The Skills Imperative

How Career and Technical Education Can Solve the U.S. Talent Shortage
ICW’s Mission

The Institute for a Competitive Workforce (ICW) is a non-profit, non-partisan, 501(c)3 affiliate of the U.S. Chamber of Commerce, promoting the rigorous educational standards and effective job training systems needed to preserve the strength of America’s greatest economic resource, its workforce.

Through its events, publications, and policy initiatives—and drawing upon the Chamber’s extensive network of corporate members—ICW connects the best minds in American business with the most innovative thinkers in American education, helping them work together to ensure the nation’s continued prosperity.

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Overview

Jobs requiring middle and high levels of education and skills will continue to dominate America’s economy. These jobs require at least a high school education; more likely, though, they require some level of postsecondary education and/or training, resulting in a two- or four-year degree, an industry-recognized credential, a certification, or some other terminal indication of mastery. Yet the United States continues to lag internationally in high school graduation rates. According to a 2008 report from the Organization for Economic Cooperation and Development (OECD) comparing national K–12 systems, the U.S. graduation rate is just below 70%, ranking it 21st out of 29 OECD countries.¹

Therefore, the challenge is not just getting students through high school, but also effectively engaging them during high school so they continue to postsecondary education and effectively manage their careers.

Today, career and technical education (CTE), formerly known as vocational or skilled trades education, presents the business community with an actionable agenda for solving growing workforce shortages. Although not well understood, CTE includes diverse sets of knowledge, skills, and abilities that employers in many industries need to fill their fastest growing jobs. In well-designed models of CTE—models that integrate rigorous academics with relevant, project-based learning drawn from the real world of work—students have lower dropout rates, higher test scores, higher graduation rates, higher postsecondary enrollment rates, and higher earnings than students who do not enroll in CTE offerings.²

Well-designed CTE programs are:
- Focused on making students more postsecondary education- and career-ready
- Rigorous
- Relevant
- Project-based
- Effective

The goal of the education system should be to enable the delivery of achievement, not just in academics, but in overall career-readiness. That means more learning environments based on everyday, real-world, project-based learning that effectively prepares all students for success in both college and careers. While some recognition of these realities appears to be taking hold on the local and regional levels in the United States, there remains significant room for greater understanding. Likewise, national or even state data on CTE education are severely lacking.

The time has come to use CTE as a change agent in reshaping the American workforce.
The Economic Context

The United States is at a tipping point in the nature of the relationship between education, talent development, and the success of our nation’s economy. “America stands at the dawn of a conceptual economy in which insight, imagination, and ingenuity determine competitive advantage and value creation.” In this economy, “rewards go to those who know what to do with knowledge, information and technology. This new system…favors judgment, intuition, creativity and insight” across more and more jobs, at all levels of the economy, and in every industry.

The very nature of America’s economy has changed dramatically over the past decade and will continue to do so. In a knowledge-based, innovation-driven era, different knowledge, skills, and abilities will be required for workers and employers to be successful. The new workplace demands higher order technical skills, as well as universally necessary 21st century skills, such as the ability to learn on one’s own; to gather and synthesize information; to work effectively in teams; to solve problems; to communicate through multiple means; and to manage time, money, and responsibilities.

Jobs that can be classified as high- or middle-skill jobs will continue to dominate the U.S. economy for the foreseeable future (see figure 1). These occupations, which include health care technician, construction, transportation, production, and installation/repair work, make up nearly half of the U.S. labor market. According to the Department of Labor, 90% of the nation’s fastest growing jobs require some form of postsecondary education. With this projected job growth, the U.S. labor market will continue to need workers who can combine technical capabilities with essential 21st century skills.

It is critically important that the United States meet this need by raising high school graduation rates and increasing the percentage of adults who pursue postsecondary education and training leading to a degree, a credential, a certificate of mastery, or some other indication of mastery of critical knowledge, skills, and abilities. It is also paramount that local communities ensure that what is being taught at the high school level, at community colleges, and throughout postsecondary institutions is aligned with the workforce needs of local businesses. To produce the workforce of the future, our country’s education system needs to be closely linked with its primary consumer—the business community—and must be able to adapt with the evolving economy.

Figure 1: High and Middle Skill Jobs Dominate the Economy
The Workforce of the Future

Overall, the level of educational attainment of America’s working-age adult population is leveling off, just when more highly skilled workers are needed. As seen in figure 2, following a nearly 20% rise in the percentage of U.S. adults over age 25 with more than a high school degree between 1980 and 2000, there will be only a 4% rise in that percentage between 2000 and 2020.

