



Career and Technology Education

Systemic Change is Needed to Help America Stay Competitive

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The collapse of the Berlin Wall, the advent of the Internet, and the overall ease of communications today has removed the borders and restrictions of yesterday's economy. Today, we live in a global economy. As a result, companies today are not only competing with businesses down the street, they are competing with businesses on other continents. And workers today are not only competing for jobs with their former classmates, they are now competing with workers educated in India and China.

In this global economy, where change is constant and highly-skilled workers are a necessity, America is falling behind. Nearly three-fourths of CEOs report having difficulty finding qualified workers in the United States.¹ According to a 2005 survey by the National Association of Manufacturing, skill shortages cut across industry sectors impacting more than 80 percent of companies surveyed and affecting their ability to achieve production levels, increase productivity, and meet customer demands.² Many technology firms such as Microsoft,[®] Intel,[®] and Google[®] are creating research and development centers in low-cost countries and venture capitalists are increasingly requesting their companies to move offshore.³ Perhaps some of this can be attributed to our current education system, which is not able to provide employers with the skilled workforce they need to compete in a global economy.

Career and technology education (CTE), formerly known as vocational education, can be a catalyst for change within the education system and play a role

Recommendations

- Improve the quality and relevance of CTE curriculum;
- Recruit industry professionals into the classroom;
- Reform the teacher certification process; and
- Encourage students to take ownership of their future.

in improving our ability to compete globally. Rethinking and reforming vocational education within our high schools is one way to help America change course and start reversing the trend of falling behind. As Chairman and CEO of Marriott International Inc, J. Willard Marriott states, "our nation's long-term ability to succeed in exporting to the growing global marketplace hinges on the abilities of today's students."⁴

Foreign Competition Led to the Creation of Vocational Education

Concern about foreign competition and the need for a better trained workforce led to the creation of vocational education in the United States. The industrial revolution, the shift from an agricultural economy to an industrial economy, an inadequate apprenticeship

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system, and increased competition with Europe's manufacturing sector revealed the need for change.⁵ While business owners wanted workers with training relevant to working in a factory, secondary schools were giving students a classical academic education not intended for that type of work.⁶ The difference between the traditional education curriculum of the day and business needs led groups like the National Association of Manufacturers and the American Federation of Labor to push for a new system to train large numbers of workers in practical skills.⁷ Thus, Congress passed the Smith-Hughes Act in 1917, formally separating an academic education from a vocational education and setting up "dual tracks" within the education system; one track for youth going to college and the other track for students going directly to work. The overall purpose of vocational education was to prepare students for employment in "positions requiring less than a baccalaureate degree."⁸

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Once again, foreign competition is causing vocational education to evolve to meet the needs of employers. Recent reauthorization of the Perkins Act,ⁱ also called Perkins IV, aligns the program with current workforce needs by doing away with the separate "tracks" within the public school system for the college-bound and noncollege-bound students. As a result, vocational education classes now prepare students for all types and levels of education including an industry-recognized credential, a certificate, an associate degree, a baccalaureate degree, and an advanced degree.⁹ Such extensive changes to the program's purpose make the label "vocational education" no longer suitable and the term "career and technology education" more fitting. As changes to

Perkins IV are implemented, more and more students will be able to take CTE classes in addition to their regular academic coursework to better prepare them for the career of their choice.

