) the CTE program must be tied to business and industry expectations and preparing students to be successful in the workplace, not at a basic level that is a “dead-end” job. But enforcement of such provisions tends to be uneven, and public perceptions might also lag behind developments in some places.



that CTE often embodies. Teachers find it difficult to achieve the integration of academic and more technical material across the curriculum. To deal with this problem, the Alabama legislature passed a \$50 million bond this year to improve equipment and materials in CTE programs. But such legislative action is quite rare, as most states facing serious budget issues have cut their education funding.

Access to professional development and support for teachers and counselors who are interested in the best models of CTE can be limited due to a variety of other factors. High-quality professional development for CTE teachers does not take place in most traditional school settings. Key to the success of CTE is the ability of teachers to maintain up-to-date industry skills and knowledge, which is hard to do in public education settings.<sup>17</sup> Achieving consensus about what constitutes “career readiness” has been more elusive than reaching it on “college readiness.” And CTE remains “siloeed” from general academics within many, but not all, state and local educational institutions and agencies around the country, and within federal agencies (like the U.S. Department of Education) as well. Because of the close ties between CTE and workforce development, it is critical that local schools and workforce boards, as well as educational and labor agencies at the federal and state levels, work together across organizational lines, though progress on this front has also been limited.

Under these circumstances, replicating successful efforts and bringing them to scale nationally will require a greater commitment of attention, time, and resources from the educational community than we have seen to date.

## What Does Rigorous Research Show?

Most of the promising models listed above have descriptive data showing impressive improvements for students in both academic outcomes as well as employment. But most have not been rigorously evaluated, using either random assignment or credible statistical methods that control for the quality of who is selected into different kinds of programs.

Still, a wide body of research on CTE programs now exists, including a small number of more rigorous studies.<sup>18</sup> What this literature generally shows is the following:

- On average, CTE programs in high school clearly improve the employment and earnings of participants for several years afterward, especially among disadvantaged students.
- CTE programs might also increase high school graduation rates (though the evidence has been mixed).
- Certificate programs and associate degrees in “occupational” areas generate positive earnings gains relative to those with no postsecondary credential.
- More recent CTE enrollees in high school are taking more rigorous math, English, and science courses than in the past.

17. See Deming et al. (2012) for discussion of the greater incentives among for-profit colleges to respond to labor market changes and to stay up-to-date than exist among many public institutions.

18. This research is summarized in the Final Report of the National Assessment of Vocational Education (NAVE), (U.S. Department of Education, 2004). Ryan (2001) reached similar conclusions when he reviewed studies of vocational education across the industrial world.

The lack of clear evidence on CTE's broad impacts on academic outcomes to date has been troubling. But more recently, rigorous evidence that focuses on specific programs and more disadvantaged populations has been generated, and the estimated impacts are mostly positive on education as well as employment outcomes. For instance, Cellini (2006) finds positive effects of Tech-Prep programs (the forerunners of more recent career pathways and programs of study) on high school completion and enrollment in two-year colleges, though she finds a modest negative effect on enrollment in four-year colleges. Neumark and Rothstein (2005) and Neumark (2007) find positive effects of a number of School-to-Work programs on postsecondary attainment as well as employment outcomes for youth, especially those with the lowest chances of attending college.<sup>19</sup> A recent study of apprentice programs that uses non-experimental methods finds significant positive impacts of these programs on earnings as well (Reed et al. 2012).

A well-known evaluation of Career Academies (using random assignment methods) finds very strong positive and long-lasting effects on the earnings of young men, especially those who are considered "at-risk." Similar evaluations of Talent Development and New York's Small Schools of Choice program, which incorporate Career Academies in some cases, show positive effects on education outcomes as well.<sup>20</sup>

Finally, random assignment studies of some of the most recent innovations in CTE show positive effects on academic outcomes. Specifically, Castellano et al. (2012) find positive effects of career pathways and programs of study on student attendance and achievement among 9th and 10th graders in three urban high school districts; while Stone et al. (2012) find positive effects of new curricula that integrate the teaching of math into such programs of study on math achievement among CTE students.

In summary, the evidence on overall CTE impacts has generally shown positive effects on employment and earnings but less clear effects on educational attainment. In contrast, more recent studies using rigorous methods and focusing on more disadvantaged populations and more recent programmatic innovations find positive effects on both sets of outcomes. A good deal more of such research is clearly needed for us to better understand the impacts of these recent innovations.