In addition, approximately 30 million Americans over age 16 do not have a high school credential, including one-third of foreign-born adults and more than 40% of Hispanics. Every year, more than a million U.S. high school students do not graduate with their class. These high school dropouts face long odds of landing a good-paying job, and they earn less than their counterparts with diplomas. And the cost to the U.S. economy is staggering. The Alliance for Excellent Education has estimated that the approximately 1.2 million students who should have but did not graduate with the class of 2007 will cost the nation nearly $329 billion in lost income over the course of their lifetimes.

Demographic shifts will only compound the problem. According to a 2007 report, America’s Perfect Storm, a larger share of workers will have minimal reading skills in 2030 than today. The combination of the baby boom retirement and a large wave of less educated immigrants moving into the workforce will result in a downward shift in reading and math skills.

In an address to the National Governors Association and Achieve Inc., in February 2005, Microsoft founder Bill Gates highlighted the importance of education and the dire state of American’s talent pipeline: “Training the workforce of tomorrow with the high schools of today is like trying to teach kids about today’s computers on a 50-year-old mainframe. It’s the wrong tool for the times. Our high schools were designed 50 years ago to meet the needs of another age. Until we design them to meet the needs of the 21st century, we will keep limiting—even ruining—the lives of millions of Americans every year.”

Significant effort will be required to better prepare America’s future workforce, as well as current workers who are going through job dislocations and career changes, for the education and skill needs of our current and emerging economy. It is a challenge that requires innovative solutions, not patchwork tinkering.
Principles of Career and Technical Education

At its best, CTE connects challenging technical courses with demanding academics, preparing students for a range of careers. This type of crosscutting, integrated design creates multiple pathways for students to explore and pursue after high school, allowing them realistic opportunities to go on to either a two- or four-year educational institution (or both) or to enter the job market with a wide range of in-demand skills already in hand.

As part of the reauthorized Carl D. Perkins Career and Technical Education Improvement Act of 2006, federal resources must ensure that CTE programs are academically rigorous and up-to-date with the needs of business and industry. The federal contribution to CTE, about $1.3 billion annually, supports innovation and expands access to quality programs. CTE programs that purposefully focus on teaching academic knowledge and skills in the context of career education help students achieve academic success, experience increased earnings and improved employment outcomes, reduce dropout and absentee rates, and achieve postsecondary success.8

Employability skills become an integral part of the career and technical curriculum by engaging students in project- and inquiry-based learning, internships, school-based enterprises, and career and technical student organization activities. By working directly with business and industry to design the curricula and projects used in classrooms, and by offering students at the secondary and postsecondary levels the opportunity to gain industry-based certifications and/or dual credit in a wide range of career fields such as engineering, computer science, health care, and business management, CTE programs benefit both students and their future employers.9

There is some evidence that CTE is a growing presence in our nation’s high schools. In 2005, virtually all high school students chose to take at least one CTE course, and more than 60% elected to take three or more. Furthermore, the choice to take CTE courses has not had a negative impact on the number of courses taken in the science, technology, engineering, and math (STEM) disciplines: compared with graduates in 1990, high school graduates in 2005 took 4.3 units of English (up from 4.1), 3.8 units of math (up from 3.2), and 3.4 units of science (up from 2.8).10 There is growing recognition that CTE should not be viewed as competing with STEM, and in fact should be taught together.

As outlined in the Overview, well-designed CTE programs address five areas:

1. Postsecondary education and career readiness
   Effective CTE is always about both college and career; it is never a choice between the two.

“Career and technical education continues to surface as a tested strategy to engage students in their learning and prepare them for postsecondary education and the complex world of the 21st Century.”

Betsy Brand, Executive Director
American Youth Policy Forum
As shown in figure 1, only 22% of the job openings between 2004 and 2014 are expected to be low-skill; fully 78% of America’s jobs over the foreseeable future will require some type of certification, credential, postsecondary degree, or long-term training.

Example: The Gulf Power Academy in Pensacola, Florida prepares students for college and career. The academy’s graduating students have a significantly higher success rate on industry pre-employment tests than is typical for job applicants without the academy experiences. Of all the academy’s graduates since it opened in 2001, more than 90% are certified by the National Center for Construction Education and Research, and 100% are test-qualified for entry-level work in the industry. Yet even though so many graduates are ready for work, and could become employed right away, more than 50% opt to enroll in college following graduation.