Career and Technology Education in Texas

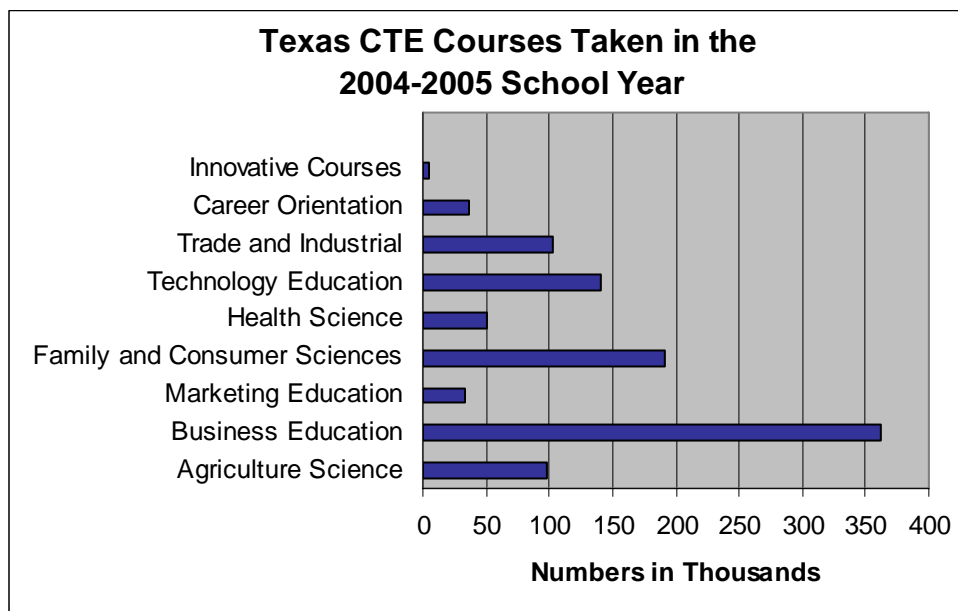
In the 2004-2005 school year, 73 percent of Texas high school students enrolled in career and technology education classes. Specifically, 892,018 students out of a total 1,216,049 high school students took a CTE class.¹⁰ CTE is offered as an elective in addition to the required high school academic curriculum. It is not required for graduation. About 97 percent of all high school students take at least one career and technology education course, and 25 percent of students take three or more courses in a single program area.¹¹ Approximately 6 percent of funding for career and technology education comes from the federal government with the state and local communities financing the majority of funding.¹²

Career and technology education program areas:

- Business Education
- Health Science
- Trade and Industrial Education
- Family and Consumer Sciences
- Technology Education
- Agriculture Science
- Marketing Education
- Career Orientation
- Innovative Courses

Advances in technology and the continued demand for higher-level skills has caused students to change the type of CTE course they take. According to a vocational education report prepared by an independent advisory panel, "Since 1982, enrollments in traditional fields such as auto mechanics have been declining, while health-care courses have more than

ⁱThe Carl D. Perkins Career and Technical Education Improvement Act of 2006 was signed into law on August 12, 2006 and reauthorized until 2012. Federal vocational education legislation is named after Carl D. Perkins, the former Chairman of the House Education and Labor Committee.



Source: Texas Education Agency, <http://www.tea.state.tx.us/cte/Accountability/Enrollments.xls>.

tripled their enrollment, and communications and information technology have nearly quintupled their enrollment.”¹³ CTE courses are also changing to provide student opportunities in new career fields. New CTE courses include engineering, bio-technology, DNA forensics, robotics, turf management, and aquaculture.¹⁴

High School Dropout Rates and Earnings

While research is mixed on whether vocational education leads to increased academic outcomes for attaining an industry credential, enrolling in college, and graduating from college, research does find that CTE reduces high school dropout rates. Students taking a combination of three CTE classes for every four academic classes had the least likelihood of dropping out. Those students with the highest risk of dropping out, those with low test scores and low grades when entering high school, had the greatest reduction in dropout rates.¹⁵ With disturbingly low high school graduation rates between 68 to 71 percent nationwide and close to 50 percent for minorities, America needs strategies to help students stay in school and graduate.¹⁶ A range of CTE course offerings can be helpful in reducing dropout rates for high school students.

Student future earnings also rise as a result of completing CTE coursework. Research consistently finds that students who took several CTE courses earn more per year than peers who did not take CTE courses. One study finds that students who took at least three CTE classes earn an additional \$1,350 per year.¹⁷ Another study suggests that students taking four CTE courses increase their average annual earnings by \$1,200 immediately after graduation and by \$1,800 seven years later.¹⁸

Integrating CTE and Academic Coursework

Change is a constant in today’s economy. As our economy evolves from an industrial economy to a knowledge economy, service-oriented jobs requiring advanced skills remain in the United States while low-skill jobs are replaced by technology or move overseas. New emerging fields such as nanotechnology demand a highly-skilled workforce in mathematics and science, yet our students are trailing foreign countries in general mathematics and science knowledge.ⁱⁱ More than 55 corporate CEOs, university presidents, and scientists called for education changes at the

ⁱⁱU.S. 12th graders were recently outperformed by 21 countries on a test of general knowledge of mathematics and science. National Summit on Competitiveness: Investing in U.S. Innovation (Dec. 2005) 1.