## Federal and State Policies: Can They Be More Helpful?

Given the uneven quality of CTE programs today for a variety of reasons, as well as the promise indicated by high-quality programs, how can federal and state policy encourage the replication and scaling of the best models — especially in fiscal environments where resources will likely remain very tight at the federal and state levels?

19. Among the programs reviewed in Neumark (2007) are co-ops, mentoring, internships, and apprenticeships. They use data from the National Longitudinal Survey of Youth (1997 cohort), and estimate fixed school effects to control for the statistical biases associated with selection. Cellini used similar data and family fixed effects to deal with these problems.

20. See Kemple (2008) for the latest evidence on Career Academies. Evidence on Small Schools of Choice and Talent Development from random assignment studies can be found in Bloom and Unterman (2012) and Kemple et al. (2005) respectively.

The primary policy lever for CTE at the federal level is the Carl D. Perkins Career and Technical Education Act (Perkins), which was last reauthorized in 2006 and which has driven some of the positive trends in CTE quality over the past several years.<sup>21</sup> Perkins distributes roughly \$1 billion per year to states and localities to fund operation of CTE programs. Since this amounts to less than 10 percent of CTE operating funds, the federal financial role in CTE is clearly a limited one. On the other hand, the level of funding is large enough to affect CTE policy and practice around the country, and to potentially generate stronger interest in reform among practitioners and leaders in the field. In practice, because the federal funds are critical for state and local programs, the Perkins Act drives a lot of the decision making and program development at the state and local levels.

In 2012, the Obama administration issued its reform proposal for the reauthorization of Perkins, “Investing in America’s Future, A Blueprint for Transforming Career and Technical Education,” which was designed to spur innovation to improve the rigor of both technical and academic skills, accountability, and linkages to well paying jobs in the labor market. Some of the funding for states and localities would be distributed through competitive grants rather than the full formula funding used in this proposal today. CTE national organizations have expressed some support for the broader goals of the proposal but are wary of having formula funds turned into competitive ones. They also urge the administration and Congress to allocate sufficient funds to expand opportunities for students in CTE.<sup>22</sup>

Perkins and other federal funding mechanisms (such as the Investing in Innovation grants, or I3) should be used to support expansion of the most promising innovative models along with high-quality evaluation research on their effectiveness. These vehicles could be particularly useful for funding efforts to replicate and scale the most promising models.

The federal government could also play a more supportive role when it comes to devising assessments to measure college and career readiness as well as accountability systems. Funding for support services (like teacher development or student remediation) could be expanded as well, particularly to ensure that rigorous CTE becomes a vehicle through which disadvantaged students can gain access to good-paying jobs. And federal mechanisms such as Title IV funding rules could be used to generate more consistent quality assurance of CTE programs, particularly at the postsecondary level.<sup>23</sup>

21. The 2006 version of the Perkins Act defines CTE as follows:

The term “career and technical education” means organized educational activities that (A) offer a sequence of courses that (i) provides individuals with coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in current or emerging professions; (ii) provides technical skill proficiency, an industry-recognized credential, a certificate, or an associate degree; and (iii) may include prerequisite courses (other than a remedial course) that meet the requirements of this subparagraph; and (B) include competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of an industry, including entrepreneurship, of an individual.

22. See U.S. Department of Education (2012) for the Obama proposals and Strauss (2013) for review and critiques of those proposals.

23. In a very recent OECD report, Kuczera and Field (2013) argue that Title IV regulations for collegiate receipt of federal aid in the Higher Education Act could require more and better articulation agreements between secondary and postsecondary CTE programs, more workplace training in postsecondary programs, more use of appropriate assessment tools in determining admission to these programs, and more monitoring of the labor market value of credentials generated in postsecondary CTE programs.

