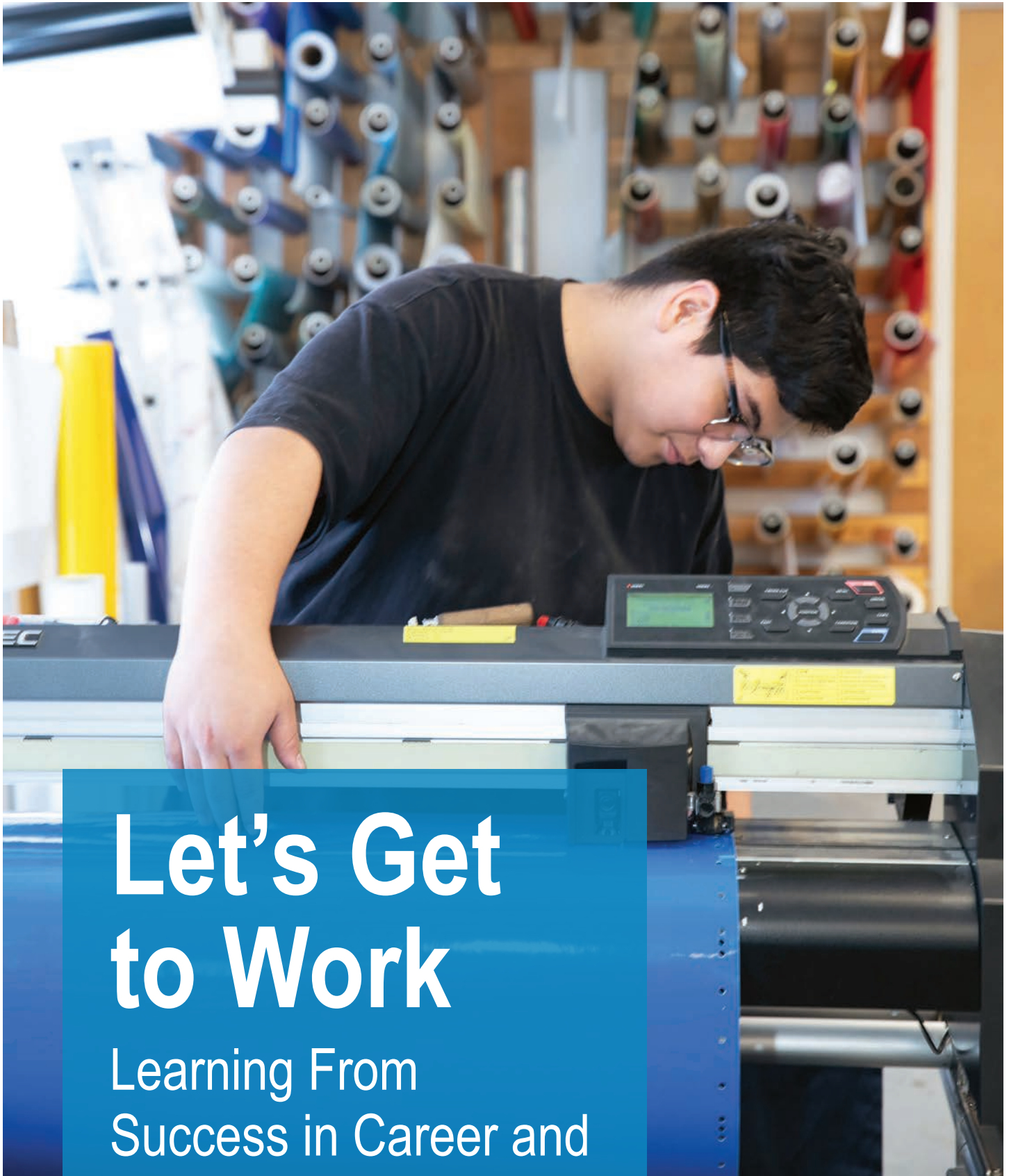


2019 January



# Let's Get to Work

Learning From  
Success in Career and  
Technical Education





# Let's Get to Work: Learning From Success in Career and Technical Education

## EXECUTIVE SUMMARY

**In today's world, good jobs follow good education. Yet as technological innovation and a shifting economy bring rapid changes to the workplace, America has fallen far behind in preparing students for the future.** It's a problem that threatens individual young people and the American economy, and it marks an under-recognized front in the battle for equity of educational opportunity.

We can do better.

Our international competitors recognize the importance of high-quality, intentionally sequenced career and technical education (CTE), while the United States lags far behind. The majority of students in leading countries such as Austria, Germany, Finland, and Switzerland take a substantial, coherent course of study focused on a particular career area, comprising five to six credits or more. In the United States, only about 6 percent of students do so.

**Education shortfalls have led the U.S. to be ranked ninth in the world in readiness for the changes in industry and technology that automation is bringing.**

That's despite our nation's current or projected shortages of workers with specialized training. And it's despite the job insecurity so many people experience even in this time of very low unemployment. Education shortfalls have led the United

States to be ranked ninth in the world in readiness for the changes in industry and technology that automation is bringing.

In part, America's tepid approach may stem from the erroneous belief that CTE is an alternative to rigorous academics. In fact, modern, high-quality CTE programs only complement strong, college-preparatory academics, while deeply engaging students. Such strong programs open multiple pathways to learning, degrees, and credentials after high school—and thus, new and better choices for students.

Research offers limited guidance for state and district leaders seeking to modernize and strengthen their CTE programs. Nearly as important may be the experience of some of the nation's leading practitioners. Among them are numerous Chiefs for Change (CFC) members, who are demonstrating what thoughtful, engaging CTE programs can look like in many states and school systems. In the process, they're showing what it means to offer *all* students a rigorous, real-world path that prepares them for college *and* good careers.

**This report seeks to help state and district leaders throughout the country serve students better through practical, actionable strategies and policies to strengthen and modernize CTE.** These recommendations reflect promising practices from several CFC members—along with a review of the existing research on CTE. This report focuses particularly on progress in improving CTE programs in Tennessee, Nevada, Denver, and San Antonio—all models of innovation, each with different lessons to offer.

From those examples, and from research, Chiefs for Change makes the following key recommendations.

## Key Recommendations

### → Improve the quality of CTE pathways and courses:

Directly engage with the business and industry, nonprofit, and economic development/workforce sectors in your region or state to improve alignment between school and real-world work opportunities. Research shows that students benefit from a linked series of courses in a specific career field, not just a course or two.

### → Expand work-based learning opportunities such as internships and apprenticeships:

States should fund more of these experiences for students and explore new ways to encourage businesses to participate. Whenever possible, businesses should provide paid work opportunities to help prepare students for the workforce and develop a human capital pipeline. States can work with the business community to establish intermediary organizations that can advocate for such endeavors and show the return on investment.

### → Show leadership and improve coordination:

Work with partners to define the respective roles of state entities in improving CTE—e.g., the governor’s office, legislature, education and labor departments, state education and workforce boards, intermediaries, etc.

### → Define career readiness in your local/state context:

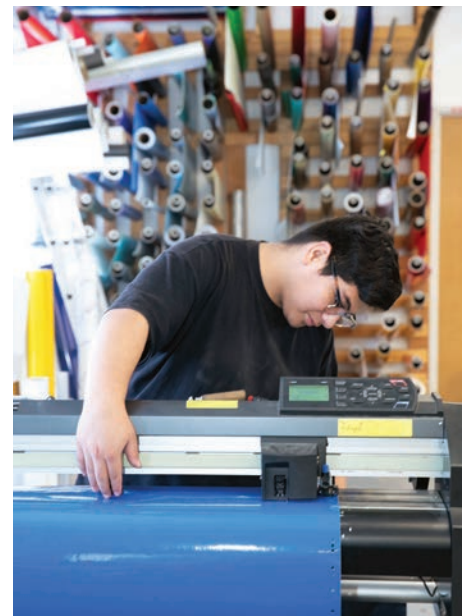
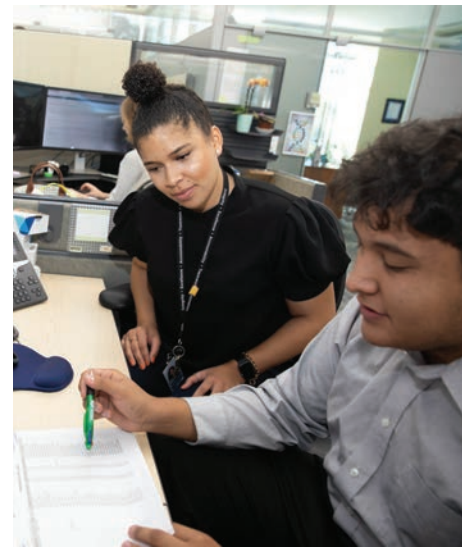
Work with industry partners and other stakeholders to establish a common definition of career readiness for K-12 students. Then develop a plan for how students will reach this standard and a process for monitoring their progress.