2. Rigorous
Both the academic and technical aspects of CTE programs are rigorous. The academics within CTE programs of study are standards-based and meet all requirements of both federal and state law, and the technical programs are designed around industry-developed skill standards and certifications, where appropriate. “Truly rigorous learning—both academic and nonacademic—involves deep immersion in a subject over time, with learners using sophisticated texts, tools, and language in real-world settings and often working with expert practitioners who serve as mentors.”11 This is an apt description of today’s CTE.

Example: The New Market Skills Center, a regional technical school serving 26 high schools in western Washington, has created a new program of study for the energy sector that uses a set of skill standards developed by industry subject matter experts that are also being used by community colleges and power companies.

3. Relevant
The content and curriculum demonstrate to students how their studies are related to real careers and occupations, and offer long-term and realistic opportunities for self-and family-sustaining success. Increasingly, CTE offerings are determined and reviewed on a regular basis to ensure that they are aligned with the economic and workforce outlook for the region, state, or nation.

To help build the relationship between CTE and emerging careers and economic drivers, the National Career Technical
Education Foundation has identified 16 career clusters for the purpose of organizing knowledge around industries and careers central to today’s economy. Each of the 16 career clusters organizes academic and occupational knowledge and skills into a coherent course sequence and identifies pathways from secondary schools to postsecondary training, whether through certification programs, apprenticeships, two- or four-year colleges, graduate schools, or other postsecondary education and training offerings.

Each career cluster is headed by an association or organization that is responsible for championing that particular cluster and convening a National Advisory Committee for input, revision and updates on the Knowledge and Skills Statements, as well as other cluster-related business. The National Advisory Committees comprise leaders from education, business and industry, government entities, associations, and labor.

Example: The Coachella Valley Economic Partnership and the region’s three school districts have identified the career clusters critical to economic success, and have established career academies in the healthcare/allied health; alternative energy/clean technology; and arts, media, and entertainment clusters.

4. Project-based
Effective CTE engages students in learning knowledge and skills through an extended inquiry process structured around complex, authentic questions and carefully designed products and tasks. Research indicates that project-based learning enhances students’ learning by fostering higher order thinking, problem-solving ability, collaboration skills, and the ability to engage complex processes.

Example: The Ford Motor Company has supported educational initiatives throughout its history. Today, the Ford Motor Company Fund supports both Ford Partnership for Advanced Studies (Ford PAS) and Ford Next Generation Learning Communities, two mutually beneficial initiatives that combine academically rigorous studies with business-oriented curriculum and community stakeholder engagement in the high school redesign process.

5. Effective
Research indicates that well-designed CTE programs lead to impressive results. For example, a study of career academies in the San Francisco Bay Area found that students enrolled in career academies had the following successes compared with non-academy students in the same schools:

- Grade point average is nearly 0.5 of a grade higher.
- Test scores are 30 to 40% higher.
- Drop-out rate is 50% lower.
- 8.2% more continue to two- and four-year colleges.
- 15.9% more go to four-year colleges.
A recent report from nonpartisan research organization MDRC shows higher earnings for graduates of career academies. Other research shows that carefully integrating academic and technical curricula leads to higher test scores if the curricula are designed and implemented well. Specifically, this research focused on pairing CTE teachers with math teachers who identified the math content within the CTE subjects. These teacher teams then developed joint lesson plans to teach the math within the occupational context. Students who were taught the integrated curriculum significantly outscored the control group on two tests of math ability.

Engaging in the CTE Movement
Chambers of commerce, associations, and employers that wish to support this approach to career and technical education have a wealth of opportunities to do so. Most important, investigate existing CTE initiatives in your region to ensure that your contributions will support and extend existing programs, not conflict with them. Further, it is essential to ensure that business-education partnerships are mutual and constructive in both practice and tone—too often, good intentions are wasted because of challenges in the partnership between education and the private sector.

By definition and design, CTE has strong interaction between education and industry. The business community can engage in CTE activities in any number of ways, but most commonly in four areas:

- Programs
- Students
- Teachers
- Policies

Here is a look at strategies and actions under each of those four areas:

**Programs**

*Curriculum, Content, and Equipment*

Many CTE programs have established industry advisory groups to ensure that the curriculum and content are up-to-date and aligned with current and anticipated knowledge, skills, and abilities. The advisory groups also verify that CTE programs are using the most modern equipment and materials available to ensure that students are learning with the most appropriate and relevant resources.

**ACTION:** Volunteer to review existing CTE curricula to ensure that they are imparting the knowledge, skills, and abilities required in today’s workplace.
Classroom Instruction and Interaction
To a large degree, CTE programs are as effective as they are because of the meaningful presence of industry representatives in the classroom, helping to bring real-world applications of educational experiences directly to students.