We recognize that the fiscal capacity at the state level is very limited and has been steadily decreasing over the past several years. Much progress has been made over the past decade, and there is more that needs to be done. Additional resources could help spur the development and/or implementation of better assessment and accountability tools, build greater instructional capacity in this area, and encourage more meaningful partnerships between private industry and CTE programs. Technical assistance could be provided to local schools and districts seeking to implement promising and innovative models. The states could adopt/adapt/develop curricula that better integrate the teaching of academic, occupational, and employability skills. Models of secondary and postsecondary collaboration to determine the types of certification that are available to CTE students could be encouraged, and educational agencies could be given more incentive to work more collaboratively with federal and state departments of labor to ensure the relevance of CTE instruction to the needs of the job market.<sup>24</sup>

At both the federal and state levels, it is critically important to encourage the breakdown of CTE silos within schools and agencies. Wherever possible, CTE programs should be integrated with broader academic programs at schools. Federal encouragement of high-quality models and innovation should not be limited to Perkins alone, but should also be included in other legislative vehicles such as the Elementary and Secondary Education Act (ESEA), Higher Education Act (HEA) and the Workforce Investment Act (WIA). All of these should be used to generate high-quality education and training systems that help prepare both youth and adults for the good-paying jobs of the present and future. Today, we have a unique opportunity to move this agenda forward, as all of these programs are in the reauthorization process.

## Conclusion and Recommendations

It seems clear that the best models of CTE offer great promise as a way of generating many more workers with the skills needed to prosper in the 21st century. But much needs to happen so that the most promising models can be brought to scale and high-quality CTE can become widely available to American students.

In particular:

- CTE programs should provide all students the opportunity to explore career paths and to gain the skills necessary to be successful in both higher education and the workplace. The silos that currently separate CTE from college-preparatory programs of study need to be broken down; this would remove from CTE the stigma of being a program only for those not college-bound. The leaders of local and state education agencies should be fully invested in these programs, and should come to view them as integral parts of their efforts to promote both college and career readiness among students.

24. A recent report of the College and Career Readiness Center at the American Institutes for Research (Brand et al. 2013) calls on states to enhance both the college and career readiness of students emerging from their secondary CTE programs by developing alternative certification options for well-qualified industry experts to become CTE instructors, enhancing professional development of instructors more generally, aligning classroom content standards with those of key career clusters, soliciting feedback on program quality from workforce stakeholders, and encouraging school districts to provide “collaborative learning communities of CTE and general education teachers” in a flexible manner.

- Curricula that integrate the teaching of rigorous academic skills into the building of technical skills and applied learning, and that generate pathways to postsecondary education and careers in high-growth sectors, must become the norm rather than the exception in CTE. The resources needed to accomplish this transition should be provided as well.
- Rigorous and high-quality CTE should be available to students from all backgrounds, especially the disadvantaged; and those with weaker early educational preparation should have these opportunities as well. To keep these students competitive in rigorous programs requires a range of supports, including remedial activities that are also contextualized and opportunities to be part of Career and Technical Student Organizations (CTSOs). Professional supports for teachers, counselors, and administrators must be provided as well.
- The involvement of business is also essential for the development of programs that are high quality and also relevant to our economy. Stronger links with business leaders from firms and sectors that typically have difficulty hiring and retaining high-quality workers would be beneficial to them and also to students and the overall economy.
- Assessment tools and accountability systems need to be developed for both college and career readiness in CTE. To date, our assessment tools and accountability systems for academic skills are more advanced than those for technical and employability skills, which then impedes the full development and expansion of high-quality CTE in an educational system that places so much weight on accountability.
- While much uncertainty remains about exactly what works in this area, more innovation and rigorous evaluation should be encouraged by federal and state governments. Models that appear to work best should be replicated or adapted and brought to scale.
- Federal, state, and local policies should help ensure the alignment of CTE at the secondary and postsecondary levels with one another and with the needs of industry. Policies should help make high-quality CTE available to adults as well as younger students, and thus create an educational system in which access to high-quality education and good-paying careers are broadly available to all. In this way CTE programs can help meet the needs of all students and ensure the economic vitality of individuals, firms, and the country.

None of this will occur quickly; but, over time, high-quality CTE offers great promise as a means of improving student achievement and employment outcomes for all Americans. The time to move ahead with more active development of these educational opportunities is now.