### → Expand and improve support for students and families:

The American School Counselor Association recommends that school counselors no longer be assigned non-advising duties such as coordination of testing in schools. The standards also urge schools to limit counselors’ caseload to 250 students each. This represents a new challenge for states and districts. Bolstering student advising will require teams of other educators and community organizations to provide support and help for students and families as they make career- and college-related decisions.

### → Build a truly seamless transition into postsecondary education and career training for students in CTE courses:

CTE programs should dovetail with higher education, including dual-enrollment opportunities that lead more students directly to industry credentials and degrees. States and districts should establish credit-transfer agreements with two- and four-year colleges and start more Early College programs. In addition, states and districts should encourage innovative approaches and more collaboration in smaller communities that may be far away from most employers and community colleges.



Photos courtesy of Denver Public Schools.

→ **Increase program rigor:**

Many CTE courses still lack the academic and technical rigor to allow students to seek postsecondary credentials and strong career paths. Many technical skills require students to have high levels of literacy. Massachusetts provides CTE programs with additional funds if they exceed specific quality standards. Also, 42 states and the District of Columbia supported the development of the Common Career Technical Core (CCTC), rigorous CTE standards developed by state working groups of industry experts, education leaders, and researchers. The standards are CTE benchmarks that students should meet on Pathways of Study within 16 Career Clusters outlined by the federal government.

→ **Raise the bar for CTE instructors:**

Many CTE teachers come from industry and may need professional development and mentor-teachers to support their classroom teaching.

→ **Identify resources:**

In 2018, a new version of The Carl D. Perkins Career and Technical Education Act was passed into law, allowing new uses of federal funds and financial aid for apprenticeships and other types of work-based learning. Determine the financial investments your state or district is prepared to make in CTE, and the expected investments from industry. Consider regional partnerships to help schools pay for needed CTE services, technology, and equipment. Also, establish a process for the state to monitor its CTE investments.

→ **Ensure equity:**

Develop a plan to ensure equal access to high-quality career readiness opportunities for all students, and ensure all students also can access traditional college pathways. These pathways should complement each other, opening the door for more students to pursue various types of postsecondary education and advanced career training.

→ **Monitor progress:**

Collect and analyze data that can be used to inform the growth of high-quality career-readiness programs. This should include disaggregated data by student group to ensure a focus on equity, academic achievement disaggregated by content areas and student subgroup, and alignment to regional labor market needs.



Photos courtesy of Denver Public Schools.

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# ABOUT CHIEFS FOR CHANGE

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Chiefs for Change is a nonprofit, bipartisan network of diverse state and district education chiefs dedicated to preparing all students for today’s world and tomorrow’s through deeply committed leadership. Chiefs for Change advocates for policies and practices that are making a difference today for students, and builds a pipeline of talented, diverse Future Chiefs ready to lead major school systems.

# ACKNOWLEDGMENTS

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Chiefs for Change is grateful to our members and their teams for the information they provided about their CTE initiatives. We are also grateful to David Steiner, Ashley Berner, Al Passarella, and their colleagues at the Johns Hopkins Institute for Education Policy for the research analysis that informed significant portions of this report.



# Let's Get to Work: Learning From Success in Career and Technical Education

## WHY CAREER AND TECHNICAL EDUCATION MATTERS MORE THAN EVER

The need is urgent to strengthen and modernize career and technical education in American schools. As a nation, we're behind other countries in this pursuit.

Many of today's jobs require training, education, and credentials beyond high school—but less than a college degree. The right preparation can make the difference between a rewarding career path and a dead-end minimum-wage job (or no job at all). Career and technical education (CTE) can put more students on the path to success—a path that can lead directly to meaningful work while preserving the option of further education and career advancement down the line.

Our international competitors recognize the importance of high-quality, intentionally sequenced CTE. The majority of upper-secondary (equivalent to grades 10-12 in the U.S.) students in leading countries such as Austria, Germany, Finland, and Switzerland take a substantial, coherent course of study focused on a particular career area, comprising five to six credits or more. In the United States, according to the most recent available [estimates](#), only about 6 percent of students do so. And, strikingly, our competitor countries achieve this without sacrificing academic rigor.

Compounding the problem, most CTE students in the U.S. [avoid higher-level math courses and are far less likely](#) than their international peers to take or complete postsecondary programs. And while nearly all U.S. high schools offer CTE programming (94 percent), [only 4 percent](#) of high schools are specialized CTE schools where all students participate in these programs. That's despite current or projected workforce shortages in many high-tech careers that require specialized training and industry-recognized credentials. And even among those who enroll in CTE courses, [only 41 percent](#) stick with specific career pathways, earning three or more credits in [Career Clusters](#) recognized by the U.S. Department of Education. All of these data suggest that millions of students—and especially those on the wrong side of equity gaps—currently don't benefit from quality CTE programs that lead to future success.

The consequences of this mismatch between education and the working world are distressing, in the cost to individuals, families, and the U.S. economy. That's true even in a time of historically low unemployment, which has not solved the challenges of job insecurity that accompany enormous numbers of low-wage, part-time, or gig-economy positions. The lack of thorough, thoughtful job preparation in turn can hinder efforts to expand equity and opportunity for students in low-income families and many others.

To some extent, America's limited number of CTE students may stem from a longstanding brand challenge: CTE programs are [still seen](#) by many educators, students, and their families as an alternative to rigorous academics. Yet the best CTE programs across the nation are academically rigorous, engaging and challenging for students, and often involve real-world learning in workplaces and in courses that count toward college credit. The work ahead is to ensure that more students have access to



Carson High School — Carson City, Nevada

programs that take a “both-and” approach to college and career preparation.

Indeed, the push for modernized CTE exists in parallel, not in conflict, with the effort to ensure all students have an academic education that opens a path to college—because strong CTE complements strong academic education. And strong CTE is especially vital given patterns of college completion. Only about [38 percent](#) of community college students in the U.S. earn a degree or industry credential within six years of enrollment. And while many more low-income students are enrolling in two- and four-year college than in previous decades, completion rates have improved little for this population.

## MAJOR SHIFTS IN WORKFORCE DEMANDS

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Workforce trends reveal why America’s CTE shortfalls are already taking a toll—and why, without major change, the damage will compound itself in a time of accelerating automation.

In October 2017, the U.S. Department of Labor reported a record-high [7.1 million](#) job openings, despite roughly the same number of American adults being unemployed. In a time of low unemployment, that indicates an underlying mismatch in skills and preparation.

The U.S. faces major shortages of qualified workers in “middle-skills” jobs that don’t necessarily require a college degree but do require training and an industry credential, [according to Third Way](#), a nonpartisan organization that analyzed skill gaps across the country. The group’s report found that the worst skilled-labor shortages are in the health care sector, and these shortages may increase as the population continues to age. Education and technology-related fields also face major skilled-labor shortages. Other shortages, such as those in construction or transportation, vary by region and will also change with retirements. “Stigma, poor delivery of information to students, and an education finance system focused on four-year degrees push too many people away from these jobs,” the organization found.

## WHAT LEADERS CAN LEARN FROM THE RESEARCH

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Research on the benefits and effectiveness of CTE programs is limited, but does offer some guidance for education leaders. While CTE participation hasn’t been shown to increase academic achievement directly, it may provide students with a modest earnings boost after graduation, among other benefits. One state-level [study](#) suggests that CTE may increase high school students’ likelihood of graduating, particularly when students take a CTE “concentration” (or full sequence of coursework).

The bottom line is simple: Millions of students in America are missing out on a path that has prepared students in competitor countries for life success and has strengthened those nations’ economies. Many of today’s generation of state and school district leaders have sought to distinguish themselves through their efforts to expand and improve educational opportunities for all—especially for still-underserved students. One part of that is pushing for major improvements in the access and quality of CTE programs nationwide.

The good news is that, despite a thin research base, examples of leading practice offer a useful guide to action.