ACTION: Volunteer to spend time in the classroom sharing how course content is directly applicable to careers and postsecondary education requirements.

Career Awareness
CTE programs provide a valuable opportunity for employers to introduce themselves to a group of interested and motivated students and to broaden awareness of their organization’s career opportunities for students.

ACTION: Ensure that your business or industry is represented at job and career fairs, and that students develop a deeper understanding of the opportunities afforded by your industry.

Project/Business Plan Competitions
Many CTE programs include formal opportunities for students to complete a cap-stone project showcasing their abilities. Business representatives often serve as judges for these efforts.

ACTION: Volunteer to help design and review CTE-related competitions in order to provide a real-world perspective, to give appropriate feedback to students, and to encourage continued achievement.

Students
Job Shadowing, Internships, and Apprenticeships
Students too often lack opportunities to learn about a career or industry in a way that applies their educational experiences and to expand their knowledge, skills, and abilities. Job shadows often are just a day or less in length; internships are often a number of weeks to a semester in length; apprenticeships are many months or years in length, and lead to a formal credential or certification.

ACTION: Work with your local school system to welcome students into your worksite in whatever way you can and provide structured learning opportunities for them.

Tutoring, Coaching, and Mentorships
Before students are ready for internships or work, they can use structured opportunities from business leaders or subject matter experts from industry to assist them with their educational achievement, postsecondary education and training decisions, and career considerations. Working with students in a one-on-one capacity can help guide their development.

ACTION: Work with a select number of students each year as they progress through their coursework, internships, and other projects.

Teachers
Externships
Professional development of teachers directly affects their instruction in the classroom. Externships are a way to expand awareness among teachers, counselors, and program
administrators about their knowledge of the industries and careers. These externships may be anywhere from a few hours during the school year to a daylong, weeklong, or summer-long program during off-school hours.

**ACTION:** Provide structured learning opportunities for teachers in your workplace to expose them to current work practices, requirements, and connections to the classroom.

*Career-to-Teacher Initiatives*

Teacher development programs, such as Transition to Teaching at IBM, allow exiting employees to continue serving their industry by becoming certified teachers. These employees can bring real-world work experience to the classroom while helping to train and recruit new employees into high-demand jobs.

**ACTION:** Allow and encourage employees in your company to take sabbaticals to teach, or investigate launching a formal program that puts experienced workers in front of the classroom.

**Policies**

State and local chambers and their business members have tremendous influence on a wide range of educational issues. Speaking out for, and supporting the development of, strong CTE programs based on promising practices, sound research, and the needs of emerging economies is one of the most important roles chambers and employers can embrace.

**ACTION:** Develop a clear policy statement from your chamber calling for strong CTE programs throughout the entire school system. Form local quick-response teams to mobilize grassroots action if CTE programs are jeopardized due to funding shortages or political issues or new programs are being discussed. Support local surveys that indicate current and future employment needs.
Case Studies on CTE Engagement

Chamber Leadership
Greater Santa Ana, California, Business Alliance and the High School Inc. Academies

At Santa Ana Valley High School, the largest and oldest high school in Orange County, California, business and education leaders have forged a unique partnership to better prepare students for the road ahead after graduation. The Greater Santa Ana Business Alliance led this effort in response to research findings over a 10-year period, revealing a major technical skills gap in the local economy. The result, High School Inc. Academies (HSI), was a market-driven institution that opened in the fall of 2007. HSI, one of the first jointly administered public/private schools in the state, will eventually enroll as many as 2,700 Santa Ana students who will receive their education through a real-world, competency-based curriculum.

HSI has its own board of directors—seven members total, with four seats belonging to the business community—that reports directly to the District Board of Education. A council of business leaders directs curriculum planning and was instrumental in developing the six learning academies that serve as a basis for organizing instruction in the school and preparing students for careers in Orange County’s top growth industries: automotive/transportation, engineering/construction, global business, health care, manufacturing, and new media.

The academies also provide concurrent fulfillment of state graduation requirements through integrated academic and technical classes, and the opportunity for students to receive class credits at local colleges and trade schools. The program is being rolled out year by year, starting with the freshman class of 2007–08. By the 2010–11 school year, all four grades in the high school will be immersed in the career academies structure. The years break down this way:

- **Freshman year** – Students receive significant instruction on what career academies are, how they work, and what their options as students are.
- **Sophomore year** – Students are placed into their choice of one of the six academies and experience instruction through field trips, integration into some pre-existing classes, and enrolling in some extra sessions that are not integrated into the regular school day, such as before- and after-school programs and club meetings.
- **Junior year** – Students acquire more specific knowledge, skills, and abilities for their respective pathways.
- **Senior year** – Students engage in high-level field learning trips, mentorships, part-time jobs, and more industry-related curriculum in general.

