

# Signature Features of High-Quality Career and Technical Education



By James R. Stone III

**A**lthough the United States has been attempting to address education for the workplace for over 150 years, it still has no national system linking education and the workforce.<sup>1</sup> Instead, it has a nonsystem built upon a series of ad hoc efforts in which the 50 states individually make and carry out most education policy, with some federal policies providing direction or oversight. Within each state, school districts often modify and interpret state policy. As a result, state and local efforts have shaped career and technical education (CTE) policy and programming in many ways. In a very real sense, context matters.

Because of our nonsystem, CTE has evolved into a broad concept with a variety of working definitions. Even key terms like *CTE concentrator* (which relates to how many courses in a specific career pathway a student takes) and *work-based learning* have

multiple definitions used by different states, with none used by a majority of states.<sup>2</sup>

A recent cost analysis of standalone CTE high schools in two states showed the impact of these differences among states in definitions—and thus in their program implementation. The researchers found one state’s approach offered clear positive returns to its investment; the other produced mostly “non-negative” smaller returns.<sup>3</sup> Clearly, each state’s definitions and resulting real-world context matter.\* With shared definitions—ideally embedded in a national system connecting education and work—lagging, states would have better odds of learning from higher-functioning states.

Given the variability among states and programs, the best approach a district or school might pursue to create a high-quality CTE program is to focus on the essential skills that students need to develop and the signature features common to any high-quality CTE program regardless of context, label, or description. In this article, I summarize the research on both these skills and features.

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\*For details on context effects, see “From Margins to Mainstream: Bringing Career-Connected Learning to Scale” on page 4.

## Essential Skills

Among researchers and policymakers, there is general agreement that a high-quality CTE program must address three types of skills in context: academic, technical, and employability (although different terms may be used to describe each).<sup>4</sup> To cultivate these skills, the focus will necessarily be adapted to the stage of student development: career awareness, career exploration, career preparation, and career training.<sup>5</sup>

For academic skills, it is obvious that different occupations require different levels of reading ability and knowledge of mathematics and science—often requiring a level of skill that extends beyond or is different than what is necessary for successful high school completion. For example, strong oral skills are considered paramount for students pursuing business careers.<sup>6</sup> Potential engineers and workers in advanced manufacturing will most certainly require different and higher levels of math skills (e.g., statistics) than those pursuing careers in the arts or culinary industry. More generally, research has found that while the math needed to be “career ready” is typically found in college-prep courses, it tends to have more advanced content than what is necessary to be considered “college ready.”<sup>7</sup>

Despite the recognized variability across careers, and in keeping with our nonsystem, the field of CTE still does not have a baseline or benchmark that defines what academics all future workforce participants will need to master to be career ready. Although the World Economic Forum summarized over 200 studies and identified how students apply core skills to everyday tasks,<sup>8</sup> far more needs to be done to support how academics are embedded in CTE programs.

Regarding technical skills, the situation is clearer. The most powerful signal of an individual’s career readiness is earning an industry-recognized credential (IRC). Acquiring skills unique to different work environments enhances employability because IRCs signal to the labor market that an individual possesses a specific set of technical skills desired by an employer. A robust system of career pathways would nest IRCs in specific CTE programs, providing a series of stackable credentials that give individuals a variety of pathways to future success. These credentials should signal an individual’s developmental growth, which begins with general work readiness credentials (e.g., the ACT WorkKeys National Career Readiness Certificate or the Occupational Safety and Health Administration’s 10-hour safety certification), leads to entry-level skills, and provides a specific path to more advanced skills (such as becoming a certified nurse aide by the end of high school and then a licensed practical nurse after another year of training).

Beyond academic and technical abilities, employers look for employability traits, behaviors, or skills that are necessary for getting, keeping, and doing well on a job. From the simple ability to communicate with a customer or supervisor to navigating relationship challenges in the workplace, these are often selected as the most desirable skills in employer surveys.<sup>9</sup> Research indicates that college typically does not build these skills. One study found that recent college graduates lack basic workplace proficiencies such as adaptability, communication skills, and the ability to solve complex problems.<sup>10</sup>

Character traits are also critical. Noncognitive skills such as persistence, dependability, self-control, curiosity, conscientious-

ness, grit, and self-confidence are more important than sheer brainpower to achieving success in the workplace as well as in college.<sup>11</sup> As with academic skills, the World Economic Forum’s literature review identified 10 employability competencies needed to equip students to succeed in the emergent digital economy,<sup>12</sup> but CTE instructors will need support to embed these skills in their programs. Fortunately, there is some evidence that work-based learning and out-of-classroom experiences through career and technical student organizations may offer better venues for this aspect of youth development than classroom-based learning.<sup>13</sup>

How best to engage students in acquiring these academic, technical, and employability skills is the primary challenge of developing high-quality CTE programs. Implementing the following signature features will help.