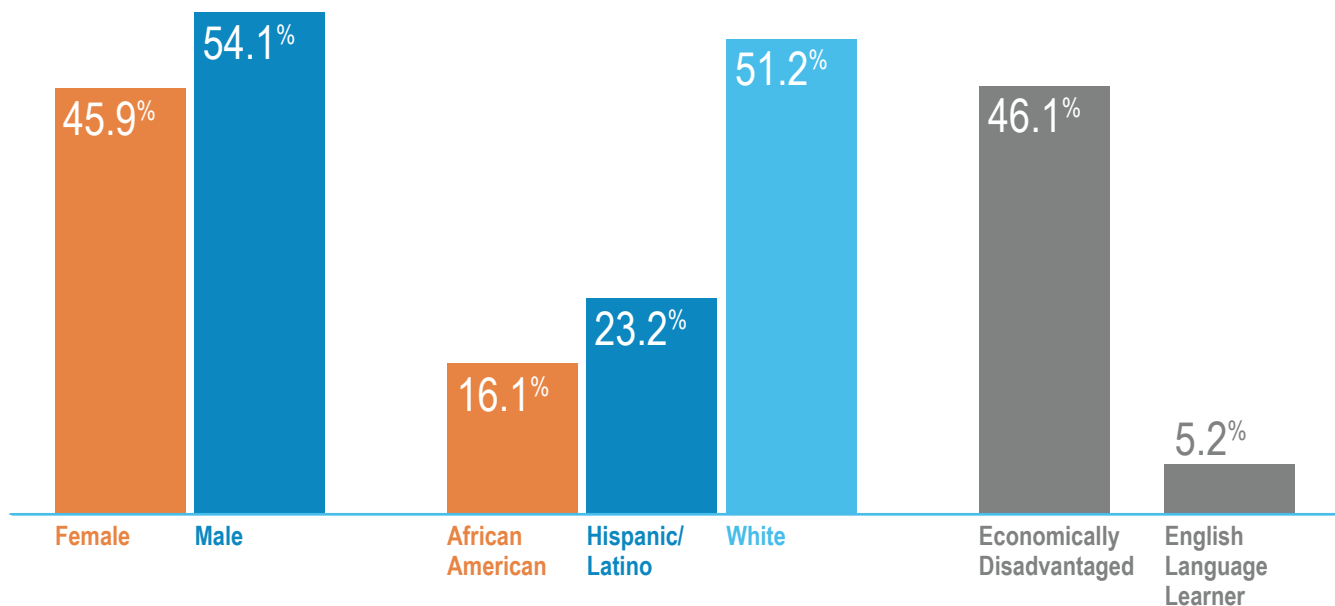
That’s where we are now. It’s going to get worse.

Technological advances mean that rote tasks are increasingly being automated. That doesn’t necessarily mean a net loss of jobs—but that people in many of those jobs will shift from doing those tasks to overseeing the robots handling those tasks. The U.S. isn’t well-prepared for this historic shift, ranking a mediocre ninth in the world on the [Automation Readiness Index](#). “Advanced automation can mean better, more meaningful jobs ... but even countries most ready for the future of work must rethink education and training to prepare people for the jobs of tomorrow,” an accompanying study argues.

The jobs that withstand these global economic changes [are expected to require](#) more advanced technological and interpersonal skills than ever before. Indeed, many of the fastest-growing jobs will require advanced technical skills and postsecondary training—though not four-year degrees. Some researchers [predict](#) that the jobs requiring the lowest education levels are the most likely to disappear. More and more, substantial levels of education and preparation matter for job and life success.

Two common American CTE models make the most impact for students, research shows: **Regional Vocational and Technical High Schools** [that specialize in](#) CTE studies, and [Programs of Study](#) that consist of an aligned series of related courses that lead ultimately to a postsecondary degree or industry credential. Another common CTE model, **Career Academies**, has been shown [to increase wages](#) for some students after high school graduation. (See [Appendix](#) for

## TOTAL CTE PARTICIPANT ENROLLMENT BY SUBGROUP (FOR THE 2014–2015 SCHOOL YEAR)



SOURCE: 2015 U.S. Department of Education, Office of Career, Technical, and Adult Education, Consolidated Annual Report (CAR). States report data based on their definitions of CTE participant and CTE concentrator.

*detailed descriptions and research findings on these and other models.)*

For years, policymakers have debated whether all students should be expected to enroll in college after high school. Some proponents of the “college-or-career” approach have argued that not all students need to complete postsecondary education for a fulfilling career and that students may get saddled with debt for coursework not related to their career or local workforce needs. Others even have argued not all students have what it takes to succeed in college.

Research shows, however, that CTE need not be an “either-or” proposition: while some form of postsecondary education is [now necessary](#) for students to land most jobs that provide a family-sustaining wage, students’ paths can begin or include industry-aligned certifications earned in high school. Proponents of the “college-and-career” approach argue that all students should be prepared for both college and for a full range of options after high school.

Research also strongly suggests that pathways of connected courses that lead to an industry credential are the most valuable CTE pursuits for students. [Taking one or two](#) CTE courses doesn’t do much for students’ job preparation or their academics.

State and district leaders continue to wrestle with how to appropriately target career-readiness programs for students

who stand to benefit the most, while also ensuring equity. CTE programs are [often cited](#) as a strategy for alleviating family poverty and/or ensuring that students deemed unlikely to complete a traditional four-year degree make a smooth transition to the labor market. This push is meant to combat the troublesome, low rates of college completion for students most impacted by the opportunity gap—particularly students of color, students living in poverty, and students with disabilities.

However, critics argue this approach may lead to student “tracking” along demographic lines. Tracking was a troubling hallmark of vocational education models of the past, sorting students with more advantages into academic, college-oriented paths, and others into career preparation. Recent research strongly suggests tracking remains an issue for students of color, students from low-income families, and [students with disabilities, all of whom traditionally have been over-represented](#) in CTE. However, [other recent research](#) has suggested these patterns are not universal, and that newer, STEM-focused CTE programs, perhaps seen as higher-prestige, are more likely to serve a disproportionately high number of white male students.

State and district leaders can look to alternative CTE models for possible innovations. [Opportunity@Work](#), for example, is a nonprofit organization that works with communities to build partnerships among employers, community organizations, civic leaders, and job seekers to develop new pathways to meaningful



jobs and careers. Opportunity@Work supports TechHire, a national network of communities “that create pathways for overlooked and underrepresented Americans to gain skills and access to open technical jobs across the country.” Launched by President Obama in 2015 with 21 communities, TechHire has grown to serve 72 communities and 1,300 employers, with about 4,000 people placed into jobs.

For states with many smaller school districts, expanding on regional models may help to address the costs of CTE improvements. For example, New York state’s CTE delivery

system includes [Boards of Cooperation Education Services \(BOCES\)](#). A federal study of this model suggests regional collaborations can help CTE programs keep technology and equipment more updated and share costs for instructors, work-based learning, and other services. In New York, BOCES allocates CTE funds to hundreds of school districts using a formula that accounts for service, administrative, and facilities costs. CTE in the state’s five largest school districts, including New York City, is funded separately from the BOCES model through a weighted formula.

## Defining Career Readiness

People mean different things when they talk about career readiness. We use that phrase to embrace readiness for next steps in education as well as for the workplace. We endorse the definition put forward by the [Association for Career and Technical Education](#), which defines career readiness through three major types of skills:

- **Core academic skills:** Meeting state academic standards in math and English/language arts and the ability to apply those skills in the workplace context
- **Employability skills:** Critical thinking, time management, and adaptability skills
- **Technical, job-specific skills for a specific career pathway:** On-the-job training that leads to industry certification

## LESSONS FROM LEADING DISTRICTS AND STATES

Forward-looking states and school districts—including many led by visionary Chiefs for Change members—are setting the pace nationally for improving CTE programs. These systems offer important lessons in practice for other states and districts. (See the *CTE Innovation examples on each of these states or districts*.)

### The Pillars of Strong CTE Programs

[Research](#) shows that the best CTE programs include four main anchors:

- Student cohorts in career-themed course sequences
- Rigorous, college-preparatory academics
- Opportunities to earn college credits and industry-recognized credentials
- Meaningful work-based learning that leads to jobs or industry credentials

What do these states’ and districts’ CTE improvement strategies have in common? First, they’re focused on high-demand careers that pay well and meet local or statewide workforce needs. They’ve also built stronger links between high school CTE programs and local employers and colleges, ensuring that students’ paths lead more directly to credentials, degrees, and career growth. New types of diplomas—including Tennessee’s single statewide diploma, rather than differing diplomas for career-oriented students and their college-bound peers—set high expectations and signal career readiness for all students.