“What we’re looking at doing is achieving some important but incremental reform that is comfortable for the current structure.”

Michael Metzler, President & CEO
Greater Santa Ana, California, Business Alliance
The curriculum includes field trips to industry facilities, equipment demonstrations by managers and foremen, internship opportunities, job shadowing, and part-time jobs, especially during the senior year. Overall, 75% of the knowledge, skills, and abilities taught throughout the four years is transferable between the six academies, while about 25% is specific to a single academy. Because of the structure, HSI board and industry leaders feel they have sufficient means of affecting the curriculum from year to year in response to the changing demands of the economy. By graduation, HSI students will be fully prepared to choose one of several career options: higher education at a college, university, or trade school; immediate employment in a chosen industry; or establishment of a start-up business as a proprietor or partner.

In another twist, HSI has contracted with a private firm to set up an internal career assessment department to perform ongoing assessments, similar to those concurrent with job interviews. This strategy results in better tracking of students’ performance and opportunities during their time in high school.

HSI’s innovative approach to high school education includes greater accountability and incentives for teachers, and a management team that routinely assesses and adjusts the curriculum to reflect trends in student achievement, labor market conditions, and community welfare. The Business Alliance credits both the school’s superintendent and principal for their willingness to integrate the cultures of business and education for the good of the future workforce and the region’s economic prospects.

Chamber Leadership
Chattanooga, Tennessee, Area Chamber of Commerce’s Education Initiative
The Chattanooga Area Chamber of Commerce is the largest business association in Hamilton County, Tennessee, as well as the economic development arm for the city and the county. In November 2005, in response to a growing need among the region’s business leaders for improved skill levels among the regional labor force, the chamber’s Board of Directors adopted the Education Initiative. The Education Initiative’s strategic plan includes the vision of the chamber engaging the business community, public education, and other community organizations in a collaborative effort to develop a more highly skilled labor force in the Chattanooga/Hamilton County area.

There are two primary goals for the Education Initiative: to bring business and education leaders together to jointly identify challenges and solutions, and to improve awareness across the region of the value of education and skills development for both community and individual success. The chamber is actively working with a wide range of partners to coordinate efforts and leverage investments on this second goal.

Hamilton County has a long history of creating and supporting career academies, which have received national recognition and acclaim. The Education Initiative identified the potential of
expanding the commitment to academies, using their natural, successful connection between education, employers, and economic development as a strategic initiative.

As a result of the strong partnerships in the community in support of career academies, Hamilton County was designated a Ford Next Generation Learning Community by the Ford Motor Company Fund in August 2006. This designation recognizes Hamilton County’s leadership in establishing and advancing career academies by facilitating the following:

- A career academy master plan for Hamilton County
- A framework for prioritizing career academy development and continuation
- A process to implement academically rigorous CTE offerings and programs of study
- A means to support career cluster entrepreneurs who rally and align business support
- An evaluation of career academies that supports continuous improvement.

**Corporate Leadership**

**The Gulf Power Academy**

Perhaps more than any other sector, the utility industry is facing an imminent workforce crisis. More than half of today’s utility workforce will be eligible for retirement over the next 10 years. The positions that will experience the highest rates of attrition over the next five years are those most difficult to fill—engineering technicians and skilled and craft employees. And because of the nature and role of the utility industry as the backbone of the nation’s economy, this workforce crisis could have negative impacts on all industries.

Gulf Power, a subsidiary of Southern Company, is addressing this workforce crisis assertively by establishing the Gulf Power Academy—a career academy designed to create a pipeline of skilled workers ready to enter employment in the utility industry either directly following high school graduation or after postsecondary education.

The Gulf Power Academy, located at West Florida High School of Advanced Technology in Pensacola, opened in August 2001. Based on the National Center for Construction Education and Research’s electrical curriculum, the career academy provides 15 hours of credit through an articulation agreement with Pensacola Junior College. The academy offers students specific career education that equips them to make the best education and career decisions and prepares them for workplace realities.

“In the [Chattanooga] Chamber’s eyes, education is economic development. Without the skilled workforce necessary, Hamilton County can’t compete locally, nationally, or globally.”