National Summit on Competitivenessⁱⁱⁱ citing concerns that the U.S. will not remain a world leader in innovation and technology without a skilled workforce.¹⁹

While employers are looking for a higher level of skills than in the past, our nation's high schools are graduating students who do not know how to read, write, compute, and spell. In fact, roughly 28 percent of freshman entering post-secondary education enroll in one or more remedial classes in reading, writing, or mathematics.²⁰ And in Texas, only 18 percent of 2006 high school graduates met all four ACT college readiness benchmark scores.²¹ This lack of adequate preparation has a human cost of discouraging students from furthering their education and a financial cost to our community and taxpayers. Poorly educated students cost higher education institutions, businesses, students, and families upwards of \$17 billion a year for remedial education.²²

Most students want to be challenged in school. Ironically, many high school dropouts complain that school is boring and too easy and cite it as a reason for dropping out. Sixty-six percent of dropouts surveyed said they would have worked harder if more had been demanded of them.²³ Furthermore, only one in five high school graduates in the workforce say they were adequately challenged by their coursework, according to the U.S. Department of Education.²⁴

As technology continues to advance and global competition increases at a pace never before seen, students' educational needs have changed. As one researcher explains:

Changes in the world have necessitated a more holistic approach to education. Technology, mercurial in its transformations, requires workers to adjust consistently to change and; therefore, use generic problem-solving skills to a greater extent than ever before. Specific industry skills and occupational skills may become obsolete. This requires that workers attain easily-transferable skills, rather than

job-specific ones. Students can best learn these skills with a problem-solving approach, where the abstract concepts of traditional academics are merged with the concrete applications of vocational education.²⁵

With the strict distinctions between academic and vocational knowledge and skills becoming blurred and the separate tracks in the schools disappearing, it is imperative that our schools increase the rigor of coursework and ensure all students have mastery over the basic skills of reading, writing, and arithmetic.

Vocational education reforms over the last decade—focusing on integrating academic content into CTE curriculum to improve the rigor of CTE classes and the skill level of students—are slow to take hold. While academic and vocational education teachers do not always work well together, teachers must continue to rewrite the curriculum, update lesson plans, and modernize project assignments to integrate academic and vocational content.

To give students the best opportunity to achieve their career goals and succeed in life, schools must equip them with a good foundation of skills. As employers continue demanding higher skill levels from new workers to perform highly technical jobs, our education system must respond with courses that teach these higher-level skills.

The Importance of Post-secondary Education

In today's high-tech economy, employers are demanding a higher level of technical skills and knowledge from their workers than a high school education provides. A survey of human resource professionals^{iv} found that employers expect to hire fewer workers with only a high school diploma and more workers with some type of post-secondary education over the next five years.²⁶ Approximately 80 percent of the fastest-growing jobs^v in today's economy require some type of post-secondary education or training according to the U.S. Bureau of Labor Statistics.²⁷

ⁱⁱⁱThe National Summit on Competitiveness: Investing in U.S. Innovation was held in Washington, D.C. on December 5, 2005.

^{iv}Over the next five years, almost 60 percent of companies surveyed foresee hiring more college graduates and 49 percent project hiring more two-year college and technical school graduates.

^vThe U.S. Bureau of Labor Statistics finds that a vocational award or an academic degree is needed for 24 of the 30 fastest-growing occupations or 80 percent of the fastest-growing jobs.

As more companies demand higher skills, workers need to acquire these skills to attain and keep a good-paying job. In this new reality, schools should encourage all students to attend some type of post-secondary education program and provide them with the skills necessary to enter and complete the type of post-secondary education they choose.

