

Do High School Industry Certifications Reflect Local Labor Market Demand? An Examination of Florida

Ben Dalton, Elizabeth Glennie, Roger Studley, Siri Warkentien, and Erich Lauff
RTI International

Industry-recognized credentials, or certifications, provide one path to match people with jobs effectively. Certifications are nationally recognized, standardized credentials created by businesses and industry groups to demonstrate proficiency in skills related to specific jobs. State education systems increasingly provide students the opportunity to earn certifications in secondary school. In this study, we examine whether local labor market demand for certifications is associated with the likelihood of earning a certification in high school. Using comprehensive administrative data on a cohort of first-time ninth graders from the state of Florida, which has legislation encouraging certification attainment in high school, we find limited evidence for a relationship between certification demand and certification earning. However, high school students are more likely to earn certifications in some fields, such as health science, when local labor market demand for those certifications is high.

Keywords: career and technical education, certifications, labor markets, Florida

In addition to meeting needs for personal development and an engaged and educated citizenry, one of the core purposes of career and technical education is to prepare students for productive and rewarding lives in the workforce (Gordon & Schultz, 2020; Rojewski, 2002). Over the past several decades, this task has become more challenging: the education and training requirements for many jobs have increased substantially. Formerly low-skilled jobs require more academic and technical skills, and middle-skills jobs in areas like health science, manufacturing, and information technology (IT) require additional formal training (Holzer, 2015). These requirements have led to concerns about a skills gap; as of 2016, the demand for workers exceeded the supply in industries such as architecture, business, health science, and IT (Restuccia et al., 2018). Additional, accessible training—especially for those jobs that do not require the substantial investment of a 4-year degree—can help job seekers meet these eco-

nomics needs (Baum et al., 2013; Perna, 2013; Sparks & Waits, 2011).

Industry-recognized credentials, or certifications, provide one path to match people with jobs effectively. Certifications are credentials that businesses or industry associations independently create and verify through examinations. These nationally-recognized, standardized credentials demonstrate proficiency in skills related to particular jobs. While employers may not know the content of training associated with particular degrees, such as an associate degree from a college in another state, they may know the level of competence necessary to earn specific industry-recognized credentials. Such certifications give job applicants a way to signal their fit with a given job with no or limited additional job training. This kind of signaling is particularly important in dynamic industries where job requirements are changing due to technology and where employees have to be able to meet diverse needs of different custom-

ers, such as in health science or IT (Bartlett, 2012).

Many state education systems are giving students the opportunity to earn certifications in secondary school. As of 2019, 28 state education agencies had enacted policies pertaining to earning industry-recognized credentials, and 21 states had enacted policies pertaining to data activities, including tracking or aligning to labor market demand information within accountability systems (Advance CTE & Association for Career and Technical Education [Advance CTE & ACTE], 2020). These policies track and encourage the attainment of certifications. We study a premier case of certification policy in the state of Florida, which in 2007 enacted legislation which provided an enormous boost to certification earning among its high school population. Districts and schools can select to offer certifications from a state-approved list; in 2018, Florida's approved offerings included 239 certifications in 12 career clusters (Florida Department of Education [FLDOE], 2018). Our study seeks to understand if and how certification earning in Florida was related to the demand for jobs in Florida's local labor markets. Specifically, we examine the relationship between the proportion of sub-baccalaureate jobs (those potentially accessible by high school graduates) requiring a certification and the likelihood of a student earning a certification, overall or within a related career cluster. Our findings shed light on the relationship that students and schools may see between secondary certifications and future job opportunities.

The Landscape of High School CTE Credentials

Career and technical education (CTE) has evolved from a separate vocational pathway leading to immediate employment after high school to an academically integrated approach aligned to multiple postsecondary education, training, and work opportunities. This evolution has involved an increasing emphasis on technical assessments and their associated credentials (Holzer & Baum, 2017). Distinct from previous reauthorizations of the Elementary and

Secondary Education Act, the Every Student Succeeds Act (ESSA) of 2015 emphasizes the role of education in preparing students for college and careers and encouraged the adoption of college and career readiness indicators in state accountability systems (Achieve, 2019; Dougherty & Lombardi, 2016; Every Student Succeeds Act, 2015). In response, 40 states' high school accountability systems track a variety of college and career readiness measures, including performance on career and technical assessments and rates of technical credential attainment (Mathers, 2019). Likewise, the 2018 reauthorization of the Carl D. Perkins Career and Technical Education Act (Perkins V) allows states to choose their own CTE program quality indicators, and the number of states using some form of technical credentialing continues to grow (ExcelinED & Burning Glass Technologies, 2019). For example, in 2019 alone, 28 states took legislative action related to industry-recognized credentials (Advance CTE & ACTE, 2020).

Career and technical credentialing tests students' mastery of two major types of work-relevant content. *Employability* or *work-readiness assessments* are designed to gauge students' proficiency in personal and professional skills, such as collaboration, communication, and self-control, associated with success in entry-level employment in a variety of fields (Lippman et al., 2015; McMurrer & Frizzell, 2013). Examples include ACT WorkKeys and Conover Workplace Readiness assessments. *Technical* or *subject-matter assessments* test students' proficiency in applied academic and technical knowledge and skills in their CTE field of study, such as health science or hospitality and tourism. Technical assessments are akin to academic subject-matter tests such as Common Core-aligned state standards assessments, and like Advanced Placement or International Baccalaureate exams often provide a chance for students to earn postsecondary credit.

