21st Century Career and Technical Education Pathways

on the rise

ASU Morrison Institute for Public Policy
ARIZONA STATE UNIVERSITY

"AS ARIZONA EMERGES FROM THE GREAT RECESSION, ITS FUTURE SUCCESS REQUIRES AN EDUCATION SYSTEM THAT PROVIDES FUTURE WORKERS WITH THE SKILLS AND CREDENTIALS TO MEET THE RISING CHALLENGE OF GLOBAL COMPETITION.

ARIZONA'S ECONOMIC FUTURE AND ITS QUALITY OF LIFE ARE INEXTRICABLY LINKED TO HOW WE NURTURE AND DEVELOP THE STATE'S HUMAN CAPITAL. THE STAKES ARE HIGH, ARIZONA, BUT SO IS THE POTENTIAL COLLECTIVE PAYOUT."

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Technical Education Pathways

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The Role of Career and Technical Education in Arizona's Future

April 2013

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Phil and Nita Francis

SUNDT

FROM THE EXECUTIVE DIRECTOR

Sue Clark-Johnson
Executive Director
Morrison Institute for Public Policy

Dear Fellow Arizonans,

We are pleased to present *21st Century Career and Technical Education On The Rise*, a report on CTE's tremendous potential to engage students and provide them with the skills needed to navigate an ever-evolving economic landscape. By 2020, 65 percent of jobs in the United States are projected to require a postsecondary education that will lead to credentials, certifications and degrees. With increased global competition, Arizona's investment in human talent will have a direct bearing on future economic prosperity and quality of life.

Recognizing CTE's role in closing the skills gap, this report addresses the challenges facing CTE and presents possible solutions.

Some key points:

- Original analysis on student records from two large school districts indicates taking two or more CTE courses is correlated with a reduction in dropout rates and can reduce absenteeism.
- CTE faces many challenges, including lack of data on student performance, funding cuts and an absence of embedded credit.
- Better data collection, restoring education funding, improving teacher retention and promoting work-based learning will benefit both students and employers, as well as the state's economy.

We are grateful for the generous support of the Helios Education Foundation, Phil and Nita Francis, the Arizona Department of Education and Sundt Construction, Inc. We also thank the CTE advisory committee (listed on p. 46) and the many education experts and stakeholders for their advice.

As Arizona emerges from the Great Recession, policymakers, parents, school officials and the business community will need to work together to overcome challenges facing CTE. Arizona's competitiveness in the global economy depends on it. We hope you will join the call for improving and investing in our state's education system and ensuring that Arizona students have multiple pathways to career success.

Sincerely,

ASU Morrison Institute for Public Policy
ARIZONA STATE UNIVERSITY

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EXECUTIVE SUMMARY

In Arizona as elsewhere, the future belongs to the skilled. Education and training are the stepping stones to individual development and economic self-sufficiency. Trained entrepreneurs, professionals and workers fuel business growth, attract prized employers and drive statewide prosperity in all sectors. As Arizona emerges from the Great Recession, its future success requires an education system that provides future workers with the skills and credentials to meet the rising challenge of global competition.

This report examines the role of Career and Technical Education (CTE, formerly known as vocational technical education) in meeting Arizona's educational challenges. CTE programs prepare students for a wide range of careers and postsecondary education options through a combination of hands-on training and classroom instruction. The traditional notion that CTE pigeonholes students into low-skilled occupations is outdated; the evidence suggests that CTE can engage students and help prepare them for both the workforce and postsecondary education.

As discussed in this report, Arizona faces an increasingly wide gap between the skills students leave school with and the skills employers need to successfully compete. High-quality CTE programs can help shrink this gap by working closely with local employers to make sure students acquire the right set of skills in high-demand areas.

Arizona's low high school graduation rate contributes to the skills gap as an increasing percentage of entry-level jobs will require at least a high school diploma. Many students find CTE's hands-on approach and practical focus to be more engaging than traditional classroom courses. If higher engagement makes CTE students more likely to complete high school, then this constitutes yet another benefit of CTE programs.

To document whether this is indeed the case, Morrison Institute for Public Policy analyzed student records from two Arizona school districts. Results from this limited sample indicate taking two or more CTE course leads to a reduction in the dropout rate and can reduce absenteeism. While further research is required to firmly establish this pattern, early findings point in this direction.

But numerous challenges exist that prevent CTE programs in high schools from being as effective as they could be. To identify innovative and effective practices, we examined high-performing CTE programs around the country and the world. Model CTE programs across the country share several characteristics:

- Strong support of CTE in the form of funding and public endorsement by state officials and the state legislature
- Close collaboration between postsecondary institutions, employers, non-profit institutions and school districts
- A focus on quality, as measured by graduation rates and the number of industry-recognized and endorsed portable credentials
- A focus on relevance, with programs leading to industry-endorsed and recognized credentials in sectors in demand.
- Work-based learning opportunities integrated within CTE programs through partnerships with employers
- Incentives for increasing the number of students who earn industry-recognized and endorsed credentials

Abroad, in countries such as Germany, Norway and Australia, the CTE environment is different – namely:

- CTE programs enjoy considerable status, lead to promising career pathways, and enjoy high levels of participation
- Employers are active participants who help design training programs, develop well-defined competencies and nationally recognized credentials
- Training programs and apprenticeships are partially subsidized by public agencies, reducing the employers' expense

Model programs in other states and countries demonstrate the potential of CTE programs in Arizona. However, Arizona CTE programs face many challenges at the high school level, including severe funding cuts, lack of data on student performance and outcomes, absence of embedded credit courses, high-school graduation and state university requirements "crowding out" CTE, and teacher attrition, particularly in the rural districts where the departure of a single CTE teacher can result in the entire program being shut down.

This report presents and discusses possible solutions, including:

- Implementation of a Statewide Longitudinal Data System, which is essential to identifying what works and what doesn't in establishing benchmarks for improvement
- Helping CTE educators, many of whom come from industry, become better teachers and thereby improve CTE teacher retention
- Restoring CTE funding, which was cut by $27 million in the 2011-12 school year
- Promoting more work-based learning to benefit both CTE students and employers in connecting CTE curriculum with industry's true needs
- Improving career exploration and advising before high school so students can map out a pathway for success
- Embedding more academic content and integrating CTE in the implementation of Common Core State Standards

CTE stakeholders – teachers, students, parents, administrators, school board and state school board members – must develop a shared understanding about how CTE programs fit in with a student's overall education. At the same time, CTE teachers and administrators must ensure CTE classes are rigorous, relevant, and provide the foundational knowledge required to sustain lifelong learning and navigate a changing economy.

Addressing the challenges facing CTE in Arizona will require perseverance and increased coordination. These obstacles can be overcome only if policymakers, parents, school officials and the business community work together. Arizona's economic future and its quality of life are inextricably linked to how we nurture and develop the state's human capital. The stakes are high, Arizona, but so is the potential collective payout.

A PROMISING PATHWAY

In Arizona as elsewhere, the future belongs to the skilled. Education and training are the stepping stones to individual development and economic self-sufficiency. Trained entrepreneurs, professionals and workers fuel business growth, attract prized employers and drive statewide prosperity in all sectors. The world has changed: In the past 40 years, the U.S. economy has shifted from a manufacturing-based economy to a knowledge-based and service-based one. Increased automation at the plant and in the office requires employers to demand more skills from more employees (Figure 1). Jobs that pay a good wage without requiring a postsecondary credential – once a mainstay of the American middle-class – continue to disappear.

These are massive challenges that no state can ignore. This report examines a crucial yet overlooked component of Arizona's response. Career and Technical Education programs prepare students for a wide range of careers and postsecondary education options through a combination of hands-on training and classroom instruction. CTE can be offered in high school* as an elective, by community colleges as part of a certification program or an associate's degree in applied science, and in technical schools. Formerly known as vocational education, CTE is gaining renewed national attention because it:

- teaches skills that are in demand in today's marketplace
- provides pathways to postsecondary credentials that lead to skilled jobs
- has the potential to keep more students engaged in school.

Arizona might well take note. A high school diploma is increasingly becoming a minimum requirement for even entry-level positions. Arizona's graduation rate of 78 percent underscores the fact that every year thousands of young people struggle to get jobs that enable economic self-sufficiency. Of course the state will continue to offer some jobs that require no more than a high school diploma. However, many or most will not offer good wages or long-term career growth.

The numbers are clear. The average annual earnings for high school graduates in 2011 were $19,400, below the Federal Poverty Level for a family of four. At

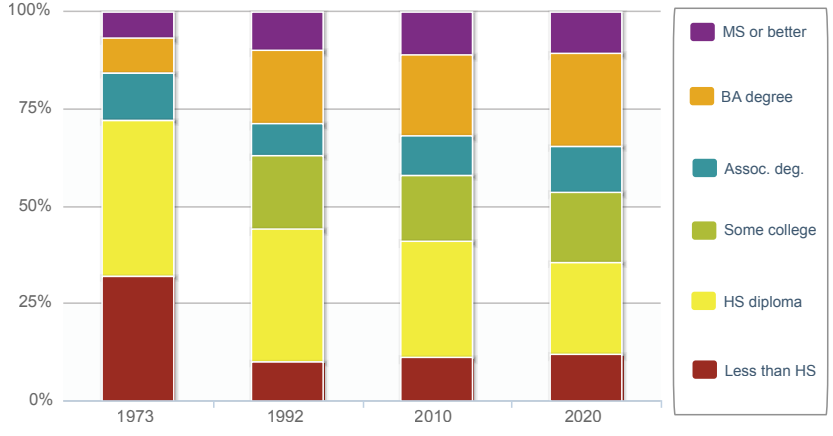
WHAT ARE CAREER AND TECHNICAL EDUCATION (CTE) PROGRAMS?

CTE has different meanings depending on the context. In a broad sense, it refers to courses and programs that provide an applied learning experience and relevant technical knowledge and skills to prepare for an industry-recognized credential, a certificate, or an associate's degree and/or lead to further education. According to the Arizona Department of Education's CTE division, CTE programs "prepare students to enter the workforce with the academic and vocational skills needed to compete successfully in the job market. CTE courses typically include competency-based learning."

* This report focuses primarily on CTE at the high school level because a diploma is necessary to acquire most postsecondary credentials.

Figure 1: Jobs Will Increasingly Require Education Beyond a High School Diploma

According to Georgetown University Center on Education and the Workforce, the proportion of American jobs requiring postsecondary education has more than doubled, growing from 28 percent in 1973 to 59 percent in 2010. The proportion is projected to increase to 65 percent in 2020.[1]



Source: Five Ways That Pay Along the Way to the B.A., Georgetown University Center on Education and the Workforce, 2012

these wage levels, a family with one working adult and young children would be unable to provide for its basic needs without relying on public assistance.[2] In addition to the personal distress there is the dilemma of lost state income tax revenue aggravated by higher demands on revenue-funded social services.

The link between education and employment is a strong one. Figure 2 notes that the Arizona unemployment rate for those lacking a high school diploma was about 18 percent in 2011. This is significantly higher than the 11 percent unemployment rate for high school graduates. But the overall picture is more complex. While college graduates have the lowest rate of unemployment at 4.7 percent, the fact of the matter is that just over half of American students who enroll in a four-year college actually earn a bachelor's degree within six years.[3]

JOHN HUPPENTHAL

Arizona Superintendent of Public Instruction

We are on the verge of a paradigm shift in education – and much of this is a result of the changing economic realities we've faced in recent years. A few decades ago, K-12 education focused on college preparation; a career and technical education track was considered a dead-end for students.

But the shifts in technology and employment patterns have dramatically altered the landscape for career and technical education. As the recession receded and businesses began to hire again, many employers were faced with a shortage of highly skilled technical workers – at a time when unemployment still hovered near 9 percent.

This is a wake-up call.

We can no longer afford to treat the career and technical education track as a dead-end. In reality, a robust CTE program that offers courses with professional certifications in health care and technical fields can provide students with a skilled job at a livable wage as soon as they graduate high school. It also can prepare high-school students with a path to a postsecondary technical or trade school. Recent news articles have highlighted that two-year degrees earned at community colleges and trade schools have allowed some of these graduates to out-earn their counterparts with a four-year degree.

It's time we give ALL of our students access to education and training that will prepare them for the world beyond high school – and we must embrace high-quality career and technical education with the same zeal that we give to college preparedness.

This suggests that a four-year college may not be the sure path to success that it is commonly believed to be. This may contribute to what might be termed the national "skills paradox" – unemployment levels linger near their highest levels in two decades, while half of employers reported in a national survey that they are unable to fill job openings with qualified workers.[4]

In any case, it is critical that the state emerges from the Great Recession with an education system that provides the skills and credentials Arizonans need to both achieve their individual potential and meet the rising challenge of global competition. This seems unlikely to happen unless students are provided multiple pathways to success in an educational menu that encourages them to engage in their own education and – critically – to remain in school. Many high school CTE programs now teach 21st century skills in curriculums that also integrate material from the highly valued disciplines of science, technology, engineering and math (STEM). Further, CTE classes offer career exploration and applied learning that prepare students for apprenticeships and defined skill areas as well as postsecondary academic options.