## Signature Features

The signature features of high-quality CTE programs described below are a distillation of research drawn from many sources,<sup>14</sup> including lessons learned from several advanced industrial nations. They emphasize the need for CTE programs to address elements of curriculum, pedagogy, and assessment within a career pathway framework that begins no later than middle school.

# The curriculum for any given CTE program must be driven by industry-recognized standards.

### Rigorous CTE Curriculum

A high-quality curriculum begins with a context that offers both meaning for the learner and an appropriate locus for the application of academic, technical, and employability skills. Work provides a social context<sup>15</sup> and experiences that will engage the learner.<sup>16</sup> To maximize learning in the classroom and in work-based settings, the curriculum needs to be authentic, which is marked by the following four elements.

#### 1. The curriculum is derived from industry and reflects qualifications for future employment.

The curriculum for any given CTE program ought to begin with a career focus and the knowledge and skills needed for successful entry into and advancement within that career pathway. It must be driven by industry-recognized standards. For many CTE programs, identifying these standards remains a challenge. Unlike many of our economic competitors, US labor markets lack a national framework for education, credentials, or qualifications for most occupations.



Consequently, the market proliferates with perhaps as many as one million education and industry credentials.<sup>17</sup> This includes degrees but also badges, certificates, licenses, apprenticeships, and myriad industry certifications. Many are narrowly focused, and many are proprietary. Further, many career fields have few if any nationally recognized credentials. (By contrast, Germany has 350 apprenticeable occupations in which more than 60 percent of high school graduates participate.<sup>18</sup>) The best strategy for addressing this challenge is for educators to work closely with regional leaders from in-demand industries or occupations.

Despite the limitations of our nonsystem, there are regional and national credentials that can be built into a high-quality CTE curriculum and stacked over time as students move from high school to the workplace and to further education at a postsecondary institution or an employer-based training program. A career pathway with such stackable credentials offers options for the many youth who will not move directly from high school to college to the workplace.



## 2. The curriculum is delivered through activities that address authentic problems.

In a robust technical course, authentic problems of practice abound, requiring the application of both academic and technical knowledge to resolve. Students need to struggle with authentic, real-world problems and “figure it out” to encourage deeper learning and to develop critical employability skills

such as persistence. An authentic, problem-focused curriculum that integrates related academics must begin with the technical requirements, not the academic. Other academic curricula may use context-based approaches that are often framed as applied learning. Such approaches may make academics more interesting, but absent authenticity of a real work problem to solve, they contribute little to a student’s career development.

## 3. The curriculum continually enhances related mathematics, literacy, and science concepts.

Academic teachers and courses are responsible for educating students in academic content. However, CTE courses can show the connections to academic learning and how the workplace uses academic concepts, reinforcing what students learn in other classes. This also helps ensure that students graduate from high school prepared to continue learning in a postsecondary institution. CTE programs should integrate multiple strategies for building students’ mastery of math, science, technical reading and writing, and communication. The National Research Center for Career and Technical Education (NRCCTE) developed and experimentally tested an approach to integrating academics into CTE courses that showed strong positive outcomes in mathematics and literacy (for more, see the box below).<sup>19</sup>

## 4. The curriculum seamlessly feeds into postsecondary CTE programs because it is guided by an industry advisory committee.

A structural mechanism to facilitate student transitions, stackable credentials, dual high school and college credit, and other linking elements is for secondary and postsecondary CTE programs to share a joint industry advisory committee. The benefit is that a single pathway advisory committee that speaks to secondary and postsecondary program leaders helps ensure a more unified career pathway to better meet the needs of students and employers.<sup>20</sup>

Through such advisory committees, educators and employers have one conversation and therefore engage in complementary work. Central to this conversation is describing the needs of industry and facilitating the design of a more tightly integrated curriculum derived from a common set of industry standards and advice. The result should be a smooth pathway from high school into the postsecondary technical curriculum and into employment.

### Educators with Technical and Pedagogic Skills

Although it should be obvious that well-prepared teachers are important to the delivery of high-quality CTE programs, developing CTE teachers can be a challenge. Many CTE teachers come directly from industry with great technical expertise but little or no traditional teacher preparation.

High-quality CTE programs provide three pedagogic venues for CTE teachers: the classroom/lab, work-based learning, and career and technical student organizations.<sup>21</sup> As shown in the table on page 15, each offers opportunities for CTE teachers to effectively enhance students’ academic, technical, and employability skills.