Technical assessments themselves can be divided into two main categories: (a) *state CTE standards* or *program assessments* and (b) *industry-recognized credentials* or *certifications*.

State CTE assessments are developed by states or vendors for states, typically with industry guidance, and are tied to specific CTE course or program standards. For example, Pennsylvania uses customized assessments from the National Occupational Competency Testing Institute (NOCTI) as their state-mandated end-of-program assessments; North Carolina uses their own NC Test system for CTE accountability. Depending on the state, CTE assessment results can result in diploma endorsements or the awarding of postsecondary credit but are principally used for feedback on student learning and meeting federal and state accountability requirements (Hyslop, 2009; McMurrer & Frizzell, 2013).

Certifications are credentials awarded by businesses or industry associations (not a school or government agency) through an examination process verifying that an individual has acquired the designated knowledge, skills, and abilities to perform a specific occupation or skill, including operating industry-standard equipment and/or software (Leventoff, 2018). Certifications are distinct from postsecondary certificates awarded by educational institutions for completion of a course of study. Certifications are also different from licenses, which provide legal authorization for specific jobs. Certification exams are typically taken at testing sites which may or may not be school grounds, and exams commonly include both written and performance components. Students who pass a certification exam are awarded a credential that is recognized in the labor market and, depending on state and local agreements, can provide postsecondary education credit. Certifications are designed and issued by national industry bodies such as the National Institute for Metalworking Skills (NIMS) (offering certifications such as NIMS Machining Level I—Manual Milling Skills I), state associations such as the Florida Veterinary Medical Association (e.g., Certified Veterinary Assistant), and industry leading companies such as Cisco Systems (e.g., Cisco Certified Network Professional) and Microsoft (e.g., Microsoft Certified Trainer). For 2017-18,

FLDOE had approved 239 certifications from 69 credentialing organizations.

It is important to note that states or local education agencies may offer or require multiple types of career and technical assessments or credentials simultaneously. In Florida, for example, high school students can earn industry-recognized credentials and take employability skill exams in addition to the requirement that CTE students take CTE program assessments. This study focuses on industry-recognized certifications which are promoted and supported under Florida's educational policies.

Certifications and Labor Market Outcomes

A key assumption driving policies favoring CTE assessments, particularly technical skill assessments, is that they provide additional preparation for CTE (and non-CTE) students for opportunities after high school—both immediate employment opportunities as well as more positive postsecondary education trajectories as students gain knowledge about the kinds and level of skills that career fields ultimately require. Existing but limited research suggests that this may be the case (Warner et al., 2019). For example, Plesnarski (2018) compared the relationship between CTE attainments (including CTE assessment benchmark proficiency, earning a certification, completing all program competencies, participating in cooperative education, and program hours) and whether graduates were working in a field related or somewhat related to their CTE program, enrolled in postsecondary education, or served in the military a year after graduation. Only technical assessment performance and participating in cooperative education were associated with any postsecondary outcomes. Munyofu and Kohr (2009) investigated several aspects of technical assessment for a limited sample of 118 students in Pennsylvania. The study found positive correlations between student scores and their employers' satisfaction ratings. In Massachusetts, participation in regional technical vocational high school programs positively influenced high school graduation and attainment of industry

CERTIFICATION IN FLORIDA

credentials (Dougherty, 2018). Other evidence suggests a preference among employers for industry-specific credentials versus general work-readiness certificates (Muller & Beatty, 2017).

The best evidence concerning industry-recognized credentials and student outcomes comes from research on Florida's high school certification program, which incentivizes schools to offer, and students to take, CTE courses leading to certifications (for more information, see below). Glennie et al. (2017) found that, on average, students who earned certifications had fewer absences during high school, earned more credits in 12th grade, and had higher high school graduation rates. Certification earners were more likely to enroll in community college immediately after their high school graduation, to persist into a second year of college, and to attain an associate degree.

The factors that may affect the likelihood of earning a certification can be classified into "push" and "pull" elements. First, students may be "pushed" into obtaining a certification if institutional pressure or policy levers strongly encourage students to earn certifications, regardless of student motivation or educational or career plans. For example, in states which link district and school funding to performance on certification rates, districts and schools have an incentive to conduct drives for student enrollment and certification exam sign-ups. Additionally, if districts or schools partner with local companies and receive support for students pursuing particular certifications, they may recruit students into those certifications.

"Pull" factors relate to how students are drawn to or motivated by the prospect of certification attainment. Students may be primarily interested in obtaining the technical skills and knowledge associated with a specific certification (Hyslop, 2009; Stone, 2017). These students want to master the content and hone their ability to perform technical tasks in practical ways. Even if they do not foresee using these skills in a given job, they may want to have these skills. Alternatively, students may think that certification attainment will give

them a recognizable marker of success, regardless of the specific job skills obtained. These students expect that earning a certification will signal their knowledge, ambition, and persistence to employers and higher education institutions (ExcelinED & Burning Glass Technologies, 2019). Some students may believe that earning a certification will give them insight into the kinds of knowledge, skills, and effort expected by employers or postsecondary institutions. These students value this kind of knowledge, whether or not they desire the specific skills taught or see value in the earned credential as a signaling device (Papadimitriou, 2014; Tyner & Petrilli, 2018). Finally, students may seek certifications if they want to pursue a given career field and see the certification as giving them an advantage in job interviews and college applications. They may be aware, for example, of specific employers, industries, or postsecondary education programs in their community that seek applicants with that certification.