Secretary of Labor Elaine Chao reaffirms the importance of post-secondary education remarking:

More than two-thirds of the new jobs being created in our economy are in occupations that require some kind of post-secondary education. By definition, they are higher skilled and pay higher wages. While post-secondary education is essential to accessing these opportunities, that doesn't necessarily mean they require a four-year college degree. Some of the strongest demand is for workers with two-year degrees in specialized fields from community colleges... it is more important than ever before for workers to complete their education and keep their skills current.²⁸

Higher future earnings can play a factor as well in attracting students to attend and complete post-secondary education programs, since earnings are substantially more for workers with a year or two of education beyond high school compared to a high school graduate. Research clearly shows an earning advantage to those with an associate degree in a CTE field versus those with only a high school diploma. Females who receive an associate degree in a CTE field make 47 percent more than their counterparts without a degree and males with an associate degree make on average 30 percent more than similar high school graduates.²⁹ In addition, earnings are roughly twice as high over a worker's life for those with a bachelor's degree compared to those with only a high school diploma.³⁰ The U.S. Census Bureau finds that workers with a bachelor's degree will make on average \$1.1 million more over their lifetime than workers with only a high school diploma.³¹

High school students earned over 16,000 industry-validated licensures and certifications during the 2004-2005 school year through career and technology courses.

Providing a Seamless Transition to Post-secondary Education

Another way to help students attain some post-secondary education and prevent them from dropping out of high school is an easy and seamless transition from high school into a technical college, community college, or four-year university with course credit toward a degree. CTE course curriculum can teach complex, current, and college-level material so that completion of the coursework can easily count towards credit needed for an industry-recognized credential, an associate degree, or baccalaureate degree. Students' options include dual credit, dual enrollment, advanced placement, and courses with special agreements (formally called articulation agreements) with two- and four-year colleges all across the state. High school students earned over 16,000 industry-validated licensures and certifications during the 2004-2005 school year through career and technology courses.³²

Offering coursework in high school that can lead to a future job and higher earnings, can often be a motivating factor for students to finish high school and further their education. It can also save students valuable time in earning a certificate or degree and save taxpayers money by reducing the number of hours taken at public two- and four-year colleges and universities that are subsidized with tax dollars. Seventy-five percent of Texas school districts have at least one Tech-Prep^{vi} articulation agreement with

^{vi}Tech-Prep is a sequenced set of courses including high school and an associate of applied science or a two-year apprenticeship program that prepares youth for technical careers.

one or more colleges.³³ If educators work to significantly update and strengthen CTE courses so that more colleges will grant college credit for the coursework, it is likely that more students will attend post-secondary education institutions and have a better chance for success in their career.

Improving Curriculum and Instruction

Although the vocational education of yesterday offered courses such as agriculture, home economics, auto-mechanics, wood shop, and typing, today's CTE courses offer a broader array of options ranging from biotechnology, robotics, nursing, landscaping, architecture, computer software engineering, and computer network administration. To help students assess their career interests and find their courses relevant to the real world, keeping CTE classes current is vital.

Surprisingly, 47 percent of high school dropouts surveyed said a major reason for dropping out of school was because classes were not interesting.³⁴ Challenging content and relevance to the real world can capture students' interest and keep them in school. CTE classes can engage students through hands-on, project-based coursework that teaches advanced technical skills needed in the workplace.

To ensure that CTE courses are up-to-date with industry needs and changes in the private sector, CTE teachers and industry leaders should meet regularly to discuss and improve CTE curriculum. Local chambers of commerce and other business organizations could help initiate this necessary dialogue.

The National Society for the Promotion of Industrial Education, an organization that pushed for federal involvement and funding of vocational education in the early 1900s said, "Trade teachers should first of all be masters of their trade. To be qualified to teach their trade they must have lived it; from this trade experience they bring skill and intimate acquaintance with the best practices."³⁵ This idea was incorporated in the first federal vocational education law, the Smith-Hughes Act of 1917, by requiring all vocational education teachers to have work experience in their specific occupational area.³⁶

CTE courses need to be reassessed regularly to ensure the content:

- Incorporates the latest technologies;
- Involves real-life situations and challenges in the workplace;
- Includes interaction with employers through internships, job shadowing, mentoring, or field trip opportunities; and
- Uses a range of teaching techniques to seize the attention of students with various learning styles.