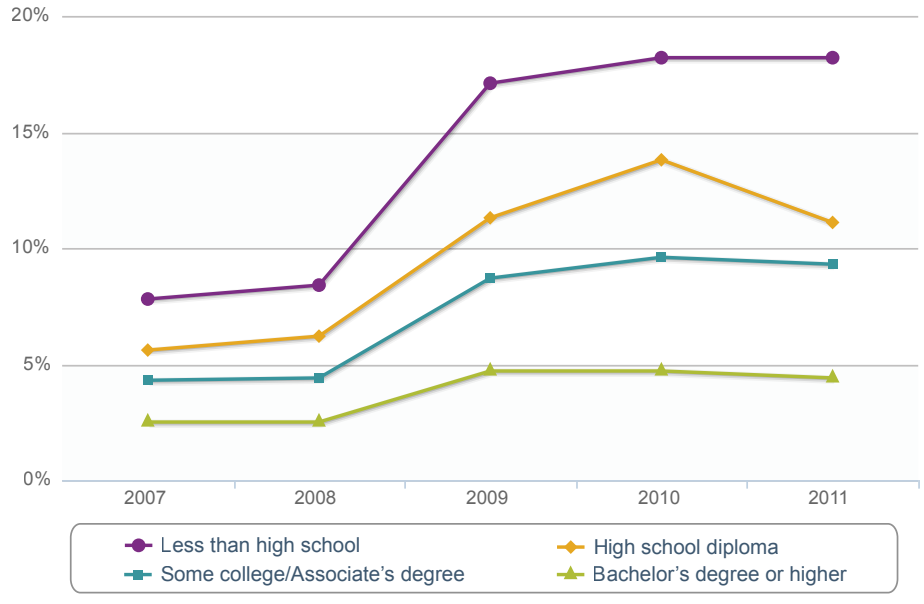
A traditional four-year college education of course remains an important pathway to success. But many modern middle-income jobs will require knowledge and skills obtainable through high school CTE classes and certification and associate's degree programs in community colleges. In some cases, these degrees and credentials provide access to jobs that pay well beyond a middle-class income.

HOW DO YOU ASSESS QUALITY IN CTE?

Just like in other subjects, CTE courses quality can vary. In order for CTE to be considered a desirable pathway, the level of instruction and course content need to be of consistent high quality in addition to fulfilling the CTE Division's requirements for course content. CTE courses in Arizona at the high school level have to satisfy the learning objectives set by the Arizona Department of Education's CTE division. But how does one measure quality? One possible method of benchmarking is measuring whether graduating students are able to pass the tests for obtaining industry-endorsed and recognized credentials.

Figure 2: Postsecondary Education Boosts Employability

Unemployment rate by educational attainment



Source: U.S. Department of Census, American Community Survey annual estimates

A HISTORY TO OVERCOME

The Smith-Hughes Act of 1918 provided federal funding for vocational education programs in high schools to prepare students for apprenticeships or full-time employment in the trades. It defined vocational education as preparation for occupations that did not require a postsecondary degree, making it mutually exclusive with postsecondary education.

Whether as a result of racial bias, low-expectations or a combination of both, minority students tended to be disproportionately steered into vocational programs in high school, as were low-income students of all racial backgrounds. In the 20th century, vocational programs became affiliated with students who did not appear academically inclined or were perceived to have limited career prospects.

In the last two decades, CTE has evolved to become compatible with multiple pathways including postsecondary education. However, its initial bifurcation from college preparation continues to tarnish its image for many students and parents.

CTE ENROLLMENT IN ARIZONA

In Arizona, CTE programs in high schools and community colleges offer a sequence of courses centered around dozens of programs. The goal is to provide students with applied knowledge and skills in high-demand fields. In 2011-12, 89,730 (39 percent) out of 229,569 CTE enrollees in Arizona were in high school and 139,839 (61 percent) were in postsecondary institutions.

Community colleges provide an effective and affordable pathway to postsecondary credentials, such as a certificate or an Associate's Degree. At the community college level, CTE courses are taught in a network of 10 community college districts with campuses throughout the state. In 2011-12, an estimated 31 percent of the 357,895 students enrolled in Arizona's community colleges took one or more classes that were categorized as occupational or vocational – alternative labels for CTE. These CTE pathways do not close doors. In fact, one in four who earn a postsecondary certificate eventually earn a four-year college degree.[5]

CTE classes are taught in a variety of areas, ranging from agri-science and culinary arts to welding technologies and bioscience. Table 1 lists the number of concentrators in high school and in community colleges. As the table shows, the number of concentrators in health science, information technology and law, public safety and security increases significantly at the postsecondary level. The popularity of certain industry sectors, such as health sciences, information technology and business management, reflects the labor market demand and the prominence of certain industry clusters in Arizona.

Figure 3: CTE Enrollment in Arizona*

* The criteria and method for reporting CTE enrollment changed in 2008-09 and 2010-11.

Source: Comprehensive Annual Report FY 2011-2012, Arizona Department of Education, CTE Division

Table 1: CTE Enrollment in Health Sciences Leads the Way in High School and Community Colleges in Arizona

CTE Concentrators** in Arizona by Industry Cluster 2011-2012			
	High School	Post-Secondary	TOTAL
Health Science	2,347	12,260	14,607
Law, Public Safety, & Security	768	7,413	8,181
Bus., Manag'nt., & Admin	1,707	6,202	7,909
Arts, A/V Tech., & Comm.	2,583	3,312	5,895
Info. Tech.	671	4,661	5,332
Education, & Training	1,121	2,986	4,107
Hospitality & Tourism	2,570	995	3,565
Archit., & Const.	1,119	2,150	3,269
Transp., Distrib., & Logistics	1,440	1,729	3,169
Human Services	422	1,881	2,303
Manufact.	698	1,428	2,126
Marketing, Sales, & Services	1,355	390	1,745
Agri., Food, & Nat. Resources	902	460	1,362
Science, Tech., Engineering, & Math	443	640	1,083
Finance	79	62	141
Gov't., & Public Admin.	–	79	79
Total	**18,225**	**46,648**	**64,873**

Source: Comprehensive Annual Report FY 2011-2012, Arizona Department of Education, CTE Division

PAUL LUNA

President and CEO,
Helios Education Foundation

Helios Education Foundation is working to create opportunities for individuals in Arizona and Florida to succeed in postsecondary education. Like many others, we see student success as inextricably linked to the long-term economic prosperity of our states, because the 21st century economy has created a convergence of the skills and knowledge needed in the workplace and in the postsecondary classroom. To meet these economic demands, we must move beyond the divisive debate over college or career and embrace both college and career.

Today's CTE courses should be the antithesis of yesterday's vocational education, a non-college-bound track used to funnel mostly low-income and minority students into the labor market. High quality CTE courses, which combine the rigor of the new Common Core State Standards and the relevance of today's workforce, can prepare students to succeed in college and career. These courses often include the highest levels of science, technology, engineering and math (STEM) education. STEM is a focus of Helios' investment strategy precisely because it develops the skills demanded by our future economy.

Now more than ever, it is critical that we help students across the education continuum understand and connect the relevance of their education with their career aspirations. That connection can inspire students to engage, persist and achieve a postsecondary education, all things that contribute to Arizona's future economic prosperity.

**For Federal reporting purposes, the State of Arizona defines a CTE concentrator in high school as a student taking two or more CTE courses in a sequence. A CTE concentrator in community college is defined as a student enrolled in the last five years who completes at least 12 credits in a single program area sequence and terminates in the award of an industry-recognized credential, a certificate, or a degree; or completes a short-term CTE program sequence of less than 12 credit units that terminates in an industry-recognized credential, certificate, or a degree within a two-year timeframe from entering the institution.

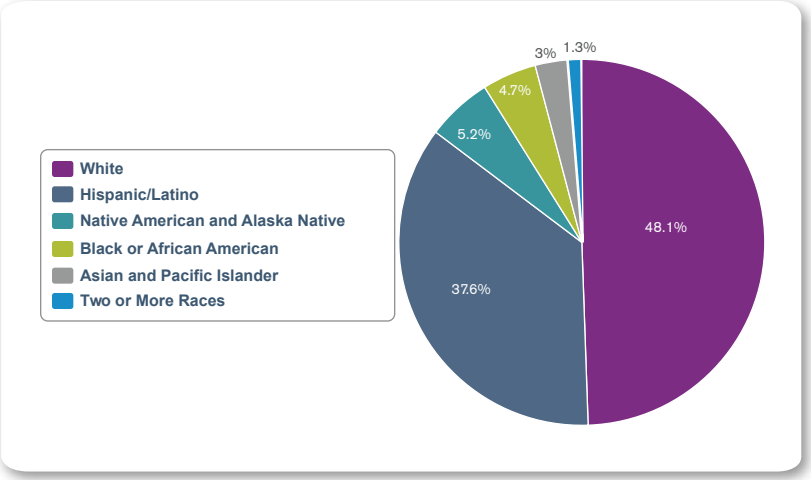
Which Arizonans are taking CTE? As Figures 4 and 5 indicate, there is a demographic shift in CTE enrollment between high school and postsecondary institutions. At the high school level, 48 percent of CTE students are White and 38 percent are Latino. At the postsecondary level, however, only 26 percent of those enrolled in CTE are Latino, versus 58 percent White enrollment. This change in CTE participation presumably reflects the fact that fewer Arizona Latinos continue on to postsecondary education of any type. This educational "achievement gap" is further illustrated by the fact that Latinos lag behind Whites in high school and college graduation rates. This, in turn, limits their earning potential. A prior Morrison Institute for Public Policy report identified this overall "gap" as a major impediment to Latino achievement and a crucial problem for the state as a whole.[6]

CTE programs offer one approach to narrowing this achievement "gap" while serving all students. A national study found that 39 percent of men with a postsecondary certificate earn more than the median male worker with an associate's degree and 24 percent out-earn the median bachelor's degree holder.

"IT'S TIME WE GIVE ALL OF OUR STUDENTS ACCESS TO EDUCATION AND TRAINING THAT WILL PREPARE THEM FOR THE WORLD BEYOND HIGH SCHOOL – AND WE MUST EMBRACE HIGH-QUALITY CAREER AND TECHNICAL EDUCATION WITH THE SAME ZEAL THAT WE GIVE TO COLLEGE PREPAREDNESS."

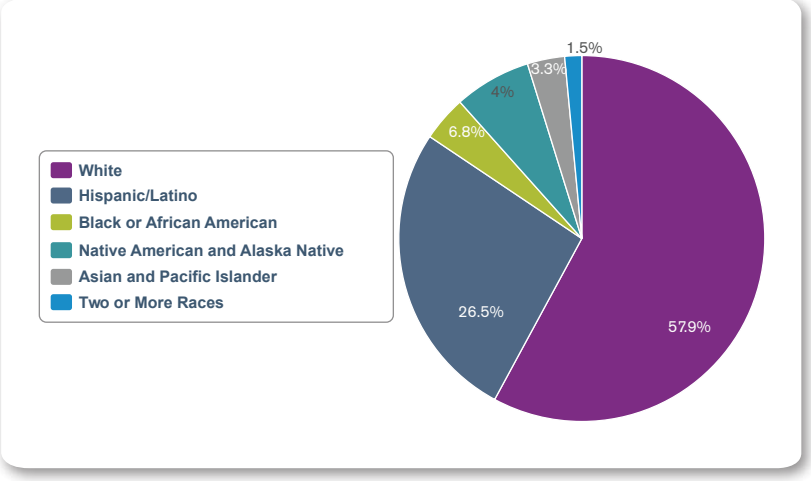
-John Huppenthal, Arizona Superintendent of Public Instruction

Figure 4: Demographic Breakdown of CTE Students in High School



Source: U.S. Department of Education, Perkins Collaborative Network

Figure 5: Demographic Breakdown of CTE Students in Postsecondary Institutions



Source: U.S. Department of Education, Perkins Collaborative Network

RICHARD CONDIT

Chief Administrative Officer, Sundt Construction

I have the good fortune to have served as a Career and Technical Education (CTE) teacher and administrator for 23 years, followed by 20 years as a businessperson. The one thing I have observed over those years time and time again is that students who participate in quality career and technical education programs are more likely to stay in school, pursue postsecondary education and training, find a job and stay employed.

While there are many contributions CTE can make to improving student performance, the greatest of those is applied learning. It is clear that when students see application of content, they are more engaged in and committed to their education.

Arizona needs to ensure that all students have an educational experience that is equal to any in the world. While not THE answer, CTE is clearly one of the main ingredients in helping to ensure we achieve that outcome. High-quality CTE will help ensure that Arizona's economy will reap the benefits from achieving a best-in-class educational system that serves the needs of all of Arizona's students and employers.

For women, 34 percent of those with a postsecondary certificate out-earn those with an associate's degree and 23 percent have a higher average salary than women with a bachelor's degree.[7] These results counter the general perception that CTE results in limited career and earnings potential.