For multiple factors above, the local labor market may be a key attribute in shaping students' motivations and school practices which encourage certification attainment. However, very little is known about whether labor market demand influences certification earning. The existing research on CTE and labor market demand has focused on CTE coursework, not certifications explicitly. For example, Sublett and Griffith (2019), using Bureau of Labor Statistics data, found that while students take more CTE courses when there are more local jobs available, there is little evidence that local employment opportunities are related to a student's putting forth extended efforts to master a given area by concentrating in the available field. In addition, they found that a number of high-demand occupations were in fields in which there was little CTE coursework at the high school level. In this study, we provide evidence on the relationship between local labor market demand and certification earning—a market-oriented credential.

Certifications in the State of Florida

The current study seeks to help address this research gap by examining the relationship between labor market demand and the likelihood students earn certifications in the state of Florida. Florida has had a program to promote certifications for more than a decade. In 2007, the Florida legislature passed the Career and Professional Education (CAPE) Act to provide high school students rigorous, relevant coursework leading to industry certification and college credit. The goal was to create a partnership between the business community and education agencies to “expand and retain high-value industry, and sustain a vibrant state economy” (FLDOE, 2020). Therefore, the CAPE Act focuses on state-approved industry certifications considered critical to Florida employers (Goodman et al., 2014). Since the rollout of the CAPE program, the number of industry certifications earned by secondary school students increased from 954 certifications in 2007–2008 to 123,839 certifications in 2017–2018 (FLDOE, 2017). As of August 2018, Florida Department of Education’s (FLDOE’s) list of CAPE certifications included 239 industry certifications in 12 career clusters (FLDOE, 2018). The clusters are Agriculture; Architecture & Construction; Arts, Audiovisual Technology, & Communication; Business Management & Administration; Education & Training; Engineering & Technology Education; Health Science; Hospitality & Tourism; IT; Law, Public Safety, & Security; Manufacturing; and Transportation, Distribution, & Logistics. A list of the approved certifications for school year 2017–2018 can be provided by the authors upon request.

Students can earn any certification on this approved list without having to pay examination costs, register to take the exam, or arrange for transportation to take an exam off school premises. Because these exams have been linked to courses, students can rely on extensive support to prepare for them rather than developing a study plan by themselves, and they receive additional instruction in subject area content beyond the vendor-specific test

requirements. Schools have an incentive to promote industry certifications because they earn points in the Florida School Report Card for the number of students earning industry certifications. The report card weights industry certifications equally to other kinds of advanced coursetaking, such as Advanced Placement. Florida requires most teachers to have the industry certification for which they teach.

Purpose of the Present Study

Florida’s mature and comprehensive high school certification program provides a premier context in which to examine the relationship between certifications and labor market demand. In addition to being the first study of Florida’s program, our work expands on existing research by using detailed, job postings-level data from Burning Glass Technologies, which provide specific information on certifications required by each job in a given year at the county level and allows for multiple robust ways of calculating demand. Our study seeks to answer the following research questions:

1. Accounting for student and school characteristics, is there an overall relationship between local labor market demand and certification rates at the county/district level?
2. Accounting for student and school characteristics, is local labor market demand in specific career clusters related to student likelihood of earning a certification in that career cluster?

Method

Data Sources and Measures

We combined several data sources to examine these questions (see Table 1). All data linked to the 2017–18 school year and were connected through standardized school and district identification variables that are consistent across sources. For example, the Burning Glass data were collected at the county level, which corresponds to Florida’s districts. Our analyses were centered on data from Florida’s PK-20 Educa-

tion Data Warehouse (EDW), which is the FLDOE-maintained state longitudinal database system containing complete demographic and school-related information on all of Florida’s public school students. We followed a cohort of all first-time Florida public school 9th graders in 2014–2015 and identified those who earned certifications at any time through 2017–2018 (their expected high school completion year). The EDW certification data provide information about each certification earned by each student including the certification title and career cluster. Given the relationship between student characteristics and CTE opportunities and participation (e.g., males earn more CTE credits than females on average in agriculture, construction, and engineering, and females earn more in consumer services and healthcare; see Liu & Burns, 2020 and Xing et al., 2019), we included measures in our regression models that account for student demographics and background, specifically gender, race/ethnicity, free and reduced-price lunch eligibility, limited English proficiency, and mental or physical disability. In addition, we controlled for measures of academic achievement (grade point average and gifted or talented designation) and behavior (whether the student was ever suspended during high school and the student’s attend-

ance rate). For these and variables subsequently discussed, Table 2 provides additional details and descriptive statistics.

School resources and characteristics may also influence the likelihood of earning a certification. Schools with more CTE program offerings and higher percentages of CTE teachers may be better able to offer and promote industry certifications because they have qualified teachers and costly equipment already. Larger schools and those with more financial resources may be better able to support buying equipment and hiring qualified teachers. Therefore, our models included measures for school size (i.e., enrollment in grades 9–12), student/teacher ratio, the percentage of the study body eligible for free or reduced-price lunch, the locale (urban, town/rural, and suburban, with the last being the omitted category), charter and magnet school status, the percentage of CTE courses offered, and an academic performance index. The performance index was based on data published by U.S. News & World Report’s “Best High Schools” rankings; it summarizes the percentage of students achieving proficient or above on state math and reading assessments, providing a finer measure of school-level performance than Florida’s school grades (Dalton et al., 2021).