## 1. The classroom/lab integrates academic content and connects to work-based learning.

Relatively few CTE teachers enter the classroom with a traditional teacher education background, especially those who teach in the skilled trades. One state estimate suggests that as many as 95 percent of CTE teachers begin as experts in their trade and

## Videos on Integrating Academics

After developing and testing its approach to integrating academic content in CTE, the National Research Center for Career and Technical Education produced a series of free videos to support educators.

- “Maximizing the Academics in CTE: The NRCCTE Curriculum Integration Studies” provides an overview of the approach and the research findings: [go.aft.org/xgw](http://go.aft.org/xgw).
- “An Introduction to the Math-in-CTE Curriculum Integration Model” includes interviews with educators in Arlington, Virginia; Detroit, Michigan; and Eugene, Oregon, explaining how they transformed their teaching: [go.aft.org/a7e](http://go.aft.org/a7e).
- “Math-in-CTE at the Arlington Career Center, Arlington Public Schools,” offers more in-depth commentary and examples from educators in Virginia: [go.aft.org/ytw](http://go.aft.org/ytw).
- “Math-in-CTE Sample Lesson: Information Technology” shows a class at the Arlington Career Center using Scratch (a coding language for youth) and learning how to plot points on a coordinate plane: [go.aft.org/6ew](http://go.aft.org/6ew).
- “Math-in-CTE Sample Lesson: Cashiering” shows a class at Detroit’s Breithaupt Career and Technical Center using basic math to handle guest checks in a restaurant: [go.aft.org/woy](http://go.aft.org/woy).

–J. R. S.



later pursue a career in teaching.<sup>22</sup> Other estimates are lower but as high as 75 percent in the 30 states surveyed.<sup>23</sup> Not only are CTE teachers more likely to enter the profession sans traditional teacher education, but there is also evidence that their leaving rate is considerably higher than traditionally prepared teachers.<sup>24</sup>

To address these challenges, the NRCCTE developed an intensive, evidence-based approach to help new CTE teachers master essential teaching skills and reduce their leaving rate.<sup>25</sup> Called “Teaching to Lead,” it focuses on four traditional teacher skills adapted for the CTE classroom, beginning with classroom management and moving on to instructional planning, instructional strategies, and student assessment. This iterative approach is designed to span a new teacher’s first year, starting with a 10-day summer institute before school begins and continuing with an intensive coaching component during the school year and another institute the following summer. An evaluation found that teachers improved their classroom management and student engagement.<sup>26</sup> (To implement this professional development, see [sreb.org/cte-teacher-preparation](http://sreb.org/cte-teacher-preparation).)

In addition to the instruction they provide, high-quality CTE teachers are necessary for the authentic learning contexts they facilitate. Most important are work-based learning and career and technical student organizations.

## 2. Work-based learning is authentic.

Work-based learning (WBL)—and connecting work- and school-based learning—can be done in many ways, such as applying academic and/or technical skills learned in school to tasks encountered on the job, showing the relevance of school to the real world, or demonstrating mastery of skills to earn a certification.<sup>27</sup> Regardless, authentic WBL must be a goal of high-quality CTE program design.<sup>28</sup> The National Governors Association,<sup>29</sup> in its argument for more authenticity in WBL, identified four key characteristics:

- a partnership agreement that details the expectations for each partner: the employer, the participant, and the school;
- a work experience where the student is engaged in real or authentic work activities supervised and mentored by an industry professional;
- a structured learning component that intentionally connects theory with practice and workplace skills; and
- a third-party assessment and recognition of skills (such as an industry-recognized credential), ensuring that the student is progressing in a career pathway.

Many researchers have considered European models of WBL for lessons that might be applied to US educational systems. Colorado implemented a Swiss-style apprenticeship program, a more intense form of WBL than most CTE students experience in the United States.<sup>30</sup> Its essential features include

- engaging in meaningful work experience, such as earning a wage while receiving hands-on work experience;
- earning a nationally recognized industry certification;
- being a true team member doing meaningful work;
- being part of a professional network; and
- having opportunities to earn college credit without incurring debt.

## Authentic work-based learning provides a test of how well students’ interests and abilities align with the occupations they are considering.

Authentic WBL benefits are many, including students gaining the soft and hard skills necessary to be successful in both college and career settings<sup>31</sup> and improving reading scores, attendance, high school graduation, college attendance, and postsecondary achievement.<sup>32</sup> More than skills, authentic WBL also provides a test of how well students’ interests and abilities align with the occupations they are considering.<sup>33</sup>

What is critical but rarely discussed is the importance of occupational socialization as a function of high-quality WBL pedagogy.<sup>34</sup> While schools can replicate the appearance of a workplace in a CTE program, they cannot replicate occupational socialization.