Studies conducted by the National Research Center for Career and Technical Education have found that students who participate in high-quality CTE programs featuring a strong element of core academic content and career education have better learning outcomes, higher academic achievement and greater persistence in postsecondary education.[8] And when individual students prosper, the state as a whole benefits as well. The Alliance for Excellent Education estimates that if half of Arizona's 24700 high school dropouts in 2010 had instead graduated from high school, the economic impact on Arizona would include $91 million in increased earnings and $7 million in increased state tax revenue. If the 2010 graduates had gone on to various sorts of postsecondary education – including CTE certification – the statewide economic impact would have risen to $156 million in increased earnings.[9]

"THE ALLIANCE FOR EXCELLENT EDUCATION ESTIMATES THAT IF HALF OF ARIZONA'S 24,700 HIGH SCHOOL DROPOUTS IN 2010 HAD INSTEAD GRADUATED FROM HIGH SCHOOL, THE ECONOMIC IMPACT ON ARIZONA WOULD INCLUDE $91 MILLION IN INCREASED EARNINGS AND $7 MILLION IN INCREASED STATE TAX REVENUE."

CTE AND STAYING IN SCHOOL

A commonly claimed benefit of CTE is that it leads to higher graduation rates and lower absenteeism. An analysis of four years of data on students who graduated from Tucson and Mesa high schools in 2011 offers some support for that claim.

Graduation rates and absenteeism are associated with a wide variety of socio-economic factors, as is a student's choice whether to take CTE classes. Thus, it is crucial to determine whether achievement differences among students are actually due to CTE rather than to other characteristics. To address this issue, a quasi-experimental analysis used "propensity score matching" to compare CTE students to non-CTE students who are comparable on average in their likelihood of enrolling in CTE, based on their race, gender, English language learners (ELL) status, disabilities, 9th-grade absenteeism and GPA, 8th-grade reading and math Arizona's Instrument to Measure Standards (AIMS) scores. This "propensity score matching" process allows an assessment of the effects of CTE participation on graduation rates and absenteeism since the two groups have similar characteristics on average.

The results indicate that CTE participation does have an effect on students' academic engagement as measured by the likelihood of dropping out and absenteeism. **For Tucson Unified School District (TUSD), taking three or more CTE classes in the same program area leads to a reduction in the range of 20 percent to 60 percent in a student's likelihood of dropping out of high school. For the Mesa Public Schools group, just taking two CTE classes is correlated with a 79 percent lower likelihood of dropping out. The findings also supported the claim that CTE increases student engagement as measured by lower absentee rates.** In Mesa Public Schools, the number of days absent is reduced by three days for students taking two or more CTE classes. The analysis did not find a significant effect on absenteeism in the TUSD.

While this analysis was designed to measure the causal effect of CTE on student engagement, the findings are not definitive. They are applicable only to the students in the study, and could be driven by socio-economic factors that were not measured. However, the results do lend credence to the claims of CTE supporters. They also illustrate the need for a robust statewide educational data system that, among other things, could help develop a better understanding of the effect of CTE on student success and to identify "best practices" among CTE programs.

JOB PROJECTIONS SHOW DEMAND FOR CTE WILL SURGE

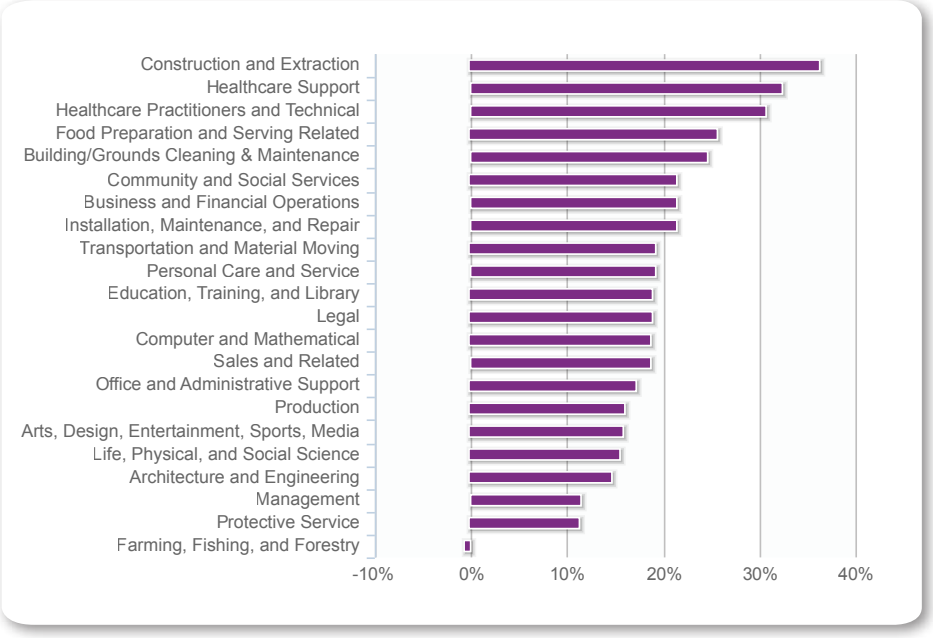
By providing opportunities for applied learning, Arizona's CTE programs can help engage students who otherwise may not be motivated to stay in school. At the same time, occupational programs in community colleges offer an affordable pathway for adults seeking additional job skills or retraining.

These are timely programs. By 2020, employment in these "middle skill" occupations – occupations that required either an associate's degree or a postsecondary vocational credential – is projected to increase by nearly 20 percent. This is roughly the same percentage rise as "high skill" occupations (bachelor's degree or higher), and well above the projected 11.7 percent increase in "low skill" occupations. Table 2 shows the estimated growth rate for middle-skill occupations.

"NOW MORE THAN EVER, IT IS CRITICAL THAT WE HELP STUDENTS ACROSS THE EDUCATION CONTINUUM UNDERSTAND AND CONNECT THE RELEVANCE OF THEIR EDUCATION WITH THEIR CAREER ASPIRATIONS."

- Paul Luna, President & CEO, Helios Education Foundation

Figure 6: Projected Job Growth in Arizona by Occupational Groups, 2010-2020



Source: Arizona Department of Administration, Office of Employment and Population Statistics, 2010-2020 Occupation Projections

Growth rates for middle-skill occupations in Arizona are consistent with federal projections for the nation. According to the U.S. Bureau of Labor Statistics, occupations requiring an associate's degree are expected to increase 18 percent between 2010 and 2020, and occupations requiring a postsecondary non-degree award are expected to increase 16.9 percent. Occupations requiring a bachelor's degree are expected to increase 16.5 percent. It is important to note that, by preparing students for careers and postsecondary education, CTE also arms students to compete for highly skilled jobs.

Table 2: Certain Middle-Skill Occupations Will Grow Significantly Between 2010-2020

Projected Growth of Jobs Requiring an Associate's or Postsecondary Credential from 2010 to 2020

		Change	
		Number	Percent
1.	Real Estate Sales Agents	29,337	36%
2.	Registered Nurses	10,179	25%
3.	Appraisers and Assessors of Real Estate	3,545	35%
4.	Nursing Aides, Orderlies, and Attendants	3,521	17%
5.	Hairdressers, Hairstylists, and Cosmetologists	3,231	25%
6.	Insurance Sales Agents	2,541	13%
7.	Massage Therapists	2,516	40%
8.	Licensed Practical and Licensed Vocational Nurses	2,266	21%
9.	Fitness Trainers and Aerobics Instructors	1,553	24%
10.	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	1,483	28%

Source: EMSI and Morrison Institute analysis

WANTED: WORKPLACE EMPLOYABILITY SKILLS

While technical skills are essential in finding a job, they may not be sufficient to keep the job. An employee needs the ability to communicate, collaborate, problem solve and demonstrate a work ethic that supports the goals and culture of the employer's organization in order to succeed and advance in the organization.

Employers have indicated that recruits often lack these workplace skills. As part of the Arizona Skills Standards Assessment System, the Arizona Essential Workplace Employability Skills Project has identified nine standards and supporting skills that will be measured in real-world, employer-validated assessments given to CTE students in Arizona.

CTE IN ACTION

The CTE Division of the Arizona Department of Education (ADE) oversees program delivery in high schools and adult education settings. The state has developed technical standards that specify topics and areas to be taught in each program and approves new and emerging programs. Every two years, the CTE division reviews the CTE curriculum offered in Arizona high schools. It identifies industry sectors with high projected job growth using a formula approved by the State Board of Education using O*Net scores and projected job demand provided by the Arizona Department of Administration's Office of Employment and Statistics. Once it has identified an emerging job sector, the CTE division develops the criteria and standards for a CTE program that would prepare students to pursue careers in that sector. It takes about three years to identify and develop a new CTE program. There are currently 71 programs, including two emerging programs, approved by the CTE division. They are designed to prepare students for occupations projected to be in high skill and/or high wage categories. All CTE courses in Arizona must meet or exceed established state performance measures.

For example, ADE requires high school CTE teachers coming from industry to obtain certification by taking 15 semester hours of courses in:

- principles/philosophy of CTE
- operation of a career and technical student organization
- methods of teaching CTE
- curriculum design/development
- instructional design/methodology
- assessment/evaluation
- instructional technology
- educational philosophy
- classroom management

These teachers also have to take Structured English Immersion (SEI) training during their first year and take half of the 15 semester hours within three years in order for their provisional teaching certificate to be renewed.[9]

At the high school level, most Arizona CTE courses are taught and administered via 13 Joint Technical Education Districts (JTEDs). However, Phoenix Union High School District, Yuma High School District and a few high school districts in Santa Cruz County do not belong to JTEDs, opting to deliver and administer CTE courses themselves.* JTEDs are composed of multiple high school districts and provide opportunities to learn on central campuses using state-of-the-art equipment that might otherwise be beyond the budget of a single school district.

* School districts in Yuma County are likely to form a JTED within a few years.

Legislation creating the JTED program was passed in 1990. To date, the 13 JTEDs deliver 88 percent of all high school CTE classes in the state. JTEDs are governed by an elected board and operate under the oversight of the ADE's Career and Technical Education Division. JTEDs deliver CTE classes in two ways at no additional cost to students: through classes that are three periods or longer on a central JTED campus, and through classes at the member high schools (called "satellite" classes). Satellites typically meet one or two periods while classes on central campuses last three hours.

At the central campus of the East Valley Institute of Technology (EVIT) in Mesa, for example, more than 3,000 students are bused in from 10 districts for 3-hour classes. They are enrolled in more than 35 occupation-specific programs ranging from 3-D animation to welding science. EVIT Superintendent Dr. Sally Downey's goal is "for every graduating student to have an industry-recognized, transportable credential to allow them to work in the industry in which they've been trained."

EVIT's campus has state-of-the-art facilities and equipment, much of which has been donated by industry partners. West-MEC and Pima JTEDs, districts in western Maricopa County and Pima County respectively, offer a combination of central campus classes and satellite classes at high school campuses. Rural JTEDs, including Western Arizona Vocational Education in Western Arizona (WAVE), VACTE in central Arizona and Gila Institute for Technology (GIFT) in eastern Arizona, offer classes in the local high school and partner with local community colleges for classes that require specialized equipment or facilities.

The state requires all students taking CTE courses in high school to participate in a Career and Technical Student Organization (CTSO), which allows for practical application of CTE concepts learned in the classroom. Through CTSO, students form teams to work on a project related to their CTE class and compete with other schools for prizes. In addition to providing leadership development opportunities, CTSO involvement promotes collaborative problem-solving.

In addition, Arizona has a statewide dual enrollment policy that allows high school students to take certain CTE courses that count for both high school graduation requirements and community college credit.

COMBINING CORE ACADEMICS AND CTE: THE MOVE ON WHEN READY INITIATIVE

Enacted by the Arizona Legislature in 2010, the Arizona Move On When Ready initiative offers pathways that combine rigorous academics with strong technical education.

Voluntarily adopted by 30 Arizona high schools, with more coming on board each year, Move On When Ready accelerates the rate at which schools are able to raise academic achievement to international and national standards, eliminates "seat time" by enabling students to advance upon demonstrated mastery, and broadens the range of high-quality pathways open to students within and beyond high school, including career and technical education.

Arizona schools with strong career and technical education programs, including Metro Tech High School in Phoenix and Kofa High School in Yuma, participate in Move On When Ready. Students in the program must demonstrate mastery of core academic subjects grounded in rigorous internationally benchmarked standards.

Students who demonstrate this benchmarked level of readiness have the option to earn industry recognized credentials and certifications, and the option to devote their full school day to pursue these studies. Arizona schools participating in Move On When Ready will be able to offer their students the opportunity to earn the internationally recognized Pearson/Edexcel BTECs.

BTECs are vocational and work-related courses delivered in 85 countries across a wide variety of sectors. They provide a practical, real-world approach to learning alongside a theoretical background and result in vocational qualifications (awards, certificates, and diplomas) recognized by business, industry and universities worldwide.

These allow community college faculty to teach high school courses (either at the high school or the college location) that count for credit at both the high school and community college level. For example, students enrolled in the cosmetology program at GIFT in Gila County take the courses through Eastern Arizona College (EAC) with GIFT paying their community college tuition. They can earn an associate's degree in cosmetology or general technical studies by the time they graduate high school. If they pass the Arizona State Board of Cosmetology License to become a certified cosmetologist, GIFT reimburses them for the cost of the test. GIFT students are also enrolled at EAC in allied health programs such as sports medicine and pharmacy technician.