Table 1
Data Sources

Level of data collection	Indicator	Source
Student	Certification earning Demographic data	FLDOE’s PK-20 Education Data Warehouse
School	Emphasis on certifications	RTI’s statewide high school certification survey
	Size, student/teacher ratio, poverty level, locale, type	NCES’s Common Core of Data
	Percent of CTE courses	FLDOE’s PK-20 Education Data Warehouse
	Academic performance	U.S. News & World Report’s High School Rankings
County/District	Percent of jobs requiring certification or skill associated with certification	Burning Glass Technologies job postings data

Schools principals and/or CTE coordinators that take an active interest in promoting certifications may be able boost certification taking and passing rates. To examine schools' certifications program strategies, in 2018, we conducted an online survey of school administrators or CTE coordinators in all public, non-alternative high schools in Florida with at least 5 students in the 12th grade. Of 524 eligible schools, 399 (76%) responded to the survey. Of survey respondents, 382 (96%) reported offering industry certifications. Among other questions, we asked about whether the school emphasizes certifications in any specific career fields. This item is included as a dummy variable with categories for emphasizing career fields, not emphasizing career fields (the omitted category), and missing, non-responding, or not applicable schools.

Finally, to understand local labor market demand for certifications, we acquired job postings data from Burning Glass Technologies (BG), a company that collects labor market data from job posting sites, company websites, and job boards. Our file includes required credentials for every 2017 job posting in Florida. BG data may undercount low-wage, lower-skill jobs and jobs in industries which mainly hire offline (e.g., restaurant and some hospitality jobs), but certifications approved by FLDOE are targeted at higher-wage, middle-income occupations.¹ In contrast to labor market data provided by the federal Bureau of Labor Statistics and often used in labor market analyses, these data are direct measures of job demand and contain indicators of each job's certification requirements and skill requirements. We mapped job listings that require no more than a sub-baccalaureate credential (those potentially accessible to high school graduates) to the specific certifications approved by the State, and created measures, for each county, of the percent of jobs requiring a certification. Because Florida school districts are synonymous with Florida counties, these

measures represent local labor market demand in each district. In total, we examined four measures representing increasingly narrow aspects of the employment context in which schools and students were operating. Considering demand from the broadest to narrowest employment context, we measured:

1. the percentage of counties' job postings requiring no more than a sub-baccalaureate degree;
2. the percentage of counties' job postings requiring a certification in any of the twelve career fields identified by FLDOE;
3. the percentage of counties' job postings requiring a certification specifically approved by FLDOE; and
4. the percentage of counties' job postings requiring a certification in each of the 12 career clusters (that is, separate measures of demand for each career cluster).

With these four characterizations of demand, at the broadest level (#1), students and schools may be responding to demand for jobs that require less than a college degree; certifications may be perceived as providing graduates with an additional credential that signals their accomplishments or career readiness overall, rather than specific skills or dedication to a field. More narrowly (#2), students and schools may be responding to a general demand for certifications in the career clusters covered by the FLDOE certification list—e.g., for demand in Hospitality & Tourism, IT, etc., regardless of whether demand is for specific FLDOE-approved certifications. Alternatively (#3), they may be responding to job opportunities requiring the set of specific certifications on the FLDOE list, such as the Certified Front Desk Operator certification in the Hospitality & Tourism cluster, the Apple Certified Support Professional in the IT cluster, and other approved certifications. At the narrowest level (#4), students and schools may be responding to demand in specific clusters, but not others, such that, for example, demand for Health Science certifications is related to the likelihood of students earning a Health Science certification, but stu-

¹ In addition, Carnevale et al. (2013) found that between 60 and 70 percent of jobs were posted online. Burning Glass Technologies (n.d.) claims this share has grown to roughly 85 percent.

dents do not similarly respond to Agriculture certification demand—if, say, Agriculture jobs are plentiful or obtainable without that field’s certifications.

The above measures rely on the certification indicator in the BG data, which lists which certifications (if any) the job requires. To account for the possibility that students and schools are responding to the demand for specific skills represented by certifications, and not necessarily the certification requirements themselves, we also created measures that capture the number of times skills linked to each career cluster appear in the BG data, using a separate skills indicator in the BG data. Specifically, for each career field, we created weights that reflect the frequency of association between skills related to that field and the skill requirements observed across jobs. Weights were then summed across jobs in each career field, by county, to create weighted counts of jobs in each county that are associated with that field. The counts reflect the strength of association between each job’s skill requirements and the skills typically associated with jobs in that cluster.

In addition, we created measures of job skills rather than named certifications to specifically address certifications earned in four career clusters where certifications did not appear in any or only a very small proportion of job postings. Specifically, certifications were nonexistent or extremely rare in the following career clusters: Agriculture; Arts, Audiovisual Technology, & Communication; Engineering & Technology Education; and Manufacturing. For example, Adobe Certified Expert in Photoshop was a FLDOE-approved certification that did not appear in the certification indicator for any job in the BG data. However, “Photoshop” and variations thereof did appear in BG’s skills indicator. Therefore, we created a demand rate that divides the number of jobs with any skill linked to a FLDOE-approved certification in each of these four career clusters by the total number of sub-baccalaureate jobs available (again, by county).