*Tom Edd Wilson, President and CEO*  
*Chattanooga, Tennessee, Area Chamber of Commerce*
As of the summer of 2007, three classes had graduated from the Gulf Power Academy. The first class graduated in May 2005, from which Gulf Power hired eight of the 21 graduating students (two entered the military, two went on to work in related industries, and the other nine attended college). An additional six students were hired out of 21 graduates from the class of 2006, and four of the 27 graduates from the class of 2007 were hired (one entered the military, and the remaining 22 students planned to enter college).

**Association Leadership**

**Air Conditioning Contractors of America Apprenticeship Program**

According to the Bureau of Labor Statistics, the heating, ventilation, air conditioning and refrigeration (HVACR) industry needs more than 100,000 new skilled workers each year to replace retiring workers and fill new positions. Most jobs in these industries cannot be outsourced, and it is not unusual for an experienced technician to earn $75,000 to $100,000 a year.

Representing more than 4,000 contracting companies of all sizes in the United States, the Air Conditioning Contractors of America (ACCA) oversees an apprenticeship program run locally by its own chapters to produce its own workforce talent in the HVACR industry. The four-year program is offered by ACCA chapters in partnership with local education institutions. It is usually held two to three nights a week, seven months per year, and attracts a diverse age range of students, from high school students and high school graduates to adult workers looking for retraining or a career change.

The curriculum is a combination of both national and local needs, mixing knowledge needs for national industry certification with issues important to the local market. To customize the curriculum, every chapter has a local apprenticeship advisory committee responsible for program content. Local contractors, instructors, community college administrators, school boards, unions, and other partners serve on these advisory committees. The related training is complemented by the on-the-job training the apprentices receive from their employer, and also allows workers to receive a state license and credits toward an associate’s degree from a local postsecondary institution. The ACCA-National Capital Chapter partners with the Montgomery College’s Gudelsky Institute for Technical Education, one of the highest rated institutions of its kind in the country.

Employers benefit as well, since they can train an employee for less than $5 a day, including all books and training materials. It also gives employers the immediate ability to measure increased productivity while establishing more defined career ladders and better wage scales for their workforce. According to ACCA, the apprenticeship program improves relationships with manufacturers through improved installation and service, while local contractors use it as a marketing tool when promoting their quality of service to local communities.
Community and Industry Partnership
Greater San Antonio Alamo Area Aerospace Academy

Like that of the utilities industry, the aerospace workforce is aging, and recruiting workers from outside a region has not been cost-effective. San Antonio has a long and storied history with aviation, dating back to missions flown in the early 1900s. A century later, the region has become a hub of aerospace activity. Today, the impact of the aerospace industry in San Antonio alone is more than $3 billion. According to a study by the Greater San Antonio Chamber of Commerce, more than 9,500 workers are employed in the aerospace industry, with a $406 million annual payroll. However, more than 30% of the people currently employed across the industry will be eligible for retirement by 2008.

In response to this considerable need, the Alamo Area Aerospace Academy (AAAA) was born.AAAA is a community-based program run by a partnership composed of businesses; the cities of San Antonio, New Braunfels, and Seguin; the Alamo Community College District; local universities; Workforce Solutions Alamo; the San Antonio Manufacturers Association; Port San Antonio; the Greater San Antonio Chamber, and many other interested parties, including more than 20 independent school districts and several private and charter schools.

AAAA’s mission is to provide the talent pipelines that high-skill, high-wage industries need to thrive in the San Antonio region. By establishing a career path for high school juniors and seniors through industry-driven dual-credit programs, AAAA prepares students for higher education and for skilled employment in the participating industries. AAAA combines rigorous academic instruction with real-world applications, including summer internships. Students receive technical training in areas such as airframe and power plant mechanics for careers in aerospace maintenance, preparing them for aerospace industry jobs.

The AAAA internship program, in partnership with such companies as Lockheed Martin, is a cooperative relationship between employers, community colleges, and area public schools. Students are offered on-the-job training, job shadowing, and mentoring in specific career paths. The average student will spend an eight-hour day for eight weeks during the summer between the junior and senior years. Students become members of the business organization’s staff or temporary employees, and may receive wages comparable to entry-level employees. Students also have the option of continuing training toward a Federal Aviation Administration (FAA) license or earning college credit.