Industrial psychologists define occupational socialization as the process whereby individuals learn to be fit for performing work by becoming aware of organizational and occupational practices, internalizing them, and carrying them out as partici-

Pedagogical Setting	Integrated Academic Skills	Technical Skills	Employability/Work-Readiness Skills
Classroom, Lab, or Shop	Address math, English language arts, or science in the context of the industry skill.	Develop and practice industry standards-based skills.	Work in teams on in-class assignments.
Work-Based Learning	Reinforce relevant skills in an applied setting.	Apply skills in an authentic context working with occupational incumbents.	Engage in occupational socialization as part of a work group.
Career and Technical Student Organization	Participate in leadership development activities.	Test skills in a competitive environment.	Interact with industry professionals.

pating members of a work group. It is the learning of attitudes and behaviors, informal work norms, and peer-group values and relationships necessary for success in an occupational context.<sup>35</sup> Formal elements include company, team, or organizational meetings where the adolescent worker engages with adults (including customers); classes, including those taught by external vendors, demonstrating the newest tools or processes; and meetings with mentors and with other adult employees working on the same tasks. Informal elements include casual conversations with other employees, social get-togethers, and

the simple act of observing how adults in the workplace interact with each other, their supervisors, and the work itself. These are experiences that cannot be replicated in a school setting and are fundamental to an adolescent's career development.



## It is important to develop well-defined pathways that ensure students are on their way to their chosen careers.

Finally, authentic WBL helps youth begin to acquire the social capital created by interactions with adult supervisors, mentors, instructors, and others who can provide access to valuable resources such as information, assistance, support, encouragement, and connections.

### 3. Career and technical student organizations provide students more opportunities to explore career pathways and develop their skills.

Successful CTE programs have active student organizations. Career and technical student organizations (CTSOs) are co-curricular, meaning activities are directly related to the CTE curriculum and some activities occur during school. CTE teachers can use CTSO competitive events in their classes to develop teamwork, decision-making, career awareness, and personal development. CTSO leadership opportunities also add to students' development through club meetings and projects. Many CTSO activities occur outside of the classroom and include community service projects, conference participation, and professional development through state and national CTSOs. For teachers, CTSOs are an effective pedagogy to enhance students' career development, noncognitive skills, and academic

engagement.<sup>36</sup> One of the few studies of CTSOs found evidence of positive effects on several proximal variables linked to post-secondary student success, including academic motivation, academic engagement, grades, career self-efficacy, college aspirations, and employability skills.<sup>37</sup>

### An Assessment Framework That Incentivizes Career Pathways

Although it is beneficial for CTE programs to be open to students who are just exploring, it is also important to develop well-defined pathways that ensure students are on their way to their chosen careers. States and school districts should offer options among high school CTE programs and pathways, recognizing that not all students will wish to pursue the same level of technical preparation—and they should incentivize establishing more intensive CTE options.

At an operational level, it might be useful to consider three levels of standards that CTE programs must meet to receive funding, with bronze as the minimal level acceptable for state or district support.

*Bronze-level* CTE programs require that students meet all high school graduation requirements and have an option for students to earn at least one industry-recognized credential (IRC).

*Silver-level* CTE programs require that students meet all high school graduation requirements and

- ensure students meet established postsecondary entrance requirements—for example, a score of 22 on the ACT exam or the reading and math cut scores on a two-year college placement exam such as Accuplacer;
- integrate related math, literacy, and science concepts into each career pathway;
- include at least one authentic work-based learning experience in a related industry setting;
- meet at least one IRC requirement that links to a next-level IRC;
- incorporate dual enrollment so students have the option of earning college credits; and
- lead to a two-year technical education program that provides the next-level IRC or academic credential.

*Gold-level* CTE programs require that students meet *silver-level* expectations and

- have higher academic expectations (e.g., advanced math and science courses as appropriate for each career pathway, etc.);
- include an extended, more intensive authentic WBL experience in a related industry setting; and
- include a four-course technical education sequence in each career pathway that concludes in at least one dual enrollment course in the technical sequence.

**H**igh-quality, world-class CTE programs and pathways are necessary for a prosperous 21st-century society. By designing CTE programs that include the essential skills and signature features described here, schools and districts greatly increase their likelihood of success in preparing youth to move from secondary education into productive adult lives. □

For the endnotes, see [aft.org/ae/spring2024/stone](http://aft.org/ae/spring2024/stone).