Table 2 presents descriptive statistics for the variables used in the analysis. Further information on certification requirements in job postings by career clusters is presented in Table 3 and discussed as part of the results section.

Analysis Approach

We used two-level logistic regression with random school intercepts to examine the relationship between the local labor market and certification-earning, net of other student and school factors. Specifically, our models estimated the conditional probability of student i in school j earning a certification (i.e., the logit of the odds):

$$\Pr(cert_{ij} = 1) = \beta_{00} + \beta_{10}\mathbf{X}_{ij} + u_{0j}$$

where β_{00} is the intercept, β_{10} is a vector of effects for student, school, and district variables \mathbf{X}_{ij} , and u_{0j} represents the random school-level intercepts (i.e., deviations from the fixed intercept). The primary parameter of interest in β_{10} is the district/county-level variable of local labor market demand for certifications (defined in multiple ways as described above). This model allows us to compare students across districts (with varying labor market demand), controlling for individual student variables, school characteristics, and the clustering of students within schools. The intra-class correlation for the unconditional model (without controls) showed that approximately 36% of the variance in earning a certification is accounted for by clustering at the school level. We used Stata 16.1 and the `melogit` command to estimate the model parameters. All results were presented as odds ratios.

Rates of missing data were very low (less than 1%), owing both to the administrative data used from Florida and our ability to identify last known measures for students without complete records. For example, GPA, attendance rate, and ever suspended use cumulative (across all high school years) data up to the last year of

Table 2
Overall Descriptive Statistics for Analysis Sample

	%	SD
Students		
Earned any certification	24.4	43.0
Female	48.9	50.0
Race/ethnicity		
Black	21.8	41.2
Hispanic	32.5	46.9
Other	5.9	23.6
White (reference category)	39.7	48.9
Free or reduced-price lunch eligible	59.2	49.1
Limited English proficiency	21.4	41.0
Physical disability	3.2	17.6
Mental disability	10.5	30.7
Cumulative grade point average ^a	2.68	0.88
Gifted/talented	5.7	23.1
Ever suspended	16.8	37.4
Percent of days attended	88.9	15.0
School		
School size (grades 9-12) ^a	1,887.3	833.6
Student/teacher ratio	20.0	7.6
% eligible for free or reduced-price lunch	52.6	20.9
Locale		
Urban	26.0	43.9
Town/rural	15.3	36.0
Suburban (reference category)	58.7	49.2
Charter school	5.6	22.9
Magnet school	41.6	49.3
% CTE courses offered	19.1	9.5
Academic performance index ^a	74.9	24.8
School emphasizes certifications		
Yes	35.7	47.9
No (reference category)	20.5	40.4
Don't know/not applicable/missing	43.7	49.6
Percent of job postings requiring		
Sub-baccalaureate degree or less	30.7	4.6
Any sub-baccalaureate certification	17.8	3.7
A specific Florida certification	5.0	1.5

Note. N = 224,728 (students), 660 (schools). Data sources include Florida P-20 Education Data Warehouse, Common Core of Data, U.S. News & World Report, and Burning Glass Technologies.

^arepresents a mean value.

data available. Accordingly, other than accounting for missing survey response for the school’s emphasis on certifications in a specific dummy category, we did not impute missing data. We excluded students in schools with fewer than 10 students cumulative in grades 9 through 12.

Results

Across their high school years, 24% of the cohort of first-time 9th graders in 2014–2015 earned at least one industry certification. Of all job listings, 18% required certifications needing less than a 4-year degree. The certifications earned, and those required, differed by field. Acknowledging that certification requirements, which are typically attached to non-entry-level jobs, may be overrepresented in the BG data for some career clusters where hiring mostly takes place offline (such as Agriculture or Hospitality & Tourism), Table 3 presents the percentage distribution of certifications by career cluster and the percentage distribution of sub-baccalaureate certification requirements in the same clusters. One striking result was that Arts, Audiovisual Technology, & Communication (AATC) certifications were the most popular certification (42% of all certifications earned by

Florida high school students were in this field), but no job listing required these certifications. Even when the approved AATC certifications, which were primarily Adobe software certifications, were listed as a required skill and not a certification, less than 1% of all jobs required these skills.

Another clear mismatch between the field of the certification earned and field of certification required for a job include IT, where 22% of all certifications were earned by high school students but only 11% of jobs required an IT certification. In contrast, certification demand appeared to outstrip supply in the case of Health Science, where only 11% of certifications were earned but 64% of jobs with certifications required them. Likewise, Business Management & Administrative certifications were present in 15% of all jobs that required a certification, yet less than 2% of the certifications earned by Florida high school students were in this cluster.