In addition, these states and districts have set high expectations for what students can accomplish and provide an array of choices for students and their families. These systems reject “tracking” of students into restrictive career or education paths. Rather, these leading-edge CTE programs are designed to build *more opportunities* for all students, so they can continue their learning in their chosen industry training and college.

The **Denver Public Schools** are rapidly [expanding](#) work-based learning, now enrolling some 4,000 high school students in job shadowing, mentoring, internships, and apprenticeships. The district enrolls about 600 students in six-week summer or

semester *internships* in fields such as health care, technology, computer science, finance, advanced manufacturing, and engineering.

About 75 Denver students have participated in *apprenticeships*, with a second pilot cohort starting in the 2018-19 school year. Modeled on Switzerland's approach, apprenticeships in Denver begin in students' junior year of high school and can last up to three years. Students work two or three days a week and attend school on the other days. They earn part-time pay, high school CTE and college credit, and can earn a valuable industry certification or even an associate's degree and eventual full-time positions in one of four high-demand local careers: health care, technology, business, and advanced manufacturing. Students have a "navigator," an educator who assists them with workplace issues and choosing postsecondary opportunities. Already, students enrolled in a career pathway are 40 percent more likely to graduate on time from high school, and students in the pilot cohort of interns were 270 percent more likely to graduate on time. With these innovations, Denver should garner even more national attention for its expansion and refinement of work-based learning, and how such work relates to other CTE improvements.

Some of the most significant statewide CTE innovations nationally are taking place in **Tennessee** and **Nevada**. Tennessee has worked over several years to align state and local policies, build stronger career pathways, and expand access to **dual-credit programs that include CTE courses**. More than 40 percent of the state's high school graduates now take postsecondary courses in high school.

Tennessee also has taken ambitious steps to show students and the public more precisely when high school graduates are prepared for career training and college. The state's **new [Ready Graduate](#) indicator** will see its first major data release in 2019.

## LESSONS FROM INTERNATIONAL CTE MODELS

Quality CTE programs are linked directly to broad national economic goals in Switzerland, Denmark, and Germany. Vocational education and training, known as "VET" in these countries, generally begins in late high school and continues for about three years. Students often combine work-based learning with classroom study in career or technical schools that resemble U.S. community colleges.

Among international examples, [Switzerland's model](#) may be most informative for American education leaders, with some important exceptions. (See the profile of CTE in Switzerland and other countries in the [Appendix](#).) The Swiss system follows a strong standard academic curriculum and has high goals for

The state is monitoring the rates of students that meet Ready Graduate levels by earning a 21 on the ACT, completing four early-postsecondary courses, completing two of those courses and earning an industry certification in an industry-aligned CTE pathway, or completing two such courses and earning a score of military readiness on the ASVAB exam. The state plans to include a certain level of performance on the ACT WorkKeys National College Readiness Certificate (NCRC) in the Ready Graduate formula in future years.

[Nevada's work](#) to improve CTE is focused on providing better job opportunities in the state, so that fewer students move away after high school or college. The state has streamlined and upgraded its CTE programs statewide, **focusing on career pathways and industries in high-growth, high wage fields** to help diversify the state's economy. State leaders saw the economic harm that heavy dependence on only a few sectors such as tourism can have on the state in an economic downturn. While bolstering tourism, the state also is focused on growing technology, advanced manufacturing, and other sectors.

In **San Antonio**, Texas, Superintendent Pedro Martinez is leading a movement to make education fit the way today's students pursue careers. Instead of simple, straight paths—education, then only one long-term career—he's recognized that for many students, the path looks much more complex, with career switches and multiple stints in school to pursue new degrees and credentials. His vision is one of on- and off-ramps in education—paths that students design themselves. The district is putting that idea into action through an ambitious agenda—working with local employers in new ways to develop stronger CTE courses, linking workplaces and higher education, and even starting [new specialized schools](#). One of the new schools focuses on specialized technology skills and careers, and more specialized schools are set to open in the city.

academic achievement, followed by quality assessment and then full-time CTE or upper-academic tracks starting in 10th grade. Early-warning indicators show school leaders which students aren't on track for high school graduation, triggering intensive summer, after-school, and in-class interventions. Massachusetts' pilot use of the Organization for Economic Cooperation and Development's (OECD) Program for International Student Assessment (PISA) exam is one approach states could follow to develop 10th grade exams for this purpose.

Swiss-style CTE is expensive because of [its emphasis](#) on work-based learning, especially apprenticeships. Business and industry shoulder much of the cost, as employers pay students.

Also, the Swiss lean heavily on academic “tracking,” whereas our strong belief is that all U.S. students deserve choices in

the paths they pursue. Still, most Swiss students experience a rigorous academic curriculum, regardless of their ultimate path.

## Lessons for American Education and Policy Leaders From International CTE Models:

- **More in-depth collaboration among education, industry, and government** sectors could ensure higher standards and improved programs for U.S. students.
- **Government-specified, industry-approved training programs** are required of certified CTE instructors in Switzerland and other nations. Although interest in scaling and replicating these models in the U.S. has increased, movement has been modest.
- **Greater investment for more comprehensive work-based learning programs.** In Germany, costs range from \$25,000 to \$80,000 per apprentice. Costs in the U.S. can be even higher when beginning programs. In 2014, Siemens USA in Charlotte, N.C., spent some \$170,000 per apprentice. Federal funds cover only some of these costs, leaving the rest to businesses and states.

## RECOMMENDATIONS FOR STATE AND DISTRICT LEADERS

Clearly, the need to bolster the quality and reach of CTE programs is pressing—as a matter of educational justice, individual opportunity, and nationwide economic health. Chiefs for Change makes the following recommendations for state and district leaders seeking to improve CTE policy and practice:

- **Improve the quality of CTE pathways and courses** by engaging directly with the business and industry, nonprofit, and economic development/workforce sectors in your region or state, and improve alignment between school and real-world work opportunities. Research shows that students benefit from a linked series of courses in a specific career field, not just a course or two. Work with your higher education systems and technical colleges to equate the industry certifications to credit hours so that students become more likely to enter postsecondary programs.
- **Expand work-based learning opportunities** with local employers, including internships and apprenticeships. States should fund more of these experiences for students and explore new ways to encourage businesses to participate. In addition, whenever possible, businesses should provide paid work opportunities to help prepare students for the workforce and develop a human capital pipeline. States can work with the business community to establish intermediary organizations that can advocate for such endeavors and show the return on investment.
- **Show leadership and improve coordination.** What’s your state or district’s role in improving students’ college and career readiness more broadly? What are the respective roles of state entities (governor, legislature, education and

labor departments, state education and workforce boards, intermediaries, etc.)?

- **Define career readiness in your local/state context.** Has your state adopted a definition of career readiness for K-12 students, with relevant constituents, including industry? If so, has the state developed a plan for how students will reach this standard and to monitor if they’re on track? Do your graduation requirements include career readiness?
- **Expand and improve support for students and families.** The American School Counselor Association standards recommend that school counselors should no longer be assigned non-advising duties such as coordination of testing in schools. The standards also urge schools to limit counselors’ caseload to 250 students each. This represents a new challenge for states and districts, and bolstering student counseling will require teams of other educators and community organizations to support students and families with career- and college-related decisions.
- **Build a truly seamless transition** into postsecondary education and career training for CTE students. CTE programs should dovetail with higher education, including dual-enrollment opportunities, that lead more students directly to industry credentials and degrees. States and districts should establish credit-transfer agreements with two- and four-year colleges and start more early college programs. These programs should be structured so that students can earn postsecondary credit, requiring that systems collaborate more closely on “stackable” credentials that run from high school through technical school, community college, and four-year degrees.

- **Increase program rigor.** Many CTE courses still lack the academic or even technical rigor necessary to prepare students for postsecondary credentials and strong career paths. Massachusetts provides CTE programs with additional funds [if they surpass](#) quality standards set under the federal Carl D. Perkins Career and Technical Education Act. (See the “*Get resources right*” recommendation below for more on this law.) Also, 42 states and the District of Columbia supported the [Common Career Technical Core \(CCTC\)](#), rigorous CTE standards developed by state working groups of industry experts, education leaders, and researchers. The standards are CTE benchmarks that students should meet on Pathways of Study within 16 federal Career Clusters.
- **Raise the bar for CTE instructors.** Many CTE teachers come from industry and may need professional development and mentor-teachers to support their classroom teaching.
- **Get resources right.** In 2018, a new version of the Perkins Act was passed into law. Called the [Strengthening Career](#)

[and Technical Education for the 21st Century Act](#), the law enables federal funds and student financial aid to be used for apprenticeships and other types of work-based learning. What financial investments is your state or district prepared to make in CTE, and what investments could it expect from industry? How does the state monitor its CTE investments?