## References

- Barnow, B. S., Trutko, J., & Piatak, J. S. (2012). *Occupational labor shortages: Concepts, causes, consequences, and cures*. Kalamazoo, MI: W. E. Upjohn Institute for Employment Research.
- Barrow, L., Brock, T., & Rouse, C. E. (2013). Postsecondary education in the United States: Introducing the issue. *The Future of Children, 23*(1).
- Baum, S., Kurose, C., & McPherson, M. (2013). An overview of American higher education. *The Future of Children, 23*(1).
- Bloom, H., & Unterman, R. (2012). Sustained positive effects on graduation rates produced by New York City's small public high schools of choice. New York: MDRC.
- Bound, J., Lovenheim, M., & Turner, S. (2009). Why have college completion rates declined? An analysis of changing student preparation and collegiate resources. Working Paper No. 15566. Cambridge, MA: National Bureau of Economic Research.
- Brand, B., Valent, A., & Browning, A. (2013). How career and technical education can help students be college and career ready: A primer. Washington, DC: The College & Career Readiness & Success Center, American Institutes for Research.
- Carnevale, A. P., Smith, N., & Melton, M. (2011). STEM. Washington, DC: Center on Education and the Workforce, Georgetown University.
- Carnevale, A. P., Smith, N., & Strohl, J. (2010). Help wanted: Projections of jobs and educational requirements through 2018. Washington, DC: Center on Education and the Workforce, Georgetown University.
- Castellano, M., Sundell, K., Overman, L. T., and Aliaga, O. A. (2012). Do Career and Technical Education programs of study improve student achievement? Preliminary analyses from a rigorous longitudinal study. *International Journal of Educational Reform, 21*(2).
- Cellini, S. R. (2006). Smoothing the transition to college? The impact of Tech-Prep programs on educational attainment. *Economics of Education Review, 25*(4).
- Daly, M., Hobijn, B., Şahin, A., & Valletta, R. G. (2012). A search and matching approach to labor markets: Did the natural rate of unemployment rise? *The Journal of Economic Perspectives, 26*(3).
- Deming, D. J., Goldin, C., & Katz, L. F. (2012). The for-profit postsecondary school sector: Nimble critters or agile predators? *The Journal of Economic Perspectives, 26*(1).
- Ehrenberg, R. G. & Smith, R. S. (2008). *Modern labor economics: Theory and public policy* (10th ed.). New York: Prentice Hall.
- Elsby, M. W. L., Hobijn, B., Şahin, A., & Valletta, R. G. (2011). The labor market in the Great Recession — An update to September 2011. *Brookings Papers on Economic Activity, fall*, 353-71.
- Fletcher, M. (2011, February 2). Why does Fresno have thousands of job openings — and high unemployment? *The Washington Post*. Retrieved from <http://www.washingtonpost.com>.
- Haskins, R., Holzer, H., & Lerman, R. (2009). Promoting economic mobility by increasing postsecondary education. Washington, DC: Economic Mobility Project, Pew Charitable Trusts.
- Hoffman, N. (2011). *Schooling in the workplace: How six of the world's best vocational education systems prepare young people for jobs and life*. Jobs for the Future. Cambridge, MA: Harvard Education Press.

- Holzer, H. J., & Dunlop, E. (2013). Just the facts, ma'am: Postsecondary education and labor market outcomes in the U.S. Washington, DC: Center for the Analysis of Longitudinal Data in Education Research (CALDER), American Institutes for Research.
- Holzer, H., & Lerman, R. (2007). America's forgotten middle-skill jobs: Education and training requirements for the next decade and beyond. Washington, DC: The Workforce Alliance.
- Juhn, C. (1992). Decline of male labor market participation: The role of declining market opportunities. *The Quarterly Journal of Economics*, 107(1).
- Kemple, J. J. (2008). Career Academies: Long-term impacts on work, education, and transitions to adulthood. New York: MDRC.
- Kemple, J. J., Herlihy, C., & Smith, T. J. (2005). *Making progress toward graduation: Evidence from the Talent Development high school model*. New York: MDRC.
- Kuczera, M., & Field, S. (2013). *A skills beyond school review of the United States*. OECD Reviews of Vocational Education and Training. Paris, France: OECD Publishing.
- Lerman, R. (2010). Apprenticeship in the United States: Patterns of governance and recent developments. In E. Smith and F. Rauner (Eds.), *Rediscovering apprenticeship: Research findings of the International Network on Innovative Apprenticeship (INAP)* (pp. 125–136). Berlin, Germany: Springer-Verlag.
- National Governors Association. (2010-11). *From information to action: Revamping higher education accountability systems* (Chair's Initiative). Washington, DC: NGA Center for Best Practices.
- Neumark, D. (Ed.). (2007). *Improving school-to-work transitions*. New York: Russell Sage Foundation.
- Neumark, D., & Rothstein, D. (2005). Do school-to-work programs help the "forgotten half"? IZA Discussion Paper 1740. Bonn, Germany: The Institute for the Study of Labor.
- Owen, S., & I. V. Sawhill. (2013). Should everyone go to college? Washington, DC: Brookings Institution.
- Reed, D. et al. (2012). An effectiveness assessment and cost-benefit analysis of registered apprenticeship in 10 states. Oakland, CA: Mathematica Policy Research.
- Rinne, U., & Zimmerman, K. F. (2012). Another economic miracle? The German labor market and the Great Recession. *IZA Journal of Labor Policy*, 1, 1–21.
- Ryan, P. (2001). The school-to-work transition: A cross-national perspective. *Journal of Economic Literature*, 39(1).
- Stone, J. et al. (2007). Rigor and relevance: A model of enhanced math learning in Career and Technical Education. Louisville, KY: The National Research Center for Career and Technical Education.
- Strauss, V. (2013, April 10). Reaction mixed in ed world to Obama budget proposal. *The Washington Post*. Retrieved from <http://www.washingtonpost.com>.
- Symonds, W. C., Schwartz, R. B., & Ferguson, R. (2011). Pathways to prosperity: Meeting the challenge of preparing young Americans for the 21st century. Cambridge, MA: Graduate School of Education, Harvard University.
- U.S. Department of Education. (2004). *National assessment of vocational education: Final report to Congress*. Washington, DC: Office of the Under Secretary Policy and Program Studies Service.