While mismatch between certifications earned and job demand varies by county, the same conclusions hold when looking at the local level. For example, the average difference across counties between the percent of students earning a certification in AATC and the percent of subbaccalaureate jobs requiring this

Table 3
Percentage of Certifications Earned and Job Listings, by Career Cluster

	% of certifications earned (N = 82,102)	% of sub-baccalaureate certifications (N = 303,222)
Agriculture	3.9	0.5
Architecture & Construction	4.7	1.2
Arts, Audiovisual Technology, & Communication	41.5	0
Business Management & Administration	1.7	14.9
Education & Training	1.0	1.5
Engineering & Technology Education	3.4	0
Health Science	11.1	64.1
Hospitality & Tourism	7.6	2.3
Information Technology	22.4	11.4
Law, Public Safety, & Security	0.2	1.3
Manufacturing	0.9	0.3
Transportation, Distribution, & Logistics	1.6	2.6

certification was 25%. The larger statewide difference was driven by the fact that these certifications were much more popular in some of the largest districts like Miami-Dade (51% of all certifications earned) and Broward (55% of all certifications earned). In only 5 of the 67 Florida districts were there no certifications earned in this career cluster, and in only 16 districts was the mismatch less than 10%. Similarly, the average difference across counties in Health Sciences was -61% (a greater percentage of jobs required this than the percentage of students earning it), with the range being between -92% and -15%—in other words, in no county was there a close match in Health Science certifications.

Table 4 shows the results of multilevel regressions of the likelihood of earning a certification on student background, school characteristics, and alternate measures of job demand. Overall, the likelihood of earning a certification was associated with a number of student and school factors. Females were less likely to earn a certification than males, which is not surprising considering the gendered nature of high school CTE (Liu & Burns, 2020). Similarly, we found that black and Hispanic students, students with limited English proficiency, disabilities, or with a suspension history were less likely to earn a certification. These findings somewhat diverge from other research on CTE participation which shows Black students are not overrepresented, and that special education students are overrepresented, among CTE concentrators (Xing et al., 2019). Contrary to perceptions of CTE as primarily for less academically inclined or motivated students, GPA and attendance were also positively associated with certification attainment.

Among school characteristics, students attending schools in urban locations (compared to suburban) and charter schools were less likely earn certifications, while students in larger schools, with greater poverty rates, in town/rural schools (compared to suburban), which offered more CTE courses as a percentage of all offerings, and had a higher level of performance were more likely to earn certifica-

tions. However, a school's emphasis on certain certifications did not appear to affect a student's likelihood of earning a certification.

The last three rows of Table 4 show estimates of the association between county-level job demand, defined three ways, and the likelihood that a student earned a certification. For all three measures—the overall percentage of jobs requiring a sub-baccalaureate degree or less, the percentage of jobs requiring any sub-baccalaureate certification, and the percent of jobs requiring a certification specifically approved by the FLDOE—there was no statistically significant association between job demand and certification attainment. The marginal effects (average predicted probabilities) for these variables were not statistically significantly different from zero.

In separately estimated models exploring the likelihood of earning certifications in specific career clusters, the student and school characteristics had similar estimates to those presented in Table 4. Measures of cluster-specific job demand, however, showed varying relationships with certification attainment (see Table 5). Most clusters—Business Management & Administration; Hospitality & Tourism; Law, Public Safety, & Security; Manufacturing; and Transportation, Distribution, & Logistics—showed no relationship between the cluster demand and the likelihood of earning that cluster's certification, whether demand was measured as percentage of jobs requiring any sub-baccalaureate certification in that cluster (Model 1) or requiring a FLDOE-approved certification in that cluster (Model 2). In some clusters—Architecture & Construction (AC); Education & Training (ET); and IT—there were statistically significant relationships using one demand measure, but not the other. In both the AC cluster and the ET cluster, the estimates were unusually large. As these are low-incidence certification areas, these results may be unreliable.

However, one consistent result emerged: regardless of demand measure, there was a positive association between the percentage of jobs requiring a Health Science certification and the likelihood that a student earns such a certi-

Table 4

Likelihood (Odds Ratios) of Earning a Certification Given Student Background, School Characteristics, and County Job Market

Variable	Model 1	Model 2	Model 3
Student characteristics			
Female	0.62 ***	0.62 ***	0.62 ***
Race/ethnicity ^a			
Black	0.87 ***	0.87 ***	0.87 ***
Other	0.95	0.95	0.95
Hispanic	0.95 **	0.95 **	0.95 **
Free/reduced-price lunch eligible	1.00	1.00	1.00
Limited English proficiency	0.86 ***	0.86 ***	0.86 ***
Physical disability	0.59 ***	0.59 ***	0.59 ***
Mental disability	0.48 ***	0.48 ***	0.48 ***
Cumulative grade point average	2.71 ***	2.71 ***	2.71 ***
Gifted/talented	0.98	0.98	0.98
Ever suspended	0.71 ***	0.71 ***	0.71 ***
Attendance rate	1.01 ***	1.01 ***	1.01 ***
School characteristics			
School size (grades 9-12)	1.00 ***	1.00 ***	1.00 ***
Student/teacher ratio	1.00	1.00	1.00
% free or reduced-price lunch	1.02 ***	1.02 ***	1.02 ***
Locale ^a			
Urban	0.79 *	0.79 *	0.79 *
Town/rural	1.42 **	1.42 **	1.42 **
Charter school	0.72 *	0.72 *	0.73 *
Magnet school	1.14	1.14	1.15
% CTE courses offered	1.03 ***	1.03 ***	1.03 ***
Academic performance index	1.00 **	1.00 **	1.00 **
School emphasizes certain certifications ^a			
Yes	1.17	1.17	1.18
Don't know/NA/missing	0.93	0.93	0.94
County-level job demand			
% jobs requiring a sub-baccalaureate degree or less	1.00	—	—
% of jobs requiring any sub-baccalaureate certification	—	1.00	—
% of jobs requiring a specific Florida-approved certification	—	—	1.01

Note. N = 224,728 (students), 660 (schools).