Both high school and community college CTE programs prepare students who complete the required sequence of courses to take a test to earn an industry-recognized credential or to satisfy the requirements for a state license (when available). For example, the East Valley Institute of Technology offers a precision manufacturing technology sequence of courses that prepares high school students for the exam to earn a NIMS certification from the National Institute for Metalworking Skills. Similarly, West-MEC provides a sequence of diesel technology classes certified by the National Automotive Technicians Education Foundation (NATEF). These classes prepare students for certification exams from the National Institute for Automotive Service Excellence (ASE), a widely recognized industry standard.

"WHILE THERE ARE MANY CONTRIBUTIONS CTE CAN MAKE TO IMPROVING STUDENT PERFORMANCE, THE GREATEST OF THOSE IS APPLIED LEARNING. IT IS CLEAR THAT WHEN STUDENTS SEE APPLICATION OF CONTENT, THEY ARE MORE ENGAGED IN AND COMMITTED TO THEIR EDUCATION."

- Richard Condit, Chief Administrative Officer, Sundt Corporation

CTE at-a-Glance

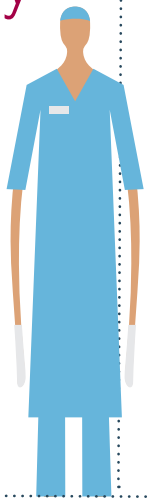
CTE STUDENTS IN ARIZONA HIGH SCHOOLS BY ETHNICITY — 48% WHITE | 38% HISPANIC | OTHER 14%

CTE STUDENTS IN ARIZONA POSTSECONDARY INSTITUTIONS BY ETHNICITY — 58% WHITE | 26% HISPANIC | OTHER 16%

What Interests Postsecondary Students?

These CTE industry clusters had the highest enrollment in Arizona during 2011-12.

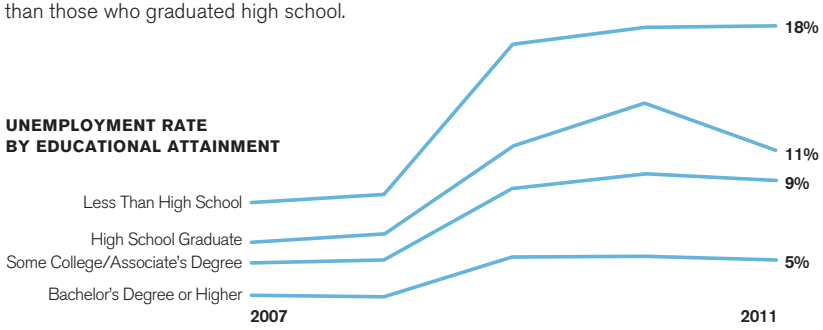
- 26% — **HEALTH SCIENCE**
- 16% — **LAW, PUBLIC SAFETY & SECURITY**
- 13% — **BUSINESS MANAGEMENT & ADMINISTRATION**
- 10% — **INFORMATION TECHNOLOGY**
- 7% — **ARTS, A/V TECHNOLOGY & COMMUNICATIONS**
- 6% — **EDUCATION & TRAINING**



Who Gets Hired?

In 2011, those without a high school diploma were 50% more likely to be unemployed than those who graduated high school.

UNEMPLOYMENT RATE BY EDUCATIONAL ATTAINMENT



Paradoxically, there appears to be a skills gap. 49% of employers report they are unable to find qualified workers to fill job openings.

Who's Earning More?

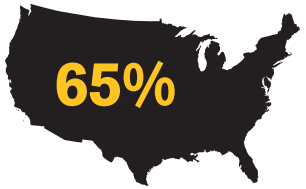
39% of men with a postsecondary certificate earn more than those with an associate's degree

24% outearn those with a bachelor's degree

34% of women with a postsecondary certificate earn more than those with an associate's degree

23% outearn those with a bachelor's degree

65% of jobs in the U.S. will require postsecondary education in 2020.



31% Between 2010-2020, jobs for healthcare practitioners and technical occupations will increase by 31%.

Apprentice On the Rise: A Case Study

With more than 1,500 employees in Arizona, California and New Mexico, Mesa-based Empire Southwest is one of the top Caterpillar dealers in North America. It launched Caterpillar's two-year ThinkBIG Apprenticeship Program in partnership with Mesa Community College in 2003. During the two-year program participants earn an associate's degree in applied science from Mesa Community College and Caterpillar Dealer Service Technician Credentials recognized by Caterpillar dealers worldwide. Graduates become highly-specialized experts, skilled in electronically controlled engines, satellite-based navigation systems, sophisticated computer-based diagnostics, state-of-the-art hydraulics, transmissions and more. Empire Southwest's compensation includes a comprehensive benefits package. Here is an example of how a participant may progress.

Two-Year Program

Each of four semesters includes 8 weeks on campus and 8 weeks of on-the-job training.

Full-time Student
$900 per course plus lab fee.

+

Empire Internship
$12.75/hour, 40 hours per week.

ThinkBIG STUDENT & INTERN

$35,000
per year. $41,000 per year with overtime.

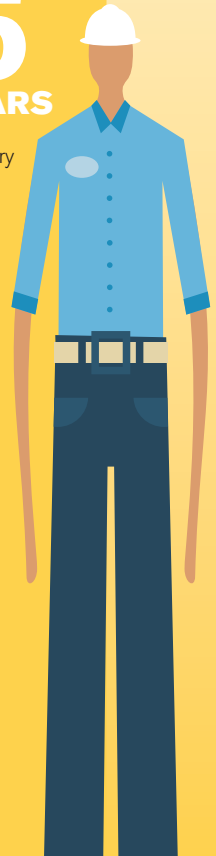
1ST YEAR POST GRAD

Receive an AA in Applied Science and Caterpillar Dealer Service Technician credentials.

$52,000
per year. $61,000 per year with overtime.

5 YEARS

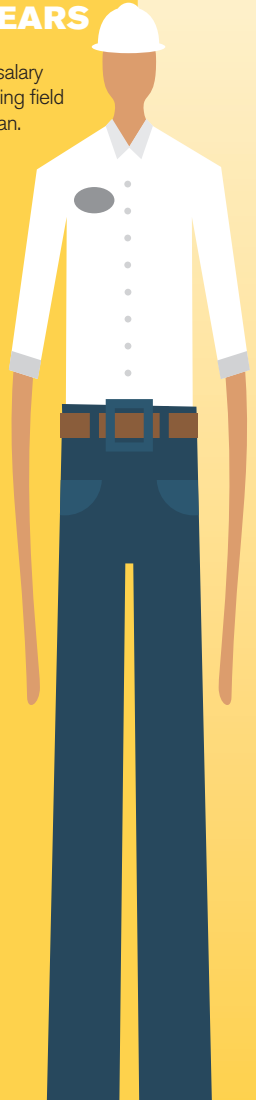
Typical salary of a heavy-equipment diesel technician.



$100,000
per year. $120,000 per year with overtime.

10 YEARS

Typical salary of a mining field technician.



A TWO-YEAR MINING APPRENTICESHIP WITH FREEPORT-MCMORAN VIA YAVAPAI COMMUNITY COLLEGE

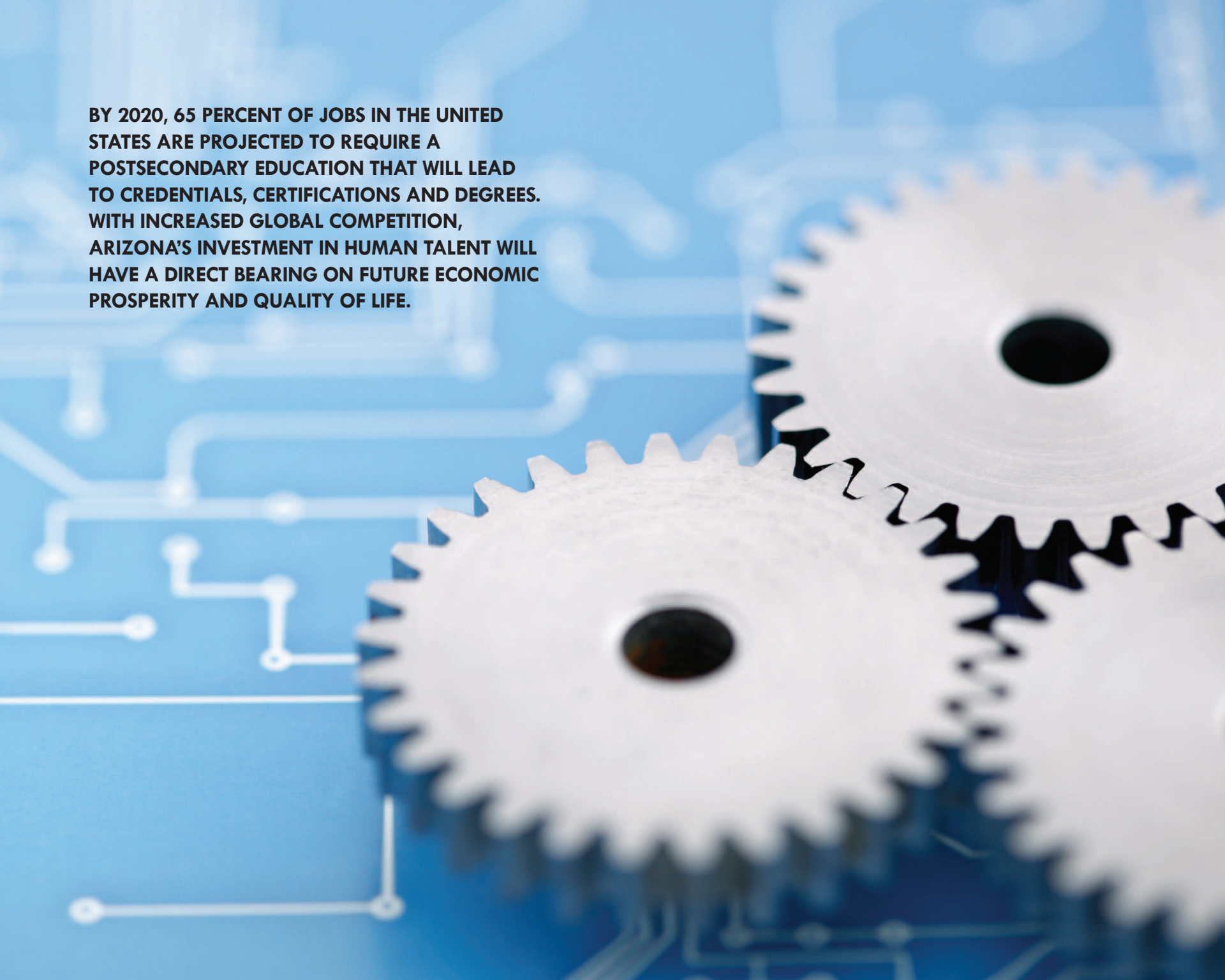
In 2006, Yavapai Community College in Prescott and Freeport-McMoRan Copper & Gold, a Phoenix-based global mining company, partnered to create a two-year apprenticeship program in diesel, industrial and electrical mechanics. Freeport-McMoRan built classrooms and paid faculty salaries for the first three years of the program. Once accepted by Yavapai Community College and Freeport-McMoRan, participants spend three days a week at Yavapai College and two days a week on site at a Freeport-McMoRan mine, receiving both hands-on learning and classroom instruction, culminating with an associate's degree in applied science.

Freeport-McMoRan pays for tuition and books and pays the apprentices $16 per hour for two days of 10-hour shifts at the mine during the first year, and $18 per hour the second year. By the end of the program apprentices have received 2,000 hours of training. The partnership has trained 100 apprentices in six years, all of whom were employed full-time upon graduation. Starting salaries are between $19 per hour and $23 per hour, plus overtime. Furthermore, apprentices have the opportunity to take industry tests to acquire industry-recognized credentials.

"COMMUNITY COLLEGES IN THE STATE OF ARIZONA ARE UNIQUELY POSITIONED TO SERVE THE NEEDS OF EMPLOYERS FOR WELL-TRAINED, CAPABLE WORKERS BY OFFERING COURSES AND PROGRAMS THAT ARE FLEXIBLE, ADAPTABLE AND CURRENT.

COMMUNITY COLLEGES PROVIDE MANY AND VARIED PATHWAYS FOR STUDENTS TO GAIN JOB SKILLS FOR TECHNICAL CAREERS WHILE DEVELOPING THEIR ABILITY TO THINK CRITICALLY AND CREATIVELY, SOLVE PROBLEMS, COLLABORATE AND COMMUNICATE EFFECTIVELY."

- Maria Harper-Marinick;
Executive Vice Chancellor and Provost,
Maricopa County Community College District



BY 2020, 65 PERCENT OF JOBS IN THE UNITED STATES ARE PROJECTED TO REQUIRE A POSTSECONDARY EDUCATION THAT WILL LEAD TO CREDENTIALS, CERTIFICATIONS AND DEGREES. WITH INCREASED GLOBAL COMPETITION, ARIZONA'S INVESTMENT IN HUMAN TALENT WILL HAVE A DIRECT BEARING ON FUTURE ECONOMIC PROSPERITY AND QUALITY OF LIFE.