- **Ensure equity.** How will the state ensure equal access to high-quality career readiness opportunities for all students, and ensure all students also can access traditional college pathways? Create transparent metrics that disaggregate CTE participation and certification attainment by student group.
- **Monitor progress.** Does your state or district have the data to inform the growth of high-quality career-readiness programs? What steps are needed to build or improve data collections and analysis?

## CTE INNOVATION: DENVER PUBLIC SCHOOLS’ EXPANSION OF WORK-BASED LEARNING

The Denver Public Schools have built one of the nation’s most robust internship and apprenticeship [programs](#) as part of a districtwide revamp of all CTE initiatives. The 92,000-student district’s extensive, growing apprenticeship program is based in part on models in Switzerland, Singapore, and Germany, giving students valuable career experiences in high school.

Major changes to the city’s CTE programs began in 2013-14, building on existing business-education partnerships. Data helped drive the changes: A district study of 10 years of data showed that students taking CTE courses had significantly higher graduation rates than their peers regardless of their neighborhood or racial/ethnic group, drawing district leaders’ attention.

Tom Boasberg, a member of Chiefs for Change who served as the city’s superintendent until fall 2018, made CTE a priority for the district, adding several key leadership positions to explore improvements. District leaders decided that programs should better align with high-opportunity local industries and link more directly with postsecondary training and college. The district was awarded the largest federal youth CareerConnect grant, for about \$7 million over four years. Foundations also have invested more than \$5 million in Denver’s CTE programs, and voters approved a tax levy to help sustain the work. District leaders visited Switzerland’s CTE programs to inform their own plans.

An extraordinary 13,000 high school students now take CTE courses in Denver and another 5,000 participate in exploratory

middle school classes. Programming even reaches into the elementary grades. In total, about 20,000 students are touched by Denver’s CTE programs. The district has about 200 formal industry partnerships. In total for 2017-18, DPS enrollment in advanced academic coursework allowed students to earn

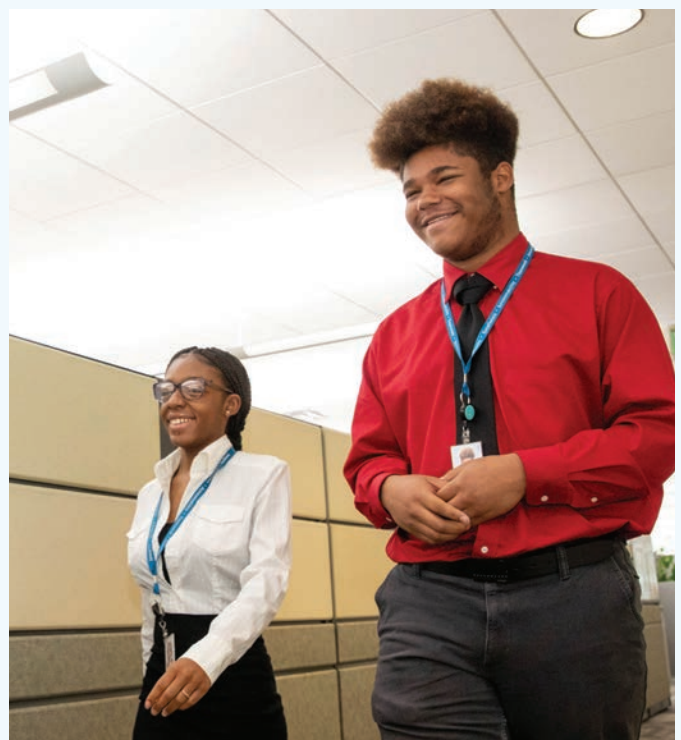


Photo courtesy of Denver Public Schools.

around 54,000 college credits while still in high school. Based on average college tuition rates, this means DPS students saved more than \$8.7 million toward college.

Internships have become a hallmark in the district: These work-based experiences connect students with some of the area's fastest growing fields, mostly in health care, technology, computer science, finance, advanced manufacturing, and engineering. District leaders see the program as a substantial step toward helping more disadvantaged students, who often choose the career- or community college-focused paths, to find greater success. It also helps to address citywide shortfalls in middle-skill fields, where labor shortages exist.

"The feedback from employers has been tremendous," said one district leader of the work-based learning experiences. Student interns help boost workplace morale and introduce new energy and ideas, the leader said.

**"I met with the first group of apprentices and learned about their experiences. At the end I asked them, 'If you had a younger brother or sister who was going to be a junior, would you recommend them to this program?' ... One young man looked up and said ... 'You get paid work, you get free college credit—why wouldn't I recommend it to my younger brother or sister?'"**

– Former Denver Public Schools  
Superintendent Tom Boasberg

The district also is building out more sequences of high-quality, engaging CTE courses aligned with high-need local industries. Courses are heavily project-based, with many hands-on activities. As students plan for ninth grade, schools hold in-depth conversations with families about these opportunities. Students can change their pathways. The district opposes "tracking" or pressuring students toward any pathway.

Ninth-graders in Denver enjoy at least one significant career-exploration event, such as when groups of about 15 students spend a half-day visiting a workplace in their field of interest, often students' first experience in a professional workplace. Students also participate in one-to-one or one-to-two mentoring in specific fields, developing relationships with professionals.

CTE in Denver also focuses on the non-technical skills students will need in any workplace, following the state of Colorado's standards for beginning employees. Denver students are evaluated on communications skills, critical thinking, teamwork, and other skills. Students in internships also receive a performance evaluation on those skills. District leaders are comprehensively examining student data, alongside National Student Clearinghouse data, to inform future CTE programming decisions.

Leaders in the Denver schools are conducting strategic planning for the next phase of CareerConnect, consulting with local and national experts. The goal is to provide every interested student with high-quality career exploration opportunities, including dual credit and work-based learning. Leaders also are exploring new middle school-level STEM programs and labs through organizations such as Project Lead the Way, online near-peer mentoring in STEM fields, and other online mentoring with CEOs and professionals in a variety of fields. New partnerships may include sending high school students to community colleges for nursing, pre-paramedic certification, and other courses. District leaders are considering additional innovative ideas such as enabling students to attend technology boot camps.

Denver worked with the statewide organization CareerWise Colorado to connect with the business community. This intermediary showed how paid apprenticeships can pay off for businesses and helps companies create and structure apprenticeship/internship opportunities. Organizations such as CareerWise Colorado play an essential role in sustaining connections between the business and education communities.

District leaders cited several challenges moving forward: how schools should manage larger numbers of internships and relationships with employers, employers' costs for apprenticeships, how best to use data to improve programs, and helping students manage complex schedules.

Denver's work dovetails with a Colorado statewide CTE initiative: In 2017, the pilot program [CareerWise Colorado](#) used \$9.5 million from Bloomberg Philanthropies and J.P. Morgan Chase to develop a public-private collaboration that follows the Swiss "dual system." Students split their school day between work-based and classroom learning. The initial cohort of junior and senior high school students worked with 17 companies in technology, financial services, advanced manufacturing, and hospitality. Participants earn a training wage and credit toward high school graduation and postsecondary credentials. Students then complete a one-year apprenticeship to prepare them for work or college. The program aims to recruit and train 1,000 high school students and place them with 500 employers by 2020.

## CTE INNOVATION: TENNESSEE'S STATEWIDE EFFORT TO IMPROVE CTE

More than a decade ago, the U.S. Chamber of Commerce issued Tennessee a failing grade for low academic standards and preparing too few students for postsecondary success. In response, the state began to upgrade many areas of education policy and practice, including CTE. Former Governors Phil Bredesen and Bill Haslam (who left office in early 2019) both touted the need for every Tennessean to be prepared for jobs of the future.

**“It helps us figure out what we want to do with our lives.” – Gary Miller, Student**

State leaders developed the new [Ready Graduate](#) indicator of student success, which began in the 2017-18 school year, with the first major data release set for 2019. The state will monitor rates of districts' graduates that meet Ready Graduate levels, calculated through a mix of ACT scores, series of career courses, dual-enrollment high school courses for college credit, and more.

CTE is at the center of the state's Drive to 55 goal of having 55 percent of the state's adults holding a meaningful postsecondary credential. Through the Tennessee Promise initiative, the state was first in the nation to provide last-dollar scholarships to cover students' costs for up to five semesters at any of the state's 13 community or 27 technical colleges. The initiative also provides students with mentors to help them navigate college admissions.