^aReference categories are “non-Hispanic White” for race/ethnicity, “suburban” for locale, and “no” for school emphasis on certain certifications.

* $p < .05$. ** $p < .01$. *** $p < .001$.

fication. A percentage point increase in the number of district-level jobs requiring any Health Science certification was associated with a 4% increase in the odds a student earned such a certification. In practical terms of marginal effects, a 10 percentage point increase in the number of jobs requiring a Health Science certification was associated with a 0.09 increase in the predicted probability of earning such a certification. This association was stronger for FLDOE-approved certifications, where each percentage point increase in the percentage of jobs requiring a FLDOE-approved Health Science certification was related to a 26% increase in the likelihood of a student in that county’s schools earning a Health Science certification. A 10 percentage point increase in jobs requiring certifications here was associated with a 0.06 increase in predicted probability of earning a Health Science certification. As the percentage of jobs requiring a FLDOE-approved Health Sci-

ence job range from about 3 to 59 percent by county, the likelihood of earning a Health Science certification therefore varies substantially by job demand.

Table 5 did not show results for two clusters where the demand measures contained no information and therefore results were not estimable: AATC; and Engineering and Technology Education. In addition, as Table 3 showed, there was a very low rate of demand for two additional clusters (Agriculture and Manufacturing), and results were unstable for Architecture & Construction and Education & Training clusters. To address this, as well as assess whether students are responding to the demand for the skills that certifications represent, we modeled skill demand instead of demand for certifications themselves. We examined (a) the overall skill demand for jobs in each career cluster and (b) the demand for skills specifically indicated by the certification titles (e.g., Photoshop), as

Table 5
Likelihood (Odds Ratio) of Earning a Specific Career Cluster Certification Given County Job Market for Cluster-Specific Certifications

% of jobs requiring certification in given cluster	Any cluster-specific certification	Florida-approved certification
	Model 1	Model 2
Agriculture	2.11 **	3.36
Architecture & Construction	0.08 *	0.67
Arts, A/V Technology, & Communication	†	†
Business Management & Administration	0.97	52.15
Education & Training	0.91	30.11 *
Engineering & Technology Education	†	†
Health Science	1.04 ***	1.26 ***
Hospitality & Tourism	1.02	1.10
Information Technology	0.94 *	0.94
Law, Public Safety, & Security	1.50	1.94
Manufacturing	0.85	2.51
Transportation, Distribution, & Logistics	0.86	1.18

Note. N = 212,087 (students), 660 (schools). Student and school controls shown in Table 3. Outcome variable is whether a student earned a certification in the specific cluster associated with the county-level job cluster demand. For example, the outcome for the “Health Science” row is earning a certification in Health Science.

† Too few cases to estimate.

* p < .05. ** p < .01. *** p < .001.

Table 6

Likelihood (Odds Ratio) of Earning a Specific Career Cluster Certification Given County Job Market for Cluster-Specific Skills

% of jobs requiring skills in given cluster	Skills tied to any cluster-specific certification	Skills tied to Florida-approved certifications
	Model 1	Model 2
Agriculture	1.00	1.18**
Architecture & Construction	0.99	0.99
Arts, A/V Technology, & Communication	†	†
Business Management & Administration	0.96	0.96
Education & Training	0.98	0.98
Engineering & Technology Education	†	†
Health Science	1.02*	1.03**
Hospitality & Tourism	1.02	1.03*
Information Technology	0.98	0.99
Law, Public Safety, & Security	1.27	1.12
Manufacturing	1.03	1.05
Transportation, Distribution, & Logistics	0.99	0.99

Note. $N = 212,087$ (students), 660 (schools). Student and school controls shown in Table 3. Outcome variable is whether a student earned a certification in the specific cluster associated with the county-level job cluster demand. For example, the outcome for the “Health Science” row is earning a certification in Health Science.

† Too few cases to estimate.

* $p < .05$. ** $p < .01$. *** $p < .001$.

described earlier. Table 6 shows the overall skills, based as before on any sub-baccalaureate certification and just FLDOE-approved ones. Results continued to support a consistent effect for Health Science, although at somewhat lower effect sizes, and inconsistent or null results for other career clusters.

Table 7 presents the results for demand for specifically indicated skills. It shows a strong association for Agriculture skills—a 10 percentage point increase in Agriculture demand is related to a 0.99 increase in probability of earning an Agriculture certification—but no association for any of the other clusters. The results for all but Agriculture are somewhat sensitive to choice of skill measure—other models using a wider view of skills based on BG-specific skill

“clusters” and skill “families”² in these fields sometimes showed statistically significant associations. For example, there was a statistically significant negative association between the likelihood of earning a certification and the demand for the arts technology family of design skills that include user interface and user experience (UI/UX) design as well as the BG cluster of graphic and visual design software skills in which Photoshop and other Adobe creative arts software skills sit. These results suggest that there is, at best, no consistent evidence for any association between arts technology, engineering, or manufacturing job demand and certifications earned by high school students in Florida.

² These include a variety of other related skills in these fields beyond those specifically indicated by the certification titles; that is, skills are nested into clusters, which are nested in families, in the BG data.