## APPENDIX: PROMISING MODELS

While much needs to be done to raise the level of rigor and relevance of CTE programs there are places where high-quality programs and practices exist. This appendix is intended to present a sampling of promising work being done across the country.

### Career Academies: National Academy Foundation (NAF)

The NAF is a network of career-themed academies that open doors for underserved high school students to viable careers. For more than 30 years, NAF has refined a model that provides young people access to industry-specific curricula, work-based learning experiences, and relationships with business professionals. NAF academies focus on one of five career themes: finance, hospitality and tourism, information technology, engineering, and health sciences. More than 4,600 business professionals volunteer in classrooms, act as mentors, engage NAF students in paid internships, and serve on local advisory boards. During the 2012-13 school year 62,000 students attended 546 NAF academies across 39 states, D.C., and the U.S. Virgin Islands. In 2012, NAF academies reported 97 percent of seniors graduated.

Among the 2013 NAF Distinguished Academies are the Academies of Hospitality and Tourism, Information Technology, and Finance at A. J. Moore Academy in Waco, Texas. Unlike many other NAF academies that operate within larger public schools, the A. J. Moore Academy is a wall-to-wall academy. It offers all five of the NAF career themes, three of which have earned “Distinguished” status. A. J. Moore’s advisory board is structured so that one board supports all of the academies. It is made up of more than 60 business, education, and community leaders who represent professional fields across all academy themes. The wide range of professions represented maximizes the output of the board and shows students and the community the benefits of collaborating across career fields. Each member of the advisory board serves on one of four committees including: Work-Based Learning, Curriculum Support, Public Relations and Fundraising, and Scholarships. The board has been incredibly successful in implementing positive programming, internships, and fundraising events, and in increasing membership and support.

<http://www.NAF.org>

### Southern Regional Education Board Initiatives: High Schools That Work (HSTW) and Technology Centers That Work (TCTW)

*HSTW* has been working with high schools since 1987 to ensure all students have a strong grounding in English, mathematics, science, and the humanities OR in English, mathematics, science, and career technical studies. Built on a solid academic foundation, HSTW has grown from the initial 28 pilot sites in 13 states to its current size of more than 1,200 sites in 30 states and the District of Columbia. Students have four core subject areas in a broad career pathway that is linked to pathways beyond high school or an academic concentration based on interest.

[http://www.sreb.org/page/1139/key\\_practices.html](http://www.sreb.org/page/1139/key_practices.html).