The Tennessee Diploma Project, which began in 2009, has figured into the state's long-term improvements. The project established one main high school diploma in Tennessee, eliminating the state's previous, multiple-track diploma. New diploma and graduation requirements are designed to signify a student's actual readiness for college and career, and guarantee acceptance into a state two- or four-year college. State leaders adopted higher academic standards in 2012 and introduced new CTE standards in the 2013-14 school year.

Leaders also upgraded the state's career pathways, working directly with local school systems to examine labor market trends in each region of Tennessee. [Tennessee Pathways](#), a partnership of the Tennessee Department of Education, Tennessee Board of Regents, and departments of labor and economic and community development, local schools, and industries, encouraged districts to retire CTE programs that lacked rigor or didn't match with labor projections. State

leaders aligned industry credentials to the career pathways, narrowed the number of pathways to focus on careers actually available in the state, and expanded dual enrollment so that students in CTE pathways can connect with related technical or community college programs. Over the course of several years, the state eliminated hundreds of low-rigor career courses. Then the state's focus shifted to improving specific courses in each Program of Study, infusing courses with higher math, literacy, and workplace skills recommended by employers, revising 295 courses over three years.

Starting in middle school, students can explore current and emerging careers and industries, based on state and regional economic trends. Industry leaders and representatives attend career fairs, act as mentors, and serve as guest speakers who provide overviews of their industries and the skills and knowledge required to work in them. High school students, with help from counselors and mentors, can select a program of study in one of 16 Career Clusters.

**“I see a great possibility with ... what we do beyond our borders of high school to ensure that our high school students are getting the support, advising, and resources they need to ultimately be successful. When we talk about our role in K-12, it is beyond high school graduations. Were they successful when they went to the next stage? How do we know?”**

– Former Tennessee Commissioner of Education Candice McQueen

Students can take courses to prepare either for industry certification in high school and postsecondary courses via dual or concurrent enrollment with two- or four- year colleges. Some students participate in work-based learning (apprenticeships and internships) relevant to their chosen pathways.

Nine “pathway coordinators” were added across the state for 2018-19 to build stronger connections among schools and businesses, after leaders found that busy principals or counselors didn't always have the time or expertise to engage with business partners on expansions of work-based learning.

Coordinators also offer a single regional contact for many different companies.

A partnership of the Tennessee Department of Labor and Workforce Development, the state workforce board, and the state Department of Economic and Community Development collaborates to award work-based learning grants in targeted industries, and to include CTE alignment with Tennessee Pathways in the requirements for local-level workforce boards' planning.

The state now has more than 40 percent of students taking some type of postsecondary-level course in high school (and the rate continues to grow), although only about half of those were actually earning postsecondary credit.

About one-third of the state's CTE students come from low-income families, a lower rate than for overall enrollment statewide. More affluent and white students have been more likely to pursue early-postsecondary opportunities, while black and Hispanic students were less likely. In fall 2017, the state

**“I’ll go into college, and I’ll have some of the credits that I need .... That’s going to end up saving me money, saving me time in college.”** – [Wyatt Hall, Student](#)

began to gather and share with districts their data on students' postsecondary paths once they leave high school, giving schools greater knowledge of their students' outcomes. Industry credential exams are now the capstones of several programs.

Tennessee's CTE students have higher average ACT scores than those in general education programs. A majority of CTE students complete a career pathway series of courses. The state also has seen increases in passing rates on state assessments, CTE program completion, and other measures. CTE student graduation rates have risen by 6 points, and were 10 percent higher than non-CTE students in 2016-17.

## CTE INNOVATION: HELPING TO CREATE A 'NEW NEVADA'

The state's workforce initiative, LifeWorks, is providing more relevant career pathways for students and more skilled workers for the state. A first-of-its-kind education-to-workforce

initiative in the state, LifeWorks was created across multiple state agencies with a \$2 million New Skills for Youth grant from J.P. Morgan Chase. Nevada is one of 10 states to receive the grants.

Nearly 64,000 students in the state now take CTE programs. In 2017-18, more than 4,900 Nevada students passed CTE assessments and maintained a GPA higher than 3.0 in CTE courses, earning them credit in community colleges. CTE students' graduation rates have improved more than non-CTE students' over the last decade.

In 2017, the Legislature passed Assembly Bill 7, creating the new College and Career Ready diploma, which includes the ACT National Career Readiness Certificate and expands dual-credit programs and work-based learning opportunities.

The state has 79 programs of study in six career clusters: agricultural/natural resources, business and marketing education, hospitality and human services, human science and public safety, information and media technology, and skilled and technical sciences. Pathways of Study are built on standards developed by educators consulting with business and industry, and some are uniquely local, such as mining and tourism. Approved by the state board of education, the programs include a valid assessment and curricular frameworks.



Carson High School — Carson City, Nevada

Students often begin as high school sophomores. Nevada also is expanding dual-credit opportunities so that CTE students can earn more college credit while in high school.

The state arranged career pathways as a highway, with on- and off-ramps so that students can easily continue or return to education when they wish. CTE is the initial onramp. Then students can proceed to earn advanced industry credentials and even seek a degree. Students also can switch directions and train for in-demand occupations.

The pathways are designed for what leaders call “the New Nevada Economy.” By 2020, about 64 percent of jobs in Nevada will require a degree, training, or certificate beyond high school. Only about half of those jobs will require a college degree.

The state also is revising the standard high school diploma, and expanding dual-credit opportunities and work-based learning programs. The state estimates that more than 7,000 students will receive the new College & Career Ready Diploma in 2019, indicating completed coursework or experience that qualifies students for college and further training in high-demand fields.

New cyber security and military science CTE programs became available to students in the 2018-2019 school year. An automation technology program that will include mechanical, electrical, hydraulic, and robotic systems;

programmable logic controllers; and principles automation was set to begin in 2019.

Gov. Brian Sandoval, who termed out of office in January 2019, was a strong supporter of CTE. The state increased its funding for CTE from \$1 million in 2011 to \$12.5 million in 2016. The governor spoke often of addressing “the skills gap” and enabling Nevadans ages 16 to 24 to build the skills necessary for available “middle-skill” jobs in the state. The state’s goal is for 65 percent of residents ages 16 to 24 to have some form of postsecondary training, a degree, or certificate, so that graduates can stay in Nevada long term.

WestEd is conducting a study on the state’s education offerings and examining economic data on high-skill, high-wage areas. The study will inventory all CTE programs. State officials are conducting a “barnstorming tour” of the state to speak with local educators about CTE programs. The state plans to fund only programs aligned with postsecondary pathways and to phase out dated programs.

Changes to the state’s CTE programs initially were contentious in many high schools and communities. State leaders recommend engaging local leaders and educators as early as possible. Local leaders’ involvement did help pass the state’s new diploma requirements, guaranteeing high school graduates do not need remedial courses in college.

## CTE INNOVATION: SAN ANTONIO: A HEIGHTENED FOCUS ON TECHNOLOGY

The San Antonio Independent School District (SAISD) in Texas is taking major steps to strengthen its CTE programs with new levels of guidance from local business and industry partners—in part by breaking a one-size-fits-all mold on career paths. One of the district’s main areas of focus is helping students engage with promising local careers and training programs in ways that enable them to have new choices and more varied paths in workplace training, industry certification, and higher education opportunities.

Superintendent Pedro Martinez rejects the notion that students should focus on preparing for college or career. In his view, students should prepare for success in *both*. Many of today’s Americans take multi-step routes into careers and college, perhaps starting work and earning a certification, then returning to college for industry certifications or two- or four-year degrees. Martinez sees that not as a failing, but as a factor that informs program design, and envisions on- and off-ramps in which students can access varying levels of education throughout their lives and careers.

In a new level of coordination with the two local community colleges, the district now has more than 700 students who take dual-credit coursework aligned with opportunities in local industries. District initiatives will help to expand dual credit to an even greater number of students in CTE and other pathways.

**“When you look at our district, if you take the poorest parts of most cities and put them all in one district, that’s ... San Antonio. What we’re showing is, these children, when you give them the proper supports, and you give them a shot to succeed, they always exceed your expectations.”**

– San Antonio ISD Superintendent Pedro Martinez



Toyota Motor Co. is a major local employer and works directly with the community colleges to develop training programs. As in many places in the U.S., substantial numbers of local jobs in healthcare and technology are going unfilled.