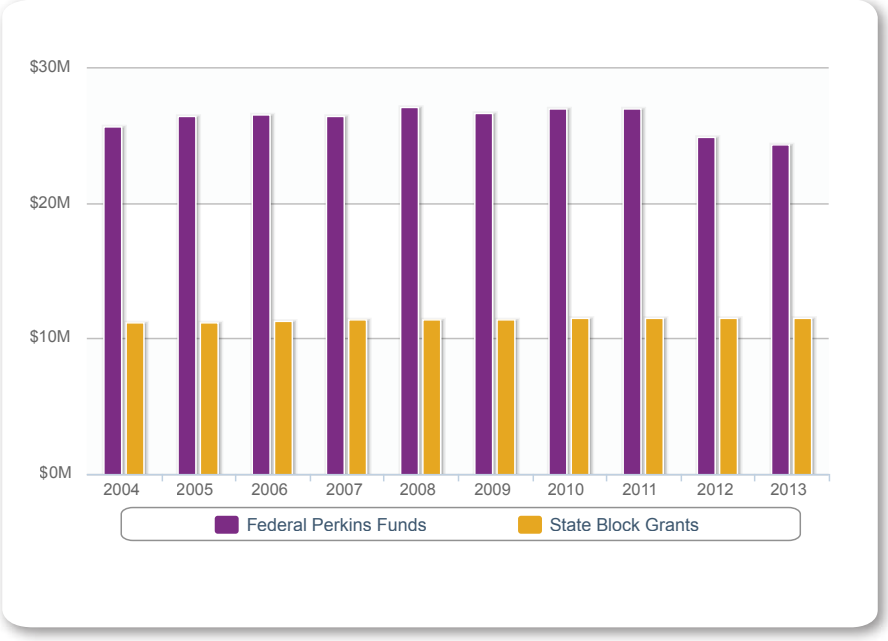
CTE FUNDING

CTE is supported by a combination of federal, state and local funds. Federal funding is authorized under the Carl Perkins Vocational and Technical Education Act. The Perkins Act mandated funding until 2012 and its funding provisions have been extended until Congress takes up its reauthorization. The Perkins program, as reauthorized in 2006, increased focus on the academic achievement of career and technical education students and strengthened the connections between secondary and postsecondary education by encouraging dual enrollment in community colleges for high school students. It also increased state and local accountability and reporting requirements and mandated that CTE programs focus on career preparation while imparting academic instruction, with the goal of preparing students for both viable careers and college.

Perkins funding is distributed in Arizona by ADE, with 15 percent of the grant allocated for oversight, program administration, assessment and professional development. It passes on approximately 72 percents of the funds to high school districts and 13 percent to the state's 10 community college districts. State CTE funds are distributed in the form of annual block grant awards to the school districts. As Figure 7 indicates, state block funding for CTE (not including JTED funding) has remained flat over the past decade, while federal funding in the form of Perkins grants has decreased slightly in the past two years.

Funding for Joint Technical Education Districts (JTEDs) is generated from a combination of local, county and state funds. The primary sources are first, a property tax levy within the JTED boundary, and second, state equalization funds determined by the number of students enrolled in the

Figure 7: Federal and State Funding for CTE Has Remained Flat



AVERAGE DAILY MEMBERSHIP (ADM) FORMULA FOR FUNDING EDUCATION

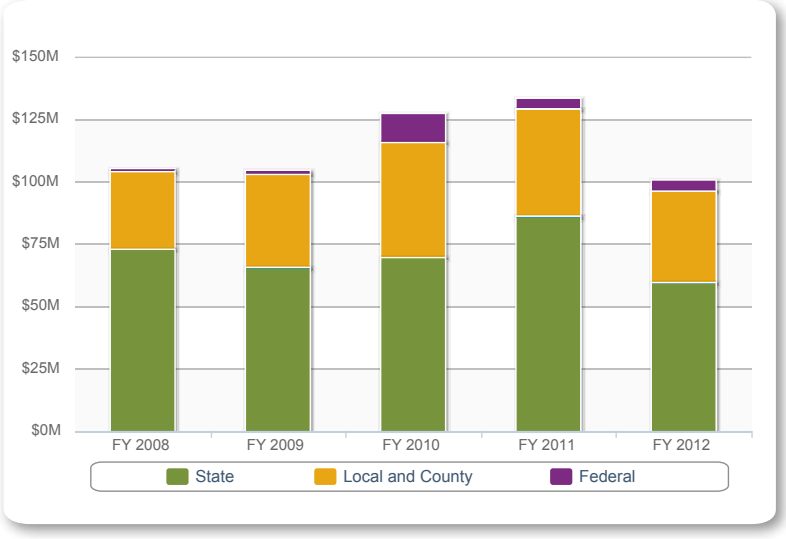
Arizona school funding is based on the amount of "seat time" per student. A full-time student generates 1.0 ADM for the school district. A student taking one CTE program for a half-day on a central campus generates 0.75 ADM for the central JTED campus and has to take at least four classes at the "home" high school campus in order for the district to continue to collect the full 1.0 ADM.

The same student taking a one-period CTE class (called a "satellite" CTE class) on his or her high-school campus generates an additional 0.25 ADM for the school district. With decreasing state funding for education, school districts have a financial incentive to establish satellite programs on their own campuses to collect the additional 0.25 ADM per student rather than have the 0.75 ADM be collected by a central campus.

The absence of data to properly evaluate student outcomes, and Arizona's decreasing public funding for education, perpetuate a system of school funding where each school is incentivized to maximize the number of students in seats – regardless of whether students would be better served by engaging in off-campus work-based internships or by taking a half-day class in a JTED central campus. This points to the urgent need to examine how the state allocates education funds and the necessity of a statewide longitudinal data system that will measure student performance and outcomes from pre-school to entering the workforce.

JTED classes. The Legislature has the authority to cap this source of funds: starting with the 2011-12 school year, it eliminated funding for 9th-grade CTE education in the JTEDs, reducing funding by $27 million. As Figure 8 indicates, state equalization funds were $59.6 million in the 2011-12 school year, compared to $86.6 million in 2010-11.

Figure 8: State Funding for JTEDs Was Cut Starting FY 2011-12



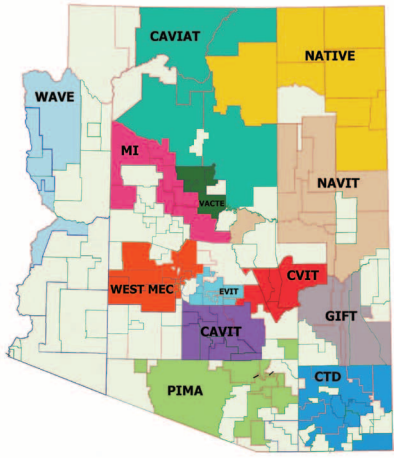
Source: Annual Reports of the Arizona Superintendent of Public Instruction, Arizona Department of Education, fiscal years 2007-2012, Joint Legislative Budget Committee Staff Memorandum, June 1, 2011.

"IMPROVING THE STATE'S EDUCATION SYSTEM IS VITAL TO ALL SECTORS OF THE STATE'S ECONOMY NOT ONLY AS ARIZONA COMPETES TO ATTRACT TALENT, BUT ALSO AS IT INVESTS IN NURTURING WORLD-CLASS, HOMEGROWN TALENT FOR A 21ST CENTURY ECONOMY."

-Mara Aspinall, President, Ventana Medical Systems, Inc.

JTED ATTENDANCE AND FUNDING FY 2011-12

To date, 88 percent of CTE enrollment in Arizona high schools is in classes taught by JTEDs. A student taking one CTE program for a half-day on a central campus generates 0.75 of average daily membership (ADM) for the central JTED campus. A student taking a one-period CTE class on the high-school campus (called a "satellite" CTE class) generates an additional 0.25 ADM for the school district. The total number of ADMs for each JTED presented below does not reflect the actual number of students taking CTE classes via the JTEDs but is an indication of how enrollment is accounted for in the state. In the case of JTEDs that do not have a large number of half-day classes on a central campus, the number of students enrolled in CTE programs is about four times the actual ADM number.



JTED	AVERAGE DAILY MEMBERSHIP (ADM)* FY 2011-12	STATE AND LOCAL FUNDING FY 2011-12
Central Arizona Valley Institute of Technology – CAVIT	798	$3,715,045
Cobre Valley Institute of Technology – CVIT	175	$949,047
Cochise Technology District – CTD	552	$1,807,970
Coconino Association for Vocational Industry and Technology – CAVIAT	636	$2,150,208
East Valley Institute of Technology – EVIT	7,982	$36,162,352
Gila Institute for Technology – GIFT	300	$1,450,136
Mountain Institute – MI	581	$1,603,118
Northeast Arizona Technological Institute for Vocational Education – NATIVE	573	$2,896,648
Northern Arizona Vocational Institute of Technology – NAVIT	1,121	$4,038,503
Pima County – PIMA	3,216	$16,058,952
Valley Academy for Career and Technology Education – VACTE	321	$1,334,208
Western Arizona Vocational District – WAVE	784	$2,570,270
Western Maricopa Education Center – WEST MEC	6,496	$21,728,391
State Total	**23,533**	**$96,464,848**

* ADM number includes 9th-grade CTE enrollment, which is not funded.

Membership and funding numbers from the Annual Report of the Arizona Superintendent of Public Instruction FY 2011-12. Map prepared by Valley Academy for Career and Technology Education (VACTE) December 2012.

KAREN C. LESHER

Superintendent,
Northeast Arizona Technological Institute of Vocational Education (NATIVE) Joint Technical Education District

CLYDE MCBRIDE

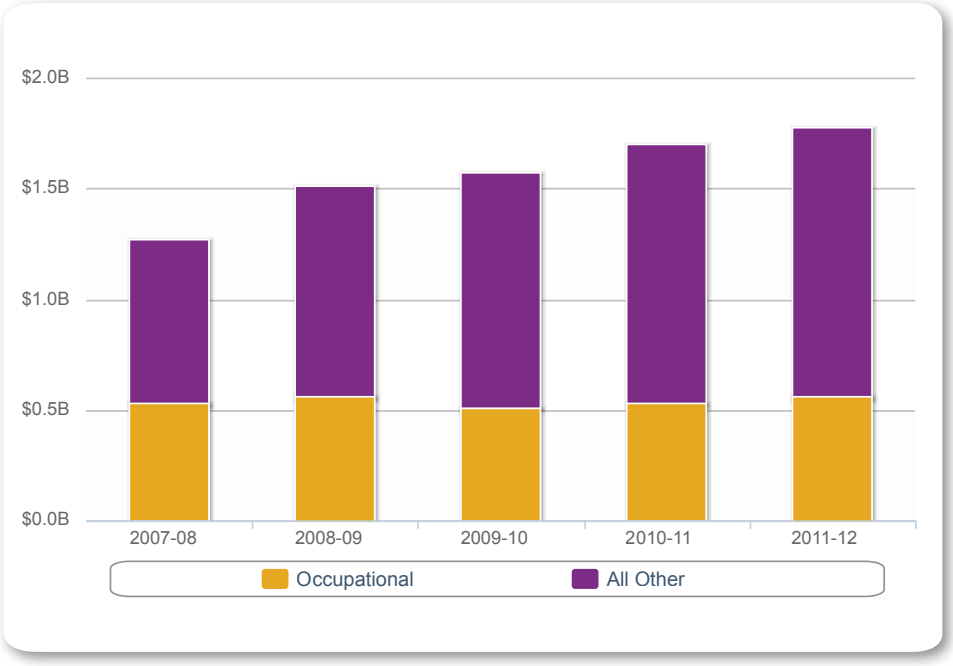
Educator and CTE Director,
Monument Valley High School, Kayenta, AZ

Throughout our long careers in public education, we have seen first-hand the power of high-quality CTE programs to transform students' lives. Quality CTE programs make the difference both in a student's school success AND in a student's career readiness. We have personally seen hundreds of examples showing the positive impact of applied education career skills development classes on student success. Time and again we see CTE programs providing students with technical skills, practical experience, and recognized certifications that provide immediate credibility in the business community. For example, the Veterinary Technician Program at Monument Valley High School is an intensive, hands-on and engaging program designed for students who provide regional preventive and emergency animal care vet-tech services. The skills acquired in the program can provide an immediate payoff for both students and employers. A 2012 Vet Tech graduate was hired on the spot by an employer who recognized the student's skills level. CTE works for students and industry!

In our experience, the key for a successful CTE program is to recognize that every JTED is unique due to cultural and geographic diversity. Best practices need to be modified and adapted to the unique needs of their uses by both students and local employers. One of the keys is to have supplemental funds and local discretion which enables CTE programs to attain high quality, procure the necessary state of the art program equipment that employers currently use, and obtain the key instructional resources that otherwise would be unavailable. The financial flexibility provided by both the local district and JTED funding transformed the Veterinary Technician CTE program at Kayenta High School into the extraordinary and nationally-recognized program it is today.

The need for flexibility is also demonstrated by the geographical challenges faced by JTEDs providing high quality and accessible educational opportunities to students in isolated rural environments. In order to meet these challenges in the Navajo Nation, the Governing Board of NATIVE decided to build a 100 mbps microwave Distance Learning network. This network virtually connects the member sites across 22,000 square miles and provides effective distance learning opportunities. These sessions are broadcast to multiple sites, expanding, equalizing, and sharing educational opportunities. Innovative and passionate CTE teachers and staff are able to leverage this interactive distance learning system to deliver hands-on CTE classes and enhancement sessions

Figure 9: Share of Funding for Occupational Programs in Community Colleges



Source: Arizona Community College Presidents' Council, Data for the Governor's Council on Workforce Policy Annual Report FY 2011-12 and Annual Report FY 2011-12.