Since 2002, AAAA has graduated more than 220 students, with more than 95% attending some form of postsecondary education or obtaining work in the industry. One success story regularly cited by AAAA, a student named Ray, graduated in 2007 and was offered a position that paid nearly $40,000 in salary, plus benefits. He accepted the job as a 19-year-old and is receiving college tuition reimbursement to help him further his education.
Education Leadership
The University of Missouri and the Nuclear Energy Industry
Many national reports have documented that the nuclear power industry has a potential human capital emergency on its hands, as increasing numbers of existing skilled workers are nearing retirement age. Studies suggest that up to 57% of these technical workers will retire within the next five years. The Nuclear Energy Institute determined that “the nuclear industry, as a whole, will need to attract roughly 90,000 new employees over the next 10 years just to sustain the current level of industry activities.” With 103 reactors in operation in the United States producing approximately 20% of the country’s electricity supply, a significant workforce gap could become a serious detriment to the efficient and safe operation of the current and planned fleet of reactors.

In response to this negative trend, the University of Missouri and its partners from the nuclear sector sought and received a $2.3 million grant from the U.S. Department of Labor (DOL) to establish a Center of Excellence for Radiation Protection Technology (RPT) Education and Training. The center will develop an associate of applied science degree in nuclear technology that will be shared with a national network of community colleges.

The RPT program is the only one of its kind in Missouri and one of only a handful in the nation. It was developed cooperatively with the Missouri University Research Reactor, the University of Missouri Nuclear Science and Engineering Institute, and AmerenUE Callaway Nuclear Power Plant, all leaders in the nuclear industry. The RPT core curriculum is designed to follow training guidelines established by accrediting organizations and includes courses that prepare the graduate for work in nuclear plant operations. Finally, an eight-week internship at an approved company is included as a part of the curriculum in the second year.

The first two courses, Radiation Fundamentals and Radiation Monitoring, were available to the five community colleges during the 2007–08 academic year. The remaining courses will be implemented in the colleges during the fall 2008 semester. Thereafter, they will be part of each school’s regular academic offerings. Graduates will be prime candidates for positions at a number of institutions:

- Nuclear power facilities
- Radioactive waste-handling facilities
- Radiopharmaceutical companies
- Universities and national laboratories
- Medical facilities
- U.S. Department of Energy sites
Critical Next Steps to Advance CTE

CTE is both well understood and little understood. For CTE and its principles of rigor, relevance, and relationships to be fully realized and leveraged for effective teaching and learning, several issues must be resolved. Other issues do exist, and still others will emerge in time. The following issues, however, have been identified as requiring critical attention in the near term.

**Data Requirements and Initiatives**

The old saying “what gets measured, gets managed” is as true in the education world as it is in the business world. For informed decisions to be made about the quality and impact of CTE programs and designs, better information needs to be consistently tracked and reported on CTE students across the country. Further, systems and methods need to be in place to consistently follow these students beyond their high school years and to demonstrate, in the aggregate, the long-term impact of CTE on the success of students, employers, and communities. Surveys should measure current local and regional employment needs as well as predicted future needs.

**Standards**

To a very large degree, standards, whether at the state or local level, are what shape students’ educational experiences. It is essential that states’ academic standards reflect the needs and realities of both postsecondary education and career. Chambers and business leaders should work closely with the governor’s office, the state education agency, and local
school districts to ensure that academic standards better reflect workplace expectations and are aligned with those of other states to enable students to transport their skills and degrees to other places around the country.

Integration
Research suggests that integrating academic courses (math, science, English, etc.) with the principles of CTE instruction (project-based, career relevance, etc.) can result in higher test scores. More effort should be made to integrate CTE and academics for all students in all schools. This will require that a number of obstacles be addressed, including providing professional development opportunities for academic and CTE teachers to understand how integration should best occur, providing joint planning and curriculum development time for these teachers, and identifying and incorporating curricula that has at their core the integration of rigorous academics with real-world, project-based content.

Teachers
The call to action of this paper is that the principles of CTE must be aligned with our expectations of high academic achievement. The ability of teachers to achieve this is essential. But most teachers are not prepared to deliver on this promise, because many academic teachers do not have a current understanding of how their subjects relate to the world of work. Most CTE teachers are technical experts but may not have formal training in a specific academic field. Issues of teacher training, certification, and ongoing professional development must be addressed in order to realize the benefits promised by CTE.