One prime example of San Antonio's creative work to improve CTE is the creation of the [CAST \(Centers for Applied Science and Technology\) Network](#), a nonprofit organization that operates in partnership with local school districts, higher education institutions, and industry partners. CAST Tech High School, which opened in SAISD in 2018 with 150 freshmen, was the first of the now three career-themed public high schools planned for one of the most economically segregated cities in the country.

The school is preparing students for careers in technology and business. CAST Tech has an advisory board of local employers that helps keep learning relevant and on target. Industry partners also guarantee students internships and mentorships. Students take a mix of core academic classes, along with courses in technology and entrepreneurship. They can earn up to 30 college credits through dual enrollment with local colleges. CAST Tech offers a "Red Hat Certification" in cyber security, a competitive credential in the field.

Students at CAST Tech understand the paths available toward industry certification at a community college, and



CAST Tech — San Antonio, Texas

**“Our students can choose to go on those pathways but they always have the ability to continue their education. They can start with certificates, they can go to associate’s degrees, and if they choose to later on, they can go to get a four-year degree.”**

– San Antonio ISD Superintendent Pedro Martinez

the outstanding cyber security degree program at a local university. In addition, students can access job shadowing and internships in these and related technology fields. Volunteers from local industry work with students at school.

CAST Tech enrolls students from across the county, with half coming from San Antonio ISD schools. There are no entrance requirements, but most students have a serious interest in technology. They learn about many specific career paths in the technology industry. At the suggestion of local companies, teaching and learning is focused on developing the “user experience” sector in technology. Students learn four up-to-date computer languages.

The district wants to ensure CAST schools avoid exacerbating economic segregation by encouraging applicants from the entire Metro area. CAST Tech reserves seats for students who come from some of the city’s lowest-income families, promoting racial and economic diversity. More than 90 percent of the district’s students come from low-income families. The district’s median personal income is \$30,000, about half the countywide median. About half of San Antonio students are born into single-parent families, and many families tend to move often.

CAST Tech is located in the old Fox Tech High School wood and metal shops. Yet with its exposed data cables and open spaces, “old tech” has become “new tech.” Students spend much of their time in shared learning spaces, and the district is renovating parts of other high schools to match this environment. Many lessons are project-based, and students often work in teams. CAST has raised about \$10 million in business and philanthropic support. Another school, CAST STEM, opened in fall 2018 with a focus on advanced manufacturing and serves a high percentage of students from low-income families. Another school, CAST Med, is set to open in fall 2019 to focus on mid-level, in-demand healthcare careers.

With a total of five CAST schools planned, it’s a sign of the change coming in San Antonio— and of what’s possible in CTE.

## Glossary of Relevant Federal Laws

- **Carl D. Perkins Career and Technical Education Act (or 'Perkins')**: A federal law providing \$1.2 billion in grant funding, which are split at the discretion of the state between high schools and postsecondary institutions (mostly community colleges and technical schools). The Act was recently reauthorized and returned more oversight and authority to the states.
- **Every Student Succeeds Act (ESSA)**: ESSA is the most recent reauthorization of the nation's largest K-12 education law, the Elementary and Secondary Education Act, replacing the previous version called the No Child Left Behind Act. ESSA grants states significant flexibility in designing school improvement and accountability systems, including rewarding schools for expanding access to and improving success in career readiness programs.
- **Workforce Innovation and Opportunity Act (WIOA)**: A federal law supporting job training and workforce development activities for adult and youth job seekers. Reauthorized in 2016, the Act pushed states to coordinate CTE and other workforce initiatives.

## APPENDIX: RESEARCH FINDINGS: MODELS IN THE U.S. AND ABROAD

### Descriptions of common American CTE models:

A primer on some of the nation's most common CTE models and what research says about them:

#### REGIONAL VOCATIONAL AND TECHNICAL HIGH SCHOOLS (RVTS): STRONG RESULTS

Usually consisting of specialized CTE programs in regional vocational and technical high schools, RVTS are one of two CTE models that research shows produce the strongest academic results for students. A [2018 study](#) found this model has led to better high school graduation rates and rates of students earning industry-recognized credentials than other approaches. RVTS students also were more likely to earn industry-recognized credentials than students in other types of CTE. This research is some of the strongest on the impact of high-quality CTE programs on student success, although some of the Massachusetts RVTS in the study were public high schools with specific admissions criteria.

RVTS in the study had a different approach to CTE instruction than in traditional high schools: Students alternated between full-time academic coursework and full-time technical studies. All RVTS students were required to complete a full academic core: four years of English and math, and at least three years of a lab-based science, three years of history, two years of the same foreign language, one year of arts, and five additional courses such as business education, health, and/or technology.

#### PROGRAMS OF STUDY: ANOTHER MODEL WITH STRONG ACADEMIC RESULTS

[Programs of Study \(POS\)](#) is an aligned sequence of rigorous, relevant CTE courses, aligned with challenging academic standards, that connect high school and postsecondary education. Through dual- or concurrent-enrollment, high school students earn postsecondary credits, leading directly to an industry-recognized credential or associate's or bachelor's degree. (New requirements for POS in the new version of the federal Perkins Act are available [here](#).)

The National Research Center for Career and Technical Education's extensive research [found](#) that completing POS can boost students' GPA and probability of graduation. Also, ninth-grade enrollment in POS and taking additional CTE credits

improved students' likelihood of graduating by more than 11 percentage points in one school district. The research also found that students in two of the three school districts in the study who took a POS were likely to continue into postsecondary education in the same program area. The positive results may be connected to having a school district advisory committee of pathway-specific instructors, district CTE leaders, business and industry partners, and higher education representatives to ensure pathways are relevant, updated, and lead to valuable credentials.

## CAREER ACADEMIES: STRONG CAREER-RELATED OUTCOMES FOR ACADEMICALLY AT-RISK STUDENTS

First pioneered in Philadelphia in 1969, Career Academies have emerged across the country, including more than 1,200 Academies in nearly 500 California high schools. A “school-within-a-school,” each Academy has a career theme such as health care, finance, technology, communications, or public service. Students spend roughly half their school day in the Career Academy and half in traditional academic courses. Academy teachers come from a variety of academic and vocational disciplines. Student cohorts often work with the same teachers in both traditional and Academy courses.

[Research](#) shows that Career Academies more strongly impact the labor market than students’ academics. Career Academy students do not finish high school at a statistically higher rate

than other students. However, Career Academy students at highest risk of becoming a dropout became less likely to quit school, completed more high school credits, and were more likely to complete three or more career or CTE courses and apply for college.

The program also showed an impact on future wages—but only for men. Those who participated in Career Academies earned 11 percent or \$2,088 more a year than comparable peers not in Career Academies. Even more strikingly, men’s higher wages, work hours, and job stability over time increased their annual earnings by 17 percent, or \$3,731. Women from the program saw no such impacts.

## NAF ACADEMIES: ACADEMIC RESULTS FOR AT-RISK STUDENTS

NAF is a national network of education, business, and community leaders working to bridge the “skills gap” between young adults and adults in higher-skilled (and higher-wage) jobs. Each NAF Academy—a small learning community in a traditional high school, similar to Career Academies—focuses on one of five career clusters: finance, hospitality and tourism, information technology, engineering, or health sciences. The NAF curriculum, created in partnership with industry, requires students to learn valuable workplace skills and meet industry-validated standards. NAF also requires students to participate in internships.

Since 1982, NAF grew from one Academy of Finance in New York City to 675 Academies in 36 states in the 2016-2017 school year. [Research](#) shows that NAF Academies’ students had higher overall graduation rates than their peers, and were highest in finance (85.4 percent), health science (83.5 percent), and engineering (80 percent). Graduation rates were especially strong for Hispanic students, academically at-risk students, and students from low-income families. Rates for black students were just slightly higher than for their non-NAF peers.

## LINKED LEARNING: ANOTHER APPROACH THAT MAY SERVE AT-RISK STUDENTS WELL

[Linked Learning](#) was begun by The James Irvine Foundation to integrate college-prep academics, rigorous technical training, work-based learning, and greater levels of support to help students stay on track. Starting with a cohort of nine California school districts in 2009, the program has expanded to more than 100 districts in the state, serving roughly 65,000 students. It designs pathways around industry-sector themes such as engineering, health care, performing arts, and law, and takes place in small, stand-alone schools or larger comprehensive high schools. Each pathway consists of:

- Rigorous academics that prepare students to succeed in college.
- CTE courses in sequence, emphasizing real-world applications of academic learning.
- Work-based learning in real workplaces that teach professional skills.
- Comprehensive support for students’ individual needs, ensuring equity of access, opportunity, and success.