Community college funding comes from a variety of sources, including a property tax levy, grants, tuition and fees, and state aid. Unlike CTE funding in high school, the vast majority of funding for occupational programs in community colleges comes these sources. As Figure 9 indicates, a significant percentage of community college funding goes toward occupational programs that lead to a certificate and/or prepare students to take an exam that leads industry-recognized credential.

MARIA HARPER-MARINICK

Executive Vice Chancellor and Provost, Maricopa County Community College District

Community colleges in the state of Arizona are uniquely positioned to serve the needs of employers for well-trained, capable workers by offering courses and programs that are flexible, adaptable and current.

Community colleges provide many and varied pathways for students to gain job skills for technical careers while developing their ability to think critically and creatively, solve problems, collaborate and communicate effectively.

These pathways include certificates, associate and applied degrees, employer-based training, apprenticeships and industry-based certifications. The Maricopa colleges, for example, offer 967 CTE programs that are supported by employer/industry advisory committees. MCCCD's vision for workforce development is to strive to ensure that the Greater Phoenix economy has a skilled labor pool which meets the existing and emerging workforce needs of the employer community.

The relationship between the colleges and the employers is critical. We rely on the expertise and knowledge of our industry partners to continually improve our programs and make the necessary changes to our curriculum. This allows the CTE program to stay current in educating students with relevant industry standards.

INNOVATIVE CTE PRACTICES IN THE U.S.

Arizona offers several models of CTE excellence. EVIT's central campuses, for example, have been recognized nationally. The NATIVE JTED on the Navajo Nation has installed a microwave broadband system to allow CTE students on different campuses to enroll in CTE classes. The Arizona Pathways Council is seeking to facilitate ways for CTE students to obtain credentials. Below are some examples from other states that can inform the development of CTE in Arizona.

1. CENTRAL CAMPUSES IN PARTNERSHIPS TO CREATE PATHWAYS TO POSTSECONDARY CREDENTIALS

Oklahoma's Department of Career and Technology Education has entered into two partnerships with multiple institutions to develop talent in two STEM fields.*

- The Cyber Security Education Consortium (CSEC) includes state officials, community colleges and the University of Tulsa. CSEC is a National Science Foundation Advanced Technological Education Regional Center and is responsible for developing curricula on cyber security in eight states in the region. This has allowed the Department of Career and Technology to develop a curriculum for high school students for cyber security that is aligned with National Information Assurance Education and Training Program standards. Through this program, high school students can seek certification from the Committee on National Security Systems. The department has created programs with community colleges and University of Tulsa that allow students to pursue associate's and bachelor's degrees.

- The Tulsa Technology Center offers CTE courses in three-hour blocks for students in 14 school districts on a central campus. In 2010, Tulsa Tech entered into an alliance with Tulsa Community College, Oklahoma State University, the University of Tulsa and several aerospace and energy companies to create a postsecondary pathway from a high-school diploma to a Ph.D. in engineering. The local chamber of commerce and other economic development agencies showcase the program in their efforts to attract companies to the region.

* Unlike most states, Oklahoma's Department of Career and Technology Education is separate from the Oklahoma Department of Education, with its own appropriation in the state budget.

MARA G. ASPINALL

President,
Ventana Medical Systems, Inc.

The biotech sector is of strategic importance to Arizona as it seeks to diversify its economy. As part of Roche, the No. 1 biotech company in the world, and with more than 1,000 employees in Oro Valley, Ventana Medical Systems, Inc. is an innovator and manufacturer of cancer diagnostic solutions that lead the market worldwide.

With a strong bioscience workforce, we recognize the need to keep students interested in school and provide them with pathways for credentials and further education in the technical and scientific sectors.

The importance of an educated population goes beyond our company's specific needs and extends to our network of suppliers and partners. A skilled workforce is critical to the long-term viability and success of the sector in the state. A rigorous career and technical education curriculum is part of the solution for improving student outcomes and preparing the workforce that biotech requires.

Improving the state's education system is vital to all sectors of the state's economy, not only as Arizona competes to attract talent, but also as it invests in nurturing world-class, homegrown talent for a 21st century economy.

2. EARLY COLLEGE THROUGH PARTNERSHIPS

In North Carolina, Wake County Public Schools, Wake Technical Community College and WakeMed Hospital together created the Wake Early College of Health Sciences, a magnet high school in Raleigh N.C. This alliance has several goals: engage students in learning, provide attractive and productive postsecondary pathways, and build the region's future workforce in healthcare. The curriculum combines rigorous academic education at the high school and community college levels with hands-on skills in the health sciences fields. Students can graduate in five years with a high school diploma and an associate of arts (AA), associate of science (AS) or associate of applied science (AAS) degree, a transferable diploma in science or arts, or a health science certificate. College credits completed while enrolled in the school are tuition-free and are transferable to any of North Carolina's 16 public universities. All students participate in internships at WakeMed hospital.

3. RAISING AWARENESS AND EARNING CREDENTIALS

In 2012, the Kansas Legislature and Governor Sam Brownback created incentives for high schools to increase the number of students earning an industry credential in high-demand areas such as manufacturing. The law established a $1,000 reward for high schools where any student earns an industry-recognized certificate in a demand occupation for Kansas. The bill funds the tuition costs for high school juniors and seniors participating in dual-enrollment CTE programs in community colleges.

Also in 2012, Governor Brownback launched a marketing campaign to raise awareness and recruit high school students into CTE programs. The campaign featured print, online and video components that highlighted the potential career pathways available to CTE graduates. The governor headlined a Skills Summit in Wichita. Last December, officials from several state departments took the campaign to six communities across Kansas to promote CTE, with the goal of building "a certified, highly qualified workforce for business and industry in the state."

4. THE CAREER ACADEMY APPROACH

An estimated 2,500 high school career academies operate in the United States. Career academies are typically schools within schools and have an average student population of 250 to 300 students. Their goal is to keep students engaged in high school while providing pathways to postsecondary education and careers through a CTE-heavy curriculum and internships. Career academies offer a combination of academic and technical classes centered on work-based learning, including exposure to local employers through partnerships. A study by MRDC, a national research organization, followed 1,400 students in nine career academies across the country from their freshman year to eight years after their scheduled graduation date. The study found that, compared with students who had applied to the academies but had not been accepted, academy graduates earned over 11 percent more over eight years following graduation from high school.[10]

As these examples suggest, model CTE programs across the country share several characteristics:

- Strong support of CTE in the form of funding and public endorsement by state officials and state legislatures
- Close collaboration between postsecondary institutions, employers, non-profit institutions and school districts
- A focus on quality, as measured by graduation rates and the number of industry-recognized and endorsed portable credentials.
- Work-based learning opportunities integrated within CTE programs through partnerships with employers
- Incentives for increasing the number of students who earn industry-recognized and endorsed credentials
- Well-articulated postsecondary pathways
- A focus on relevance, with programs leading to industry-endorsed and recognized credentials in sectors in demand

SYBIL FRANCIS
Executive Director,
Center for the Future of Arizona

We should look to CTE practices for models of how to teach and assess the critical knowledge and skills students need to be competitive in a global economy. All students can benefit from applied and hands-on learning experiences traditionally reserved for CTE students. Conversely, CTE students must master foundational academic content and skills that are increasingly vital in all work environments. In today's global economy all students must be able to identify, analyze, and solve problems, communicate effectively, work as part of a team and be leaders in their own right. Yet a "one-size-fits-all" approach is not the answer.

The next leap forward in educational system design will be personalization of the learning experience even as we ensure that all students master needed content and skills. Offering students multiple educational options and learning pathways is an important way to address different student learning modes even as we integrate the best of the different pathways into teaching and learning.

This is where CTE plays a vital role as an important pathway for students.

CTE OVERSEAS

In most European countries and Australia, CTE is generally referred to as Vocational Education and Training (VET).* Germany's vocational and apprenticeship model is known for its extensive system of apprenticeships that place high-school students within companies. Switzerland's vocational education system of competitive work-based learning opportunities is less well-known but is credited for the country's extremely low youth unemployment rate.

Germany's and Switzerland's vocational systems integrate work-based learning and academic concepts. For example, students learn mathematical concepts and improve their literacy skills while apprenticing with companies, usually by spending a day or two per week in the classroom. Both countries also have a strong history of employer engagement. German auto manufacturing companies such as Daimler and Volkswagen have thousands of apprentices working in their plants in programs developed in partnership with the government. Both countries have VET systems that integrate apprenticeships within the secondary school system.[11, 12]

In contrast to the United States, both Germany and Switzerland ask students to select a VET or university pathway – or place them on one of these tracks – as early as 10 or 12 years of age.[13] The German model of apprenticeship has been adapted in a few places in the U.S., but the public-private partnerships have been almost always with community colleges rather than high schools.

On the other hand, VET systems in Norway and Australia have a successful track record with student placement without "tracking" them into academic or VET pathway before high school. Both countries' systems give students more time to select a pathway and provide the option of changing course later on.

Australia has a very high participation rate for VET. About 60 percent of Australian students in "upper secondary" (the equivalent of the last two years of U.S. high school) enroll in VET and about 40 percent enter into an apprenticeship during their senior year. More than 50 percent of Australian employers used the VET system in 2009. VET training and apprenticeships opportunities are provided by intermediary organizations called "TAFEs," which stands for Technical and Further Education institutions. TAFEs follow national guidelines on VET training programs that have been adapted by each state and territory to fit local needs.

* This section is primarily based the book *Schooling in the Workplace – How Six of the World's Best Vocational Education Systems Prepare Young People for Jobs and Life*, by Nancy Hoffman, Harvard Education Press, 2012, and the Organization for Economic Cooperation and Development (OECD) Report *OECD Reviews of Vocational Education and Training - Learning for Jobs,* 2010.

In order to operate as a TAFE, an organization must gain government approval for the qualifications and competencies it seeks to assess. There are both non-profit and for-profit TAFEs, some of which are part of universities and others that are stand-alone organizations. They serve students in their last year of upper secondary school as well as adults seeking to change careers. More than 80 percent of occupations in the country have specific qualifications and competencies that were developed and categorized with the input of organizations representing employers. These nationally recognized qualifications and competencies are defined by the Australian Qualifications Framework and Statements of Attainments, which was developed in partnership with industry and educators.[14]

As noted in *Schooling in the Workplace,* Norway's VET system consists of two years of upper secondary schooling followed by two years of apprenticeship. The first two years are spent in the classroom, where instruction is based on a national curriculum tailored to the occupation selected by the student. The first year of the apprenticeship is spent learning on the job. During the second year, the participant is considered to be a full employee and is paid anywhere from 30 percent to 80 percent of the prevailing wage. The percentage grows as the apprenticeship progresses during the second year.

At the end of the apprenticeship, participants take an exam that earns them a nationally recognized credential as a craftsman or journeyman. The exam and the assessment are implemented by boards appointed at the county level for each occupational area. Training offices are set up by local industry councils to serve the needs of employers, many of whom are small business that would not otherwise have the capacity to set up an apprenticeship program on their own.

Approximately one third of Norway's VET participants decide to pursue further education upon completing the two years of academic instruction. This might be due to the fact that apprenticeships are not integrated into the first two years of the VET program, reducing student engagement. It also might be due to students changing their minds about what career they decide to pursue or not finding an apprenticeship that matched their preference.

Several factors in VET programs in Norway and Australia carry particular relevance for CTE in Arizona:

- VET programs in high school and post-graduation enjoy considerable status, are considered to be promising career pathways and enjoy high levels of participation
- Employers are active participants in the design of the training programs and in developing well-defined competencies and credentials that are recognized nationally
- Training programs and apprenticeships pay a wage below the minimum wage and training costs are partially subsidized by public agencies, reducing the employers' expense
- VET programs lead to the acquisition of a broad set of skills and knowledge to ensure success in the workplace. These basic skills are further supplemented by more specific sets of skills relevant to particular industry sectors.

CHALLENGES AND POSSIBLE SOLUTIONS

The importance of engaging students in their education is well documented. An analysis of the effect of CTE on absenteeism and the likelihood of dropping out for a cohort of students in Mesa Public Schools and Tucson Unified School District (see p. 16) supports the premise that CTE can increase student engagement. But numerous challenges exist that prevent CTE programs in Arizona high schools from being as effective as they could be.

CHALLENGE: LACK OF DATA

The absence of consistent statewide data about CTE's impact on student performance in school and afterwards prevents CTE from being widely recognized as a legitimate pathway to both rewarding careers and postsecondary education. Besides the collection of math and reading test scores in 8th and 10th grade, Arizona currently has no statewide system that gathers information on the academic performance of students and whether they pursue postsecondary education and/or join the workforce. This lack of data prevents parents, students and school administrators from finding out which programs – CTE and non-CTE – work for which students and which do not. The absence of information may also contribute to the notion that CTE is a second-best route to prepare for college. In fact, CTE advocates argue that this "image problem" is among the most significant obstacles discouraging students from enrolling in CTE and hampering greater integration of CTE within high school curricula.