Teachers need to be experts in their field to draw students into career and technology education classes and keep their attention. It is essential that schools recruit CTE teachers who are subject matter experts in their specific occupation or industry. This can be demonstrated through professional licensure, industry certification, or significant work experience in their field.

Another way to improve the quality of CTE is to encourage all CTE teachers to update their knowledge and skills on a regular basis through training, professional development opportunities, and meetings with business and industry. A stronger emphasis on professional development could help career and technology teachers stay abreast of technological changes in the workplace so they can keep their curriculum, projects, and real-world examples current. Well-designed and well-taught CTE courses can improve students' academic and technical skills, increase high school graduation rates, promote post-secondary education, and help students get and keep a job.

In addition to increasing the interaction of CTE instructors with industry, we should also attract the best and brightest industry experts into the classroom. These individuals could share their knowledge by being a guest lecturer, teaching part-time, or mentoring students aspiring to work in that particular field. Their very presence in the classroom could give the student's coursework and projects meaning,

provide them with a role model in that specific field, and show them the results of working hard and staying committed to finishing high school and furthering their education. Imagine the impact of a teacher with 10 years experience in her field who teaches part-time in the classroom.

Alternative Teacher Certification

What is preventing these skilled professionals from teaching CTE classes? Perhaps the biggest obstacle is the lengthy and costly alternative certification process. The current system that trains and certifies teachers does not allow easy access to the classroom for “outsiders” to the education field. The current certification process for teachers in Texas favors teachers with little experience outside the classroom over experts in their field.

If a nurse has a license and currently works in the medical field, why must she take a year of courses on “how to teach” and pay several thousand dollars in tuition to be allowed to teach a subject she has already mastered? While the idea that a licensed nurse is not qualified to teach a CTE course to students aspiring to become home health aides or licensed vocational nurses (LVNs) sounds absurd, the education system views them as unqualified because they have not passed the exit exam and are not certified to teach. Would it be possible to reconsider the alternative certification process and standards for industry professionals? Many professionals would love to teach in the classroom, part-or full-time, but are hindered by the roadblocks and high cost of teacher certification.

The idea that teacher certification should be different for career and technology teachers than academic teachers is not new. In 1914, the National Society for the Promotion of Industrial Education declared that trade teachers should be employed based on examinations, personal interviews, and practical demonstrations of their trade and that the “certification process should be separate and apart from the certification of regular teachers.”³⁷ The Federal Board for Vocational Education also noticed this problem in 1917 and stated “the common complaint of typical teacher training came from practical artisans who said school work was not practical and was far too removed for industrial conditions.”³⁸ Thus, the need for alternative routes for career and technology education teachers to become certified is long-standing.

A solution to this problem is making it easier for industry professionals to become certified to teach in their field. Texas could cut the bureaucratic red-tape by granting professionals, with college or advanced degrees and years of work experience in their fields, the ability to teach in the classroom by simply filling out an application and attending an intensive six-week course, passing a short test, and interviewing with a principal. The intensive class could include teaching fundamentals on how to interact with special-needs students, information on pertinent state and federal laws, ideas on how to handle discipline problems, and student-teaching opportunities.

Teacher certification reform could move our education system away from relying on standardized courses and exams and towards allowing experts in their field to teach in the classroom. The Texas Legislature or the State Board for Educator Certification could appoint a bipartisan taskforce of business and industry, chambers of commerce, community leaders, parents, school board members, and educators to examine this problem and come up with possible solutions.

With the impending retirement of millions of baby boomers, a large amount of knowledge and talent will disappear from our nation’s labor market. One way to counter this is to recruit retirees with technical skills to teach CTE classes, part- or full-time, and to mentor students with career interests in their field. Again, a vital component to gaining teachers from the private sector is the easing of state certification requirements, which prevents many industry professionals from teaching.