Schools’ pathways are certified if they fully meet the four core Linked Learning components, based on external review. The program encourages collaboration among academic and CTE teachers on interdisciplinary projects. A variety of models deliver the programs, including the California Partnership Academies, Career Academies, NAF academies, charter schools, and small themed schools. The [Linked Learning Alliance](#), a consortium of education, industry, and community organizations, partners with districts, postsecondary institutions, and industry to develop policies, curricula, and technology resources for the pathways.

The program’s single robust research [evaluation](#) was limited, but found that students were more likely to graduate than their peers in traditional high schools, have had a counselor or another adult encourage them to pursue postsecondary education, and to land higher-quality jobs with good benefits. Black graduates who enrolled in postsecondary institutions were more likely to attend a four-year (rather than two-year) college than their peers. English learners also fared better than their peers in completing substantial career-prep courses. And students with low prior achievement were more likely to graduate from high school and enroll in a four-year institution.

## INTERNATIONAL BACCALAUREATE CAREER-RELATED PROGRAMME (IBCP): ACADEMIC RIGOR IN CTE

IBCP offers an academically rigorous CTE curriculum. Launched in 2012, [the program](#) serves juniors and seniors in 94 U.S. high schools. The IBCP framework consists of three components:

- Career-related studies from the Business and Technology Education Council, Project Lead the Way, and other approved providers, in pathways such as health science, hospitality, and information technology.
- A minimum of two courses in the rigorous, general International Baccalaureate Diploma Program (IBDP).
- The IBCP core: study of an additional language, service learning, personal and professional skills, and a reflective project (an in-depth body of work produced over an extended period).

International Baccalaureate (IB) accreditation is required for any school seeking to offer IBCP, and IBCP is subject to the same standards as the general IB diploma. Students' career-related courses must be accredited by government and industry bodies, an employer or professional organization, and a higher education institution. IBCP is new and has not had a robust evaluation, but a recent [self-evaluation](#) shows that most graduates (87 percent) enrolled in two- or four-year institutions full time, and 59.6 percent enrolled in four-year colleges (besting the 2014 national average of 43.7 percent). Nearly all IBCP students who went to college returned for a second year (89 percent), 17 points higher than the 2014 national average. Also, 77.7 percent of black IBCP graduates completed postsecondary credentials—6.4 points higher than the U.S. average for those students. Hispanic IBCP graduates' college-completion rates were 4.2 points higher (also 77.7 percent) than the average for those students.

## PATHWAYS IN TECHNOLOGY EARLY COLLEGE HIGH SCHOOL (P-TECH)

This model also shares the dual-enrollment and industry-alignment components of some European countries. [P-TECH](#) is part Early College, part industry-recognized certification, designed to give students a seamless transition to postsecondary education by connecting their learning with employment—for “new-collar,” 21st-century careers. Launched in 2011, the original P-TECH was a private-public collaboration of the New York City Schools, The City University of New York, New York City College of Technology (City Tech), and IBM, in grades 9-14. Students enroll at P-TECH for six years, earning a high school diploma and associate's degree in computer-systems technology or electromechanical engineering technology. The college courses are free to students, including tuition, books, and fees. The program also provides opportunities for paid internships, mentorships, and job shadowing.

P-TECH is [expanding](#): The Chicago Public Schools partnered with IBM, Cisco, Microsoft, Motorola, and Verizon to open five P-TECHs in 2012-2013, and the first cohort completed their associate's degrees in 2017. Maryland now has P-TECH schools in Baltimore, suburban Washington, D.C., and the rural Eastern Shore. In Texas, 2017 legislation authorized \$5 million in district planning grants for developing P-TECH models. [Results](#) are available only from one P-TECH cohort thus far, but the model shows promise. Of the original 97 students, 56 percent finished high school *and* an associate's degree. Some of them continued toward bachelor's degrees. Brooklyn's P-TECH high school graduates were among the most college-ready in New York City, with 88 percent meeting state college-readiness benchmarks, including 90 percent of black graduates.

## Key international models:

### SWITZERLAND

Switzerland has a “dual” VET system that integrates rigorous academics with technical, work-based learning. Serving nearly 70 percent of students ages 16-19, most Swiss VET programs combine part-time classroom instruction one or two days a week with an apprenticeship for the remainder of each week. Courses focus on industry themes such as human services, health sciences, and information technology. [Students are paid monthly](#), from \$600-\$700 initially to \$1,100- \$1,200 by the third year. They also may take industry-specific courses at training centers through a host company or industry. By completing an apprenticeship, students earn a nationally recognized credential and can move into full-time work or universities.

Compulsory education in Switzerland ends at ninth grade. Until then, students follow a national, common curriculum, providing VET students with a strong academic foundation. Students receive strong support and guidance: Community-based guidance centers assist students with pursuing VET, exploring available apprenticeships and careers, and help with resumes and portfolios. The system has led to [a youth unemployment rate](#) of only 8.6 percent, among the lowest in the 30 OECD countries (the U.S. rate is 10.4 percent). Thirty percent of VET graduates seek further higher education, and apprenticeship graduates earn an average of 30 percent more than others in similar jobs. Switzerland's students are among the top

performing in the world, with Europe’s highest math scores and significantly above-average scores in science and literacy in 2015.

## DENMARK

Denmark also operates a “dual” system, with students alternating between work- and school-based learning. The Danish VET system contains more theoretical teaching than some in Europe, but [requires students](#) to spend about two-thirds of their time in work-based learning. Compulsory schooling serves students through age 16/ninth grade. Then, 80 percent of students enter an upper-secondary (or youth-education) program for general education or vocational pursuits. Vocational training typically lasts four years, including up to 80 weeks of vocational college.

Students experience work-based learning in one or more Danish Trade Committee-approved companies. Around one-third of each VET youth cohort in Denmark completes an apprenticeship, although this share has declined in the last decade. Similar to the Swiss model, [Denmark’s system](#) is

aligned with companies, government, and technical colleges, working collaboratively to ensure programs meet industry standards.

Once regarded as one of the world’s most effective VET systems, enrollment in Danish VET [has fallen](#) from about 50 percent to less than 30 percent of all students, battling a perception that it hinders access to higher education. Many engineering programs now have been integrated into universities. At the same time, academic upper schools are experiencing higher dropout rates, and some graduates are persistently underemployed or unemployed. Like the U.S., Denmark expects a serious shortage of skilled labor in the next decade. A [possible solution](#): a hybrid pathway combining eligibility for higher education with industry certification.

## GERMANY

Germany’s VET [system](#) also features strong alignment among educational institutions, employers, and policymakers to develop curricula and meet labor demands. VET is provided at upper-secondary and university levels, and dual programs are offered in more than 300 trades, with required exit exams. German states are the primary drivers of education, and students must attend school through age 15. While the Danish and Swiss models also “track” students academically, Germany starts even earlier—at age 10, compared with the OECD average of 14. VET students are placed on [one of three tracks](#): *gymnasium* (typically eight years of university-prep school); *realschule* (a six-year combination of academic curriculum and vocational training or technical college, leading to apprenticeship or career); and

*hauptschule* (focused on vocational training and work). Nearly [87 percent](#) of German students enroll in the equivalent of a postsecondary institution, compared with the OECD average of 82 percent. Like other models, German VET programs [combine work-based and in-school training](#) for about three years. The model relies heavily on states to regulate industry standards and on standardized occupational profiles or curricula developed by the federal government and employers, educators, and labor unions, helping students learn transferable skills should they switch companies. Despite some of the highest average PISA scores among OECD nations, [nearly a quarter who enter](#) training courses only qualify for “prevocational” training, preparing many only for unskilled, unstable, low paying jobs.

## Additional resources:

- AdvanceCTE, [Unpacking Putting Student Success First: State Self-Assessment](#)
- The Center on Education and Skills at New America, [Youth Apprenticeship in America Today: Connecting High School Students to Apprenticeship](#)
- CCSSO Task Force on Improving Career Readiness, [Opportunities and Options: Making Career Preparation Work for Students](#)
- ExcelinEd, [Putting Career and Technical Education to Work for Students](#), [Building Cross-Sector Partnerships to Support Career and Technical Education Pathways](#)
- Jobs for the Future, [Work-Based Learning System Development Guide](#)
- Pathways to Prosperity Project, Harvard Graduate School of Education, [Pathways to Prosperity](#), [Learning for Careers](#)