This lack of data is not unique to CTE. A recent Morrison Institute briefing noted: "The key problem, Arizona education experts agree, is an antiquated, patched-together state education data system that is seldom able to provide the reliable, real-time information that parents and educators need to determine which programs are working for which students, and which are not."[15] Until Arizona invests in a system that improves transparency and accountability in the state education system, CTE is likely to continue its struggle with a second-class image.

POSSIBLE SOLUTION: IMPLEMENT A STATEWIDE LONGITUDINAL DATA COLLECTION SYSTEM TO MEASURE STUDENT PERFORMANCE AND OUTCOMES; COLLECT CAREER DATA IN ADDITION TO P-20

Collecting and sharing statewide data are critical for improving the quality of education in Arizona overall, not just CTE. Without accurate data on which programs work (and don't work), teachers, schools and school districts will find it harder to improve public education and student performance and they will be unable to identify best practices. CTE advocates have long complained that CTE is unfairly associated with lower student performance and limited career prospects. Without accurate, statewide data about the effect of CTE on high school performance and postsecondary trajectories, the bias against CTE is likely to continue. In an era of dwindling resources devoted to education, CTE stakeholders in Arizona will need to join forces with their fellow educators and the business community to call for a statewide longitudinal data system that measures career outcomes in addition to (P-20 refers to education systems from preschool through postsecondary education). Only then could the artificial barrier between core academic programs and CTE truly disappear.

CHALLENGE: FUNDING CUTS

CTE courses require state-of-the-art equipment and facilities, which can be expensive. However, the Legislature permanently cut funding for freshman CTE classes provided by JTEDs, eliminating $27 million beginning with the 2011-12 school year. At the federal level, Perkins funds have remained flat in nominal dollars over the past 10 years, meaning that federal funding has actually decreased when inflation is taken into account.
These cuts have left JTEDs scrambling for funds to keep equipment and facilities up to date. They have further strained schools' finances and prevented the development of new programs. JTEDs such as EVIT and West-MEC have partly dealt with funding cuts by seeking donations of equipment on which CTE students can hone their skills. But rural JTEDs often are without large employers nearby, so they struggle to get by with inadequate resources, furthering the long-standing divide between urban and rural districts in the state.

POSSIBLE SOLUTION: RESTORE FUNDING FOR FRESHMAN CTE

This report's analysis of a cohort of students in the Mesa Public Schools and the Tucson Unified School District suggests that CTE has a positive effect on student engagement as measured by reduced absenteeism and likelihood of dropping out. While further analysis is required before extrapolating these results to other school districts, these results support those in previous studies conducted in other states and indicate that CTE is likely to improve student engagement.

WHO CAN MAKE BOTH OF THESE SOLUTIONS HAPPEN?

The governor, state legislature and relevant state agencies

HOW?

By funding the multi-year cost of creating the system and restoring funding for freshman CTE

THOMAS TYREE

President of the Arizona State Board of Education and Yuma County School Superintendent

I recently heard renowned educator Tony Wagner say in a presentation at the Morrison Institute's State of Our State conference, "The world no longer cares about what you know but what you do with what you know." Was there ever a better case made for the importance and value of Career and Technical Education?

The outstanding schools and educational systems of the 21st century will produce students who are innovators and problem solvers rather than passive consumers of knowledge. Arizona's challenge is to deliver high-quality education that produces students with the core competencies necessary to reach their full potential. I believe that one of the best ways to learn is through hands-on, applied instruction that is rigorous (applying what is learned) and relevant (knowing why we are learning something).

Applied learning places our teachers in a position to provide a positive, mentoring relationship with our students that keeps them focused and engaged. High-quality CTE can play a significant role in creating the engagement we need to prepare students to be college and career ready.

Much remains to be done in this regard and we need a concerted and coordinated effort on the part of educators, parents, and policymakers and the business community. Let's get to work!

CHALLENGE: ABSENCE OF EMBEDDED CREDIT COURSES AND "HIGHLY QUALIFIED" TEACHING REQUIREMENT

The federal No Child Left Behind Act (NCLB) requires teachers of core academic courses to have a bachelor's degree in order to be considered "highly qualified." A significant proportion of CTE teachers come from industry, and many do not have a four-year college degree with the required coursework in math or science. Despite their experience and skills, they are not considered "highly qualified" under NCLB. Therefore, their CTE classes cannot be counted as fulfilling a science or math requirement, regardless of how much embedded core science or math content they may contain.

POSSIBLE SOLUTION: RE-EXAMINE "HIGHLY QUALIFIED" TEACHER CERTIFICATION REQUIREMENTS

For CTE to be considered on the same footing as core academic areas, the requirements for a CTE teacher to obtain the "highly qualified" designation should not be so diluted that it further reinforces the impression that CTE is not on par with core academic areas. Instead, Arizona should consider alternative but stringent qualifications for CTE teachers who can teach courses that are rigorous and have an equivalent amount of embedded core academic content.

WHO CAN MAKE THIS HAPPEN?

The Arizona Department of Education, the Arizona Superintendent of Public Instruction

HOW?

Consider and evaluate equivalent yet stringent qualifications for teachers who are able to teach rigorous courses that have embedded academic content.

CHALLENGE: TEACHER ATTRITION

An estimated 70 percent of high school CTE teachers in Arizona come from industry. While they have mastery over the subject they teach, by and large they have not taught before and lack knowledge about preparing lesson plans and teaching high school students. Many end up leaving after their first year due to frustration in the classroom. In fact, the attrition rate has been as high as 60 percent in some years in rural JTEDs, where a single teacher's departure can shut down an entire program.

POSSIBLE SOLUTION: IMPROVE TEACHER TRAINING FOR TEACHERS COMING FROM INDUSTRY

Pima and West-MEC JTEDs have launched the Arizona Curriculum Consortium, a professional development effort that has reduced attrition rates in those two districts (see text box on page 39). The state should consider disseminating information about this program and perhaps providing incentives for school districts to participate in it.

WHO CAN MAKE THIS HAPPEN?

The Arizona Department of Education and school districts

HOW?

By encouraging school districts to train new teachers coming from industry early on in pedagogical skills and provide them with the support they need to succeed in the classroom.

ARIZONA CTE CURRICULUM CONSORTIUM

This collaboration between Pima JTED and West-MEC seeks to create a complete curriculum including lesson plans, lessons, PowerPoint presentations, handouts, worksheets, and assessments for every standard in every CTE program in the state.

To date, the consortium has developed materials for close to 3,000 lessons that are posted on its Wiki. The lessons are available online.

The Mountain Institute JTED in Yavapai County has adopted the consortium materials and has observed a much higher performance by its students on the assessments developed by the Arizona Skills Standards Commission, a body that is developing assessments to be taken by CTE students upon course completion.

CHALLENGE: HIGH SCHOOL GRADUATION AND STATE UNIVERSITY ADMISSION REQUIREMENTS "CROWDING OUT" CTE

The Arizona State Board of Education has increased high school graduation requirements to 22 credits, up from 20 credits, of which four are in math and three in science. Because CTE courses are electives, they are often cut from course schedules to make room for requirements. The growing number of graduation requirements leaves fewer opportunities to take CTE (or other electives) for students who do not pass their math and science classes on their first try. CTE courses with embedded math and science content could count toward fulfilling the math or science content, but only if they are taught by "highly qualified" teachers (see above). Even though some CTE courses provide a strong mathematics and science education, the fact that they are not recognized as fulfilling the math and/or science requirement makes them less attractive to high school students.

The Arizona Board of Regents' policy 2-102 on Assured Undergraduate Admissions requires college applicants to fulfill admissions requirements for classes in math, science (including lab science), English, foreign language and fine arts. Fulfilling these requirements can come at the expense of CTE enrollment for juniors and seniors who want to ensure that their transcripts meet college admission requirements.

POSSIBLE SOLUTION NO. 1: INTEGRATE CTE IN THE IMPLEMENTATION OF ARIZONA'S COMMON CORE STATE STANDARDS

Arizona is among the 46 states implementing Common Core State Standards with the goal of graduating students prepared for both college and careers. English instruction standards focus on reading comprehension and mastering complexity in texts used in social sciences, science and technical courses. Mathematics standards require students to apply mathematical approaches to real-world, practical problems. This presents an opportunity to integrate English language arts and mathematics instruction into CTE programs, where a practical, applied method of teaching has been used for decades. This also could help break down the silos between CTE and the core academic subject areas by incorporating the problem-solving approach used in CTE into non-CTE courses.

WHO CAN MAKE THIS HAPPEN?

The Governor, Legislature, the Arizona State Board of Education, Arizona Department of Education and school districts

HOW?

By increasing the funding for teacher training and providing incentives for CTE and core academic areas to coordinate the implementation of the ACCS.

POSSIBLE SOLUTION NO. 2: RECOGNIZE AND DOCUMENT THE EMBEDDED ACADEMIC CONTENT OF CTE COURSES BY COMPLETING THE CROSSWALK BETWEEN CTE AND CORE ACADEMIC COURSES; STRENGTHEN THE ACADEMIC CONTENT OF CTE COURSES

Depending on the subject, CTE classes can apply math, science and English language arts concepts through hands-on learning. However, until the specific concepts are documented through a crosswalk, the silos that prevent CTE's value from being recognized will remain. With graduation requirements on the rise, demonstrating the embedded academic content of CTE courses will serve to show that CTE plays a role in both college and career preparation. The existing effort by Arizona Department of Education to link mathematics standards with mathematics-related concepts in CTE classes should be expanded to other core subject areas.

Strengthening the academic content of CTE courses without diluting its practical, problem-solving approach to learning is another way to elevate CTE's standing among students, parents and educators. The goal is not for CTE to switch to traditional classroom teaching methods, which would diminish the hands-on learning approach of CTE. Instead, ADE should identify and strengthen the delivery of academic concepts through CTE. Ultimately, all students need to learn foundational math and language skills, whether through CTE or non-CTE classes.

WHO CAN MAKE THIS HAPPEN?

The Arizona Department of Education and school districts

HOW?

By making it a priority and setting clear goals and timelines. This effort has already begun but it can be expanded and fast-tracked.

CHALLENGE: LACK OF INTEGRATION BETWEEN CAREER PLANNING AND POSTSECONDARY EDUCATION

The combination of societal expectations, parental pressure and high school advising geared towards college has created a narrow focus on attaining a four-year college degree at the expense of other pathways. Yet studies indicate that six-year college completion rates hover around 50 percent, leaving many students feeling like failures for not pursuing or attaining a four-year college degree.

POSSIBLE SOLUTION: BEGIN CAREER EXPLORATION AND ADVISING BEFORE HIGH SCHOOL

All students and their families would benefit from early career information and advice so they can make informed decisions about their future. Early career guidance can help students understand the requirements and demands of different career paths and devise a path for achieving their goals. Educators and school administrators could work with the Arizona School Counselors Association to ensure that school counselors inform students about the different pathways to meaningful careers.

For example, the Mesa Public Schools Career Pathways Project introduces 7th and 8th graders to the requirements for different career paths and organizes career information sessions with students and their parents. The Online Arizona Career Information System is provided free by ADE, and can provide personalized information on career and postsecondary pathways based on the interests a student enters into the system.

WHO CAN MAKE THIS HAPPEN?

The Arizona Department of Education, school districts, and the Arizona School Counselors Association

HOW?

By providing adequate support to school districts. School districts can train school counselors on the multiple postsecondary pathways and encourage students to start exploring career pathways before high school.

"THE OUTSTANDING SCHOOLS AND EDUCATIONAL SYSTEMS OF THE 21ST CENTURY WILL PRODUCE STUDENTS WHO ARE INNOVATORS AND PROBLEM SOLVERS RATHER THAN PASSIVE CONSUMERS OF KNOWLEDGE. ARIZONA'S CHALLENGE IS TO DELIVER HIGH-QUALITY EDUCATION THAT PRODUCES STUDENTS WITH THE CORE COMPETENCIES NECESSARY TO REACH THEIR FULL POTENTIAL."

-Thomas Tyree, President of the Arizona State Board of Education and Yuma County School Superintendent

CHALLENGE: ABSENCE OF WORK-BASED LEARNING OPPORTUNITIES

Integrating work-based learning and apprenticeships in high schools has been proven to be beneficial for both employers and youth in Europe and Australia. Yet internship programs involving high school students are not systematic in the United States. This makes it more difficult for students to connect with potential employers and more likely to lead to a disconnect between the skills students learn and the skills that employers actually need. This is partly due to the lack of school credit for internships, a rigid school structure, and the absence of workplace liability insurance for minor students.

POSSIBLE SOLUTION: CONNECT EMPLOYERS AND EDUCATORS IN HIGH SCHOOL AND POST HIGH SCHOOL; PROMOTE THE IMPLEMENTATION OF WORK-BASED LEARNING

There are different avenues for collaboration between employers and educators, such as designing programs of study between high school and community colleges, partnering with JTEDs and community colleges to provide training equipment for students and offering early career guidance to high school students.