Student Ownership Over Their Future

Recent changes to vocational education reflect a fundamental shift in ownership over career choices. The original vocational education system determined a student’s future by steering them toward either the college preparatory track or the general/occupational track. Today, students can take personal responsibility for their future by developing career plans with parents and school counselors and choosing courses that will help them meet their career aspirations. CTE today can help students prepare for more than just their first job; it can prepare them for their career.

To help students make decisions about career options, guidance counselors and teachers should be informed of labor market trends such as current and future industry shortages, high-growth, high-demand occupations, wage and salary data, and employer expectations for soft skills. Relationships with employers will also help teachers and counselors provide their students with accurate information about employers' needs in the local area. Personal relationships with teachers, counselors, and employers can help students and parents make informed decisions for their future.

For students with few choices^{vii} due to limited CTE course offerings at their school, school districts should give them the option and choice to enroll in CTE courses at other high schools. Logistically, it is not possible for every school district to offer every CTE course; therefore, students should be able to attend courses in other communities to complete the appropriate CTE courses for their chosen career.

A new initiative from the Texas Education Agency called AchieveTexas³⁹ encourages schools to incorporate career awareness during elementary school and career exploration activities during middle school. AchieveTexas also encourages students to develop career plans in 8th grade and put together a career pathway of courses that will help them “achieve” their future career goals. This project goes hand-in-hand with Governor Perry’s Industry Cluster Initiative which targets six industry clusters for future growth in Texas. These six clusters are groups of high-growth industries that can provide high-wage jobs to Texans.

The business community, economic development leaders, and the education community are working together to research the clusters and prepare a road-map for Texas’ future. Business, education, and workforce leaders are collaborating to ensure that Texas has the educational pipeline necessary to provide industry with the skilled workers they need. Teachers and educators should learn about these targeted clusters and share with students. Empowering students to plan their own future and dream big may also prove helpful in stemming the tide of high dropout rates.

^{vii}Limited CTE course offerings could be a result of living in a small town or rural area or the inability to find and pay qualified teachers in certain fields.

Recommendations

Improve Curriculum

- Increase the integration of academic skills into CTE curriculum.
- Increase dual credit and dual enrollment opportunities and increase the number of articulation agreements accepted by two-year and four-year colleges statewide for CTE courses.
- Involve business and industry in annual reviews of CTE course content to ensure the curriculum is up-to-date.

Improve Teacher Quality

- Provide and encourage training and professional development opportunities to allow CTE teachers to stay current with new and emerging technology and with the latest industry standards.
- Recruit current and former industry professionals to teach.
- Change the state alternative certification process to make it easier for industry professionals to be in the classroom.

Encourage Student Ownership Over Their Future


- Encourage students to take personal responsibility for their future by setting career goals.
- Encourage guidance counselors and teachers to become more aware of labor market trends and jobs in high-growth industries, to share that information with students.

Change and Innovation

Once again, America’s economic competitiveness is directly linked to the education and skill level of our workforce. It is imperative that our nation’s education system change for America to remain competitive. The White House’s American Competitiveness Initiative sums up the problem quite succinctly stating,

Education is the gateway to opportunity and the foundation of a knowledge-based, innovation-driven economy. For the U.S. to maintain its global economic leadership, we must ensure a continuous supply of highly trained mathematicians, scientists, engineers, technicians and scientific support staff as well as a scientifically, technically, and numerically literate population.⁴⁰

While technology is moving forward at break-neck speed and change is becoming the norm for the private sector, the education system continues to resist and repel change. If our country is going to rise to the challenge, business, parents, and educators must accept that the current way of doing things is not working and be open and willing to try new things. In order for change to occur, schools must embrace innovation and new ideas.

Specifically, we must ensure basic math, science and language skills are taught and reinforced through rigorous CTE curriculum, allow industry professionals into the classroom by removing teacher certification barriers, and teach students to take personal responsibility for their future. Well-designed CTE courses can help keep students in school, make academics more relevant to their lives, and encourage post-secondary education and career paths in high-growth, high-wage industries. Other needed education changes include providing parents and students choices in where their children attend school and opening up schools to competition. If the education community embraces change rather than resisting it, our children can have the opportunity and foundation to succeed through a strong education. 

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