As chronicled in this report, efforts to use CTE to reshape the training of the American workforce are well under way. While there is no one method to achieve these much-needed reforms, it is clear CTE must be an integral part of the solution. The business community is committed to playing a vital role in helping to reinvent education systems that will improve student achievement and career readiness for all students. A strong business voice supporting CTE will align education and training to the 21st century workforce needs of the nation. It is an imperative on which the future of the nation’s economic competitiveness heavily depends.
Appendix A
National Organizations Focusing on Career and Technical Education

The Institute for a Competitive Workforce (ICW) is a 501(c)3 affiliate of the U.S. Chamber of Commerce that works to ensure that businesses have access, today and tomorrow, to an educated and skilled workforce. Through policy initiatives, business outreach, and a strong grassroots network, ICW finds solutions that will preserve the American workforce as this country’s greatest business asset and its strongest resource. www.uschamber.com/icw

The American Association of Community Colleges (AACC) represents and advocates for more than 1,200 associate’s-degree granting institutions enrolling more than 12 million students, almost half of all U.S. undergraduates. www.aacc.nche.edu

The American Youth Policy Forum (AYPF) provides learning opportunities for policymakers, practitioners, and researchers working on youth and education issues at the national, state, and local levels. www.aypf.org

The Association for Career and Technical Education (ACTE) is dedicated to the advancement of education that prepares youth and adults for careers. ACTE has written a number of Issue Briefs on a wide variety aspects related to CTE. www.actonline.org

The California Center for College and Career (ConnectEd) was founded by the James Irvine Foundation to serve as a hub for innovative practice, policy and research to expand the number of education pathways that prepare students for college and career. www.connectedcalifornia.org

The Career Academy Support Network (CASN) offers comprehensive support and staff development for small learning communities and career academies at which students can fulfill requirements for college entrance while learning to relate their academics to the world outside high school. http://casn.berkeley.edu

Ford Motor Company Fund supports Ford Partnership for Advanced Studies (www.fordpas.org), an academically rigorous, interdisciplinary curriculum and program that provides students with content knowledge and skills necessary for future success, and Ford Next Generation Learning Communities (www.fordnglc.com), local and regional partnerships of educators, businesspeople, and community leaders who are dedicated to reforming education and building a skilled workforce.

The National Academy Foundation (NAF) was created as a partnership between business leaders and educators to address the need to prepare students for professional careers. www.naf.org
The National Association of State Directors of Career Technical Education Consortium (NASDCTEc) is a professional society of the state and territory agency heads responsible for career technical education. Through its foundation, the States’ Career Clusters Initiative (SCCI) provides information on career clusters as a tool for seamless transition from education to career. www.careertech.org and www.careerclusters.org

The National Career Academy Coalition (NCAC) supports a national network of existing and emerging high school career academies and provides training on the National Standards of Practice (NSOP) for career academies. www.ncacinc.org

The National Career Pathways Network (NCPN) is a membership organization for educators and employers involved in the advancement of Career Pathways, Tech Prep, and related education reform initiatives. NCPN assists its members in planning, implementing, evaluating, and improving secondary and postsecondary transition programs. www.cord.org/ntpn

The National Governors Association (NGA) is a membership organization for state governors and their senior staffs. Its Center for Best Practices released an Issue Brief in June 2007 entitled Retooling Career Technical Education. www.nga.org

The National Research Center for Career and Technical Education (NRCCTE), housed at the University of Louisville, focuses on improving the engagement, achievement and transition of high school and postsecondary CTE students through technical assistance to states, professional development for CTE practitioners, and dissemination of knowledge derived from scientifically based research. www.nccte.org

The Partnership for 21st Century Skills serves as a catalyst to position 21st century skills at the center of the nation’s K-12 education system by building collaborative partnerships among education, business, community, and government leaders. www.21stcenturyskills.org

Project Lead the Way is a national, not-for-profit educational program that helps give middle and high school students the rigorous ground-level education they need to develop strong backgrounds in science and engineering. www.pltw.org

The U.S. Department of Education makes grants and helps set policy in the area of vocational and adult education through its Office of Vocational and Adult Education (OVAE). www.ed.gov/about/offices/list/ovae

The U.S. Department of Labor (DOL) provides statistical data on a variety of jobs, as well as important information and regulations on approved apprenticeship programs. www.dol.gov

The Workforce Alliance is running the Skills2Compete campaign to ensure that every U.S. worker has access to the equivalent of at least two years of education or training past high school—leading to a vocational credential, industry certification, or the first two years of college. www.workforcealliance.org and www.skills2compete.org
Endnotes


2 The Carl D. Perkins Career and Technical Education Act was most recently reauthorized in August 2006. For a short summary, see www.acteonline.org/policy/legislative_issues/Perkins_background.cfm.


4 The Skills2Compete Campaign defines “middle skill jobs” as jobs that require more than high school degree but less than a four-year degree.


7 Bill Gates, speech to National Governors Association/Achieve Summit (February 26, 2005), http://www.nga.org/cda/files/es05gates.pdf.


9 Ibid.


12 For a full list of the career clusters and more information about each, visit www.careerclusters.org.


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