Partnerships between employers and occupational programs at the community college level already exist. These efforts could be replicated and scaled statewide. Industry associations and community colleges could work with ADE and the Arizona Commerce Authority in developing postsecondary internships and apprenticeships programs that will help fill the looming skills gap. While workplace liability laws for minors might present an initial obstacle, certain states have taken measures to deal with such restrictions. For example, the state of Virginia requires interns to be covered under the employers' workplace liability insurance.[16] This might require revisiting state regulations on the employment of minors.

WHO CAN MAKE THIS HAPPEN?

The Arizona Department of Education CTE Division, the Arizona Commerce Authority, school districts, employers, community colleges, business associations and non-profits

HOW?

Establishing clear statewide guidelines and expectations for partnerships that can be adapted to fit local needs; engaging employers and trade associations in developing work-based learning opportunities throughout the state.

"ARIZONA FACES AN INCREASINGLY WIDE GAP BETWEEN THE SKILLS STUDENTS LEAVE SCHOOL WITH AND THE SKILLS EMPLOYERS NEED TO SUCCESSFULLY COMPETE. HIGH-QUALITY CTE PROGRAMS CAN HELP SHRINK THIS GAP BY WORKING CLOSELY WITH LOCAL EMPLOYERS TO MAKE SURE STUDENTS ACQUIRE THE RIGHT SET OF SKILLS IN HIGH-DEMAND AREAS."

CHALLENGE: UNEVEN IMPLEMENTATION AND FUNDING OF DUAL-ENROLLMENT PROGRAMS

Individual high schools enter into Inter-Governmental Agreements (IGA) with a local community college that allow high school students taking a particular high school CTE class to earn both high school credit and college credit. But these dual-credit courses cost extra, so many students are unable to obtain dual credit unless a high school or district funds dual-credit courses. In addition, the dual credits earned are not always fully transferable as core credits to community colleges other than the one that signed the IGA.

POSSIBLE SOLUTION: STRENGTHEN DUAL-ENROLLMENT PATHWAYS

High Schools, JTEDs, community colleges and universities should establish articulation programs with the goal of creating a seamless system for students seeking to pursue postsecondary education. These articulation agreements can serve to keep students engaged in their education and create a pipeline of students seeking advanced degrees.

WHO CAN MAKE THIS HAPPEN?

The Arizona Department of Education's CTE division, the Arizona Board of Regents, school districts, community colleges and universities

HOW?

By developing clear guidelines for the transfer of credits.

CHALLENGE: OBTAINING INDUSTRY-RECOGNIZED CREDENTIALS UPON PROGRAM COMPLETION

Currently, there is no systematic measurement of how many CTE students concentrating in a particular CTE program earn an industry-recognized credential in Arizona. The cost of taking the credential test is sometimes handled by the student and sometimes by the school districts.

POSSIBLE SOLUTION: CONSIDER MEASURING AND INCENTIVIZING THE ATTAINMENT OF INDUSTRY-RECOGNIZED CREDENTIALS

Where possible, ADE should encourage CTE programs to prepare students to pass tests that lead to industry-backed and nationally recognized credentials. The CTE division should work closely with the Arizona Chamber of Commerce and Industry's Skills Pathways initiative to accelerate the adoption of a CTE curriculum such as the National Association of Manufacturers' (NAM) Skills Certification System. According to the National Manufacturing Institute, the NAM-endorsed "system of stackable credentials apply to all sectors in the manufacturing industry. These nationally portable, industry-recognized credentials validate the skills and competencies needed to be productive and successful in entry-level positions in any manufacturing environment." CompTIA are corresponding industry-backed credentials in the information technology sector, and similar credentials exist in the healthcare sector.

Arizona also should consider funding programs leading to industry-backed and endorsed credentials. This could motivate more students to stay in school, provide a measureable outcome and send a strong message to existing employers and those considering locating to Arizona that the state is serious about investing in its workforce. As discussed earlier in the report, Kansas passed legislation in 2012 that provides monetary incentives for high schools to increase the number of students earning an industry credential in high demand areas such as manufacturing. Kansas also funds the cost of students enrolled in dual-credit programs.

WHO CAN MAKE THIS HAPPEN?

The Legislature, the Arizona State Board of Education, the Arizona Superintendent of Public Instruction, business associations and chambers of commerce

HOW?

The Legislature can fund the cost of industry-endorsed, portable third-party credentials

The Arizona Board of Education and the Arizona Superintendent of Public Instruction can create incentives for CTE programs to lead to industry-recognized, portable credentials

Business associations such as the Arizona Chamber of Commerce and Industry and the Arizona Business & Education Coalition can facilitate this effort by serving as an intermediary between educators and employers

CONCLUSION

In today's economy, both foundational academic knowledge and technical skills are essential to qualify for a job and succeed at it. In an era when employers seek job readiness along with specific skills, CTE programs provide multiple pathways to acquiring the required knowledge and skills in an environment that promotes applied learning. The traditional notion that CTE pigeonholes students into low-skilled occupations is outdated. The evidence is that CTE can engage students and help prepare them for both the workforce and further postsecondary education. CTE teachers and administrators must do their part in demonstrating that CTE classes are rigorous and relevant. This, in turn, will require a statewide longitudinal data system to assess course quality and outcomes. In addition, CTE stakeholders – teachers, students, parents, administrators, school board and state school board members – will need to develop a shared understanding about how CTE programs fit in with a student's overall education.

Addressing the challenges facing CTE in Arizona will require perseverance and coordination. These obstacles are likely to be overcome only if policymakers, parents, school officials and the business community work together. Arizona's economic future and its quality of life are inextricably linked to how we nurture and develop the state's human capital. The stakes are high.

APPENDIX A: ESTIMATING THE EFFECT OF CTE ON HIGH SCHOOL PERSISTENCE

BY ERIC C. HEDBERG, PH.D.

Quantitatively assessing the impact of a particular curriculum on important outcomes is a challenge consistently faced by education researchers. Such analyses are especially difficult because the "treatment," or program being evaluated, is not assigned randomly. Ideally, in the case of random assignment, we divide the study observations into "treatment" and "control" groups, or those who receive the program and those who do not. As a consequence the two groups are, on average, very similar on all characteristics except program participation. With such an experimental design, differences in outcomes may be attributed to the program.

In the case of CTE, students make choices to participate and persist in a particular program. Common sense dictates that these choices are not random, and that some students are more likely to choose CTE than other students. This presents a problem for causal inference, since factors that lead a student to participate in CTE may directly be related to outcomes, such as high school persistence. Thus, it is plausible that program participation is unrelated to outcomes and that any observed correlation is spurious.

To combat this problem, a common quasi-experimental design is to "match" students on observed characteristics that are (believed to be) related the likelihood of program participation. We use a computer to match each program participant with a number of students who did not participate in the program but share similar characteristics. In effect this quasi-control group is, on average, very similar to the treatment group on all characteristics except program participation. While this procedure is not as valid as a true experiment, it allows for some evidence of program effectiveness.

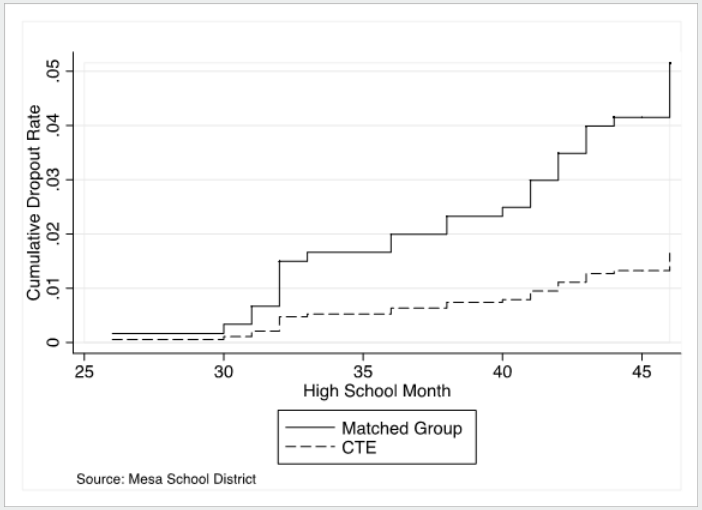
To support our assertion that CTE program participation reduces the likelihood of dropping out of school, we performed the following matching procedure to produce a quasi-control group. We first fit a statistical model to predict the likelihood of concentrating in CTE based on race and ethnicity indicators, gender, freshman year absenteeism, junior high state test scores, freshman year GPA, English learner status, retention, and special education history. We then predicted the CTE likelihoods of each student. The computer then matched each CTE concentrator with two students who did not concentrate in CTE but had similar propensities.

To test the effectiveness of our matching procedure, we performed statistical tests on several characteristics before the matching (CTE vs. all other students) and after the match (CTE vs. matched students) and confirmed that any statistical differences before the matching procedure were removed after the match. For example, before the match, CTE students had lower junior high test scores than all other students, but after the match the average test scores were statistically the same.

We then performed a survival analysis with our matched sample. A survival analysis estimates the cumulative dropout rate over time for each group. Figure A, below, showcases the dropout rate for the match group and the CTE students in Mesa. As you can see, at each month of high school, the matched group has a higher dropout rate than CTE students. Using a regression model, we estimated that the hazard of dropping out was reduced for Mesa CTE students by about 70 percent and by about 50 percent for Tucson students. Both estimates were statistically significant with less than a 1 percent chance of producing a false-positive result.

One threat to the validity of this study was that those who concentrated were simply more likely to graduate because they concentrated in CTE during the high-risk periods for dropping out. We tested this problem by focusing on those who completed two or more courses by the end of 10th grade in Tucson (the timing of courses was not available in Mesa). We then rematched those students and repeated the analysis. This analysis produced the same results. We also tested whether CTE concentration reduced absenteeism, and found that CTE reduced the number of days absent by 3 (also statistically significant).

Figure A: Cumulative Risk of Dropping out in Mesa Public Schools District for CTE and Matched Students



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Mr. Mark Muro
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General Dynamics C4 Systems

The Honorable Mary M. Schroeder
Judge, U.S. Court of Appeals
Ninth District

Ms. Mary Upchurch
Principle Partner
RockCreek Innovations

Mr. John Whiteman
Chair Whiteman Foundation

Mr. John Zidich
President and Publisher
The Arizona Republic

ENDNOTES

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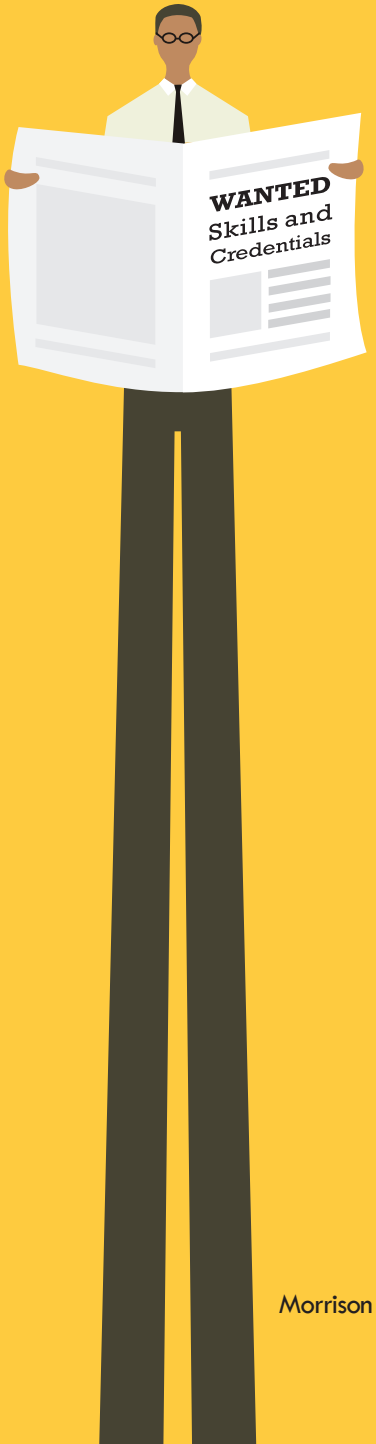
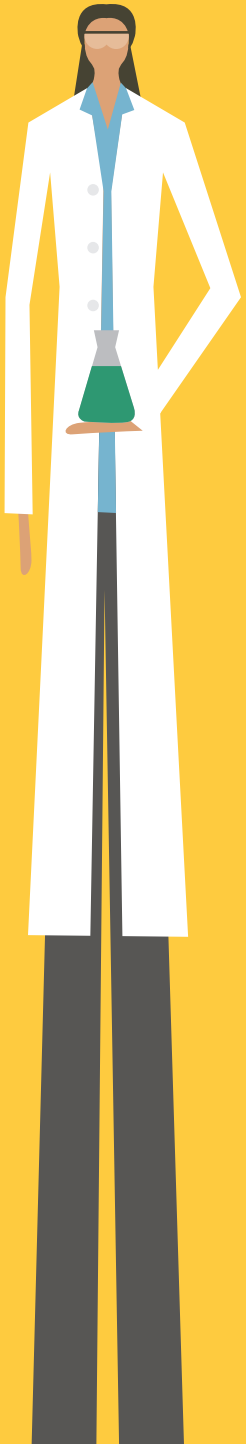


21st Century Career and Technical Education Pathways

on the rise

The Role of Career and Technical Education in Arizona's Future



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