*TCTW* was adapted from the HSTW model in 2007. This school improvement model is designed to assist shared-time technology centers in preparing graduates for postsecondary studies and employment in high-demand, high-wage, high-skill fields. Whether the schools are technical high schools, technology centers, career centers, or career and technology centers, they all have a common purpose: to provide high-quality career and technical (CT) studies to high school students. Students may attend these centers for only a portion of the school day, week, or year while completing the balance of their studies at their home high school, or they may attend full time, receiving both academic and technical instruction at the center. A new initiative of the SREB is Advanced Career (formerly Preparation for Tomorrow). Partnering with 10 states and industry leaders, SREB and the consortium are developing a four-course, academically rigorous and standards-based career technical sequence in areas of high-demand, high-skill, and high-wage occupations that are important to that state's economy and opportunity. Program areas include Aerospace Engineering (AL), Innovations in Science and Technology (AR), STEM Education and Training (KS), Advanced Manufacturing, Informatics (KY), Food and Nutritional Sciences (NE), Entrepreneurship, Global Logistics (NJ), Project Management (NC), Automated Materials Joining Technologies, Health Informatics (OH), Clean Energy Technology (SC), and Energy and Power (WV).

[http://publications.sreb.org/2009/09V19\\_TCTW\\_Enhanced\\_Brochure.pdf](http://publications.sreb.org/2009/09V19_TCTW_Enhanced_Brochure.pdf)

## Center for Advanced Technology Studies (CATS)

The Center for Advanced Technical Studies (CATS) opened its doors to 650 students in August 2013 in Lexington and Richland School District Five, SC. CATS provides students within the district the opportunity of school choice by remaining enrolled in their high school and taking their major course of study at the Center by attending a 3-hour block of instruction every other day either in the morning or afternoon. The student body this past year included 140 honors and advanced placement students with nine Merit Scholar Finalists. The projected enrollment in 2013-14 is 1,100 with the honors and AP level students increasing to 300. Students enroll in a program of study that supports their interest and career pathway and are identified by their area of study.

### Center's Vision, Mission, and Core Values

The Center is designed to prepare every student to graduate college and career ready, a good problem solver, enter the global workforce, and find success as a contributing citizen. The essence of the mission is to offer high-wage and high-tech programs that meet global academic and technical standards, integrate academic and technical studies, and provide to students a seamless transition through a pre-K–20 educational pathway with dual credit opportunities, and furnish every student with a foundation for success after high school graduation. The core value of the Center's purpose is to create a learning environment where both the teachers and students are free to explore and take calculated risks, and where failure is embraced as part of problem solving and critical thinking.

### Design of the Curriculum

The designs of the programs enable the students to be innovative learners and problem solvers. The intent of the learning environment is to transfer the responsibility of learning to the students, who become the owners of their ideas built around course content that is learned through project-driven activities. All students are required to complete a capstone project as part of their major (completer program). This learning strategy provides both

teachers and students the opportunity to use their imagination, creativity, and innovation to develop potential solutions to problems in health care, energy, animal science, aerospace engineering, film production, construction industry, advanced manufacturing, and in the 3D and virtual design of products.

### Instructional Design

Teachers are facilitators of learning, guiding students to learn through discovery using the flipped classroom model of instruction. Science theories and research-based solutions are experienced in a contextualized learning environment through student-based projects with students learning in teams, conducting research and conceptualizing solutions to current problems and discovering solutions to problems yet to be identified.

<http://www.lexrich5.org/CATS.cfm>

### Linked Learning: Porterville Unified School District (PUSD) in California

The vision of the PUSD is that “PUSD students will have the skills and knowledge to be prepared for college and career and to make a positive impact in a dynamic global society.” As the district works to realize this vision it has become part of Linked Learning. Each of its five high schools focuses on one or two pathways in:

- Digital Design and Communications
- Law, Justice, and Education
- Engineering
- Performing Arts
- Multimedia and Technology
- Environmental Science
- Business and Finance
- Health Sciences
- Precision Agricultural Technology

Each of these schools (or academies) then includes the following factors: small learning communities, college preparation, a focus on career, academic rigor blended with technical relevance, project-based/hands-on learning, and work-based learning opportunities.

<http://dnn.portervilleschools.org/>

### Employability Skills: The Weldon Cooper Center in Virginia

The University of Virginia’s Weldon Cooper Center surveyed employers across the state to identify the important skills needed for success in the workplace. These skills are assessed on the Virginia Workplace Readiness Assessment which is one of three assessments approved

for the Standard Diploma. This year (2013) almost 40,000 students took the assessment in Virginia. In addition, Nevada has adopted these same skills and the corresponding assessment. The 21 skills are grouped around three areas:

- **Personal Qualities and People Skills**

Positive Work Ethic	Integrity
Teamwork	Self-Representation
Diversity Awareness	Conflict Resolution
Creativity and Resourcefulness	

- **Professional Knowledge and Skills**

Speaking and Listening	Reading and Writing
Critical Thinking and Problem Solving	Health and Safety
Organizations, Systems, and Climates	Lifelong Learning
Job Acquisition and Advancement	Time, Task, and Resource Management
Mathematics	Customer Service

- **Technical Knowledge and Skills**

Job-Specific Technologies	Information Technology
Internet Use and Security	Telecommunications

Source: <http://www.coopercenter.org/demographics/about-workplace-readiness-skills-project>

## Career and Technical Student Organizations (CTSOs): SkillsUSA

CTE programs have strong, related CTSOs at the national, state, and local levels. These organizations can be integral parts of the instructional program and supplement the learning taking place within schools. They also have strong business involvement and support. CTSOs provide students with leadership opportunities at the school, district, state, national, and international levels. The skills, knowledge, and disposition necessary for success in the workplace are taught and reinforced in CTSOs. Students compete in local, state, national, and international arenas. With strong business sponsorship, the skills learned by students directly reflect the skills demanded by business and industry.

An example of the inclusion of employability skills within the curriculum and provided through CTSOs is the extensive lessons and assessments, including related professional development, provided by SkillsUSA. This organization serves teachers and high school and college students who are preparing for careers in trade, technical, and skilled service occupations, including health occupations. With more than 50 companies contributing \$25,000 or more at the national level, the commitment to ensuring that students are career ready is strong. With support and involvement of these organizations, SkillsUSA has developed two premier employability skills curricula — The Professional Development

Program (PDP) for high school students and the Career Skills Education Program (CSEP) for college/postsecondary students.

CSEP is grouped into five modules:

- Personal Growth
- Communication and Technology
- Career Focus
- Professional Growth
- Portfolio Development

Each of the 49 online lessons deals with a different topic of concern to the working individual. In addition to text and hands-on interactive graphics, each lesson contains a number of activities to help you develop and test comprehension.

The program covers goal setting, communications, time management, résumé writing, job interviewing, financial management, teamwork, networking, portfolio development, and much more.

<http://www.skillsusa.org/educators/programs.shtml>.

A list of the Career and Technical Student Organizations with links is provided at:

[http://cte.ed.gov/links/career\\_and\\_technical\\_student\\_organizations.cfm](http://cte.ed.gov/links/career_and_technical_student_organizations.cfm)

## U.S. Department of Education Programs of Study Project

The Promoting Rigorous Career and Technical Education Programs of Study Through Statewide Articulation Agreements (RPOS) project assesses the potential contribution that comprehensive, well-formulated programs of study can make to students' educational attainment and post program success. The U.S. Department of Education provided grants to six states to design programs of study that include statewide articulation agreements between secondary and postsecondary institutions. The states and their areas of focus are:

- Indiana — Transportation, Distribution, and Logistics
- New Hampshire — Finance and Health Science
- South Carolina — Science, Technology, Engineering, and Math
- Hawaii — Marketing
- Nebraska — Transportation, Distribution, and Logistics
- Florida — Health Sciences and Manufacturing, focusing on Biotechnology

The project included the implementation of rigorous programs of study and an investigation of the impact on students who successfully complete the RPOS compared to those who do not. The states participating in the development of these statewide models are:

- Arizona — Education and Training Cluster
- Kansas — Manufacturing Cluster
- Maryland — Transportation, Distribution, and Logistics Cluster
- Montana — Architecture and Construction Cluster
- Utah — Health Science Cluster
- Wisconsin — Manufacturing Cluster
- The states in both of these groups are designing model programs that include:
  - Legislation and Policy
  - Partnerships
  - Professional Development
  - Accountability and Evaluation Systems
  - College and Career Readiness Standards
  - Course Sequences
  - Credit Transfer Agreements
  - Guidance Counseling and Academic Advisement
  - Teaching and Learning Strategies
  - Technical Skill Assessments

This comprehensive development of programs will hopefully provide states and local districts with models that incorporate the key components of high-quality programs for the first time.

<http://www.ed.gov/news/press-releases/us-department-education-awards-six-state-grants-promote-rigorous-career-and-tech>