Table 7
Likelihood (Odds Ratio) of Earning a Specific Career Cluster Certification Given County Job Market for Cluster-Specific Skills

% of jobs requiring skills in given area	Estimate
Agriculture	2.36**
Arts, A/V Technology, & Communication	0.64
Engineering & Technology Education	0.98
Manufacturing	0.94

Note. $N = 212,087$ (students), 660 (schools). Student and school controls shown in Table 3. Outcome is whether a student earned a certification in the specific cluster associated with the county-level job area demand. For example, the outcome for the “Agriculture” row is earning a certification in Agriculture.

* $p < .05$.

Discussion

Students may be “pulled” into obtaining a certification in high school due to career interest, personal interest, encouragement from school staff and teachers, or beliefs in the efficacy of certifications to strengthen college applications or work prospects after high school. Schools and districts may “push” certifications because they believe certifications give graduates more opportunities in college and work. In Florida, schools may also encourage certifications, including those requiring low effort or few resources, because certification rates earn points on the School Report Card. However, one contextual aspect of student decision-making and school offerings is job market demand, whether for jobs that are accessible immediately or soon after high school, for certifications generally, or for specific certifications or their skills. Our analyses tested these hypotheses and found limited support for the idea that local job markets influence high school students to obtain a certification.

Overall, there was no association between the demand for sub-baccalaureate jobs or certifications at the county level with students’ likelihood of earning a certification. This result is somewhat surprising; we had expected that students would be at least partly responsive to overall job demand. Perhaps the relationship between job offerings and certifications results from the diversity of career areas involved. In

the most popular certification cluster (Arts, Audiovisual Technology, & Communication), none of the job listings required a sub-baccalaureate certification, and very few jobs required the software skills that the certifications provide. That one disjuncture between demand and supply may have washed out the overall relationship between job offerings and certifications in other career clusters. In fact, in the area of Health Science, we do consistently find that students in districts with demand for Health Science jobs were more likely to earn a certification in that area than those in other districts. In Agriculture, Architecture & Construction, and Information Technology, we find some additional evidence of a positive association with local job demand, although this result was not consistent across measurement approaches.

Our results partly accord with Sublett and Griffith’s (2019), who found that CTE coursetaking was related to local labor market demand in specific career fields. However, in many career clusters, such as Hospitality & Tourism or Manufacturing, we did not find any association between job opportunities and certification earning, regardless of our measurement approach. Indeed, our results show divergences between local labor market demand and supply in terms of certification rates. Health Science certifications, required for the largest proportion of jobs by far, was the third-most earned certification among our cohort of students. On the other end, the largest proportion of certifications

CERTIFICATION IN FLORIDA

earned were in Arts, Audiovisual Technology, & Communication, for which there was nearly no demand among local employers for either the skills provided by earning a certification or the certifications themselves. Students may be earning these certifications—primarily Adobe arts software—out of personal interest or their accessibility given the low effort and cost schools can put in to make them available.

These and other differences between demand and supply (e.g., in undersupplied Business Management & Administration and Information Sciences certifications), as well as the overall lack of or, at best, weakness, in the connection between high school certification attainment and job demand, suggest that Florida and other states with similar programs should reconsider what certifications they incentivize through their policies and legislation. While certifications and CTE itself can have value outside of labor market returns, a principal reason for the Florida CAPE Act was to better prepare students for postsecondary work and improve workforce skills to match industry needs. To better match industry needs, the certification program may need to create stronger relationships between educators and industry so that educators better understand the links between industry certifications and local jobs, and businesses understand the ways in which high school students attain relevant job skills.

The relationship between a broad contextual factor like county-level job demand and individual school and student decisions about which certifications to prioritize may be, at best, a tentative one. The mechanisms that could link certification earning in high school to job requirements in the workforce may involve a complex pathway that is difficult to analyze. Our study does not include information about student decision-making which could be crucial for understanding the reasons behind certification attainment. For example, an examination of only students who intend to enter the labor force immediately after high school could show a different result. Similarly, the level of awareness district and school officials have about current workforce demands, much less demands in

specific industries like health care, was not assessed in our research. In addition, some lower-level jobs requiring certifications can be recruited offline and may not be represented in BG data. Students may be more aware of these opportunities than those that advertise through the kind of online services and websites from which BG collects data. Nevertheless, we saw some evidence that local job demand as measured by BG data in two of the most likely underrepresented career clusters in the BG data—Agriculture and Hospitality & Tourism—was associated with a higher likelihood of earning a certification in those fields.

We do not have subsequent employment data for these students and do not know if they obtained jobs in the career clusters in which they earned certifications, or if so, whether they got a better paying job than they otherwise would have. Even if students work in a different career cluster, having a certification, which may suggest motivation or persistence, may help a person get a better paying job. Future work should examine the direct link between earning a certification in high school and subsequent work.

Finally, our study does not say anything about other potential returns to certification earning in terms of pathways to postsecondary education that may lead to related industries or employment likelihood and pay. Future work will require both deeper dives into the school and student levels of policy implementation and choice as well as a wider perspective on longer-term implications for earning industry certifications.

Conclusion

Having credentials beyond a high school diploma may help young adults get jobs, and some educational systems have responded by helping secondary school students earn certifications. Florida established a comprehensive program, the CAPE Act, under which students have opportunities to earn certifications in many career fields. Under this program, many

high school students have earned industry certifications in different career clusters.

According to FLDOE program description, certifications on the CAPE list have been deemed critical for Florida's employers, and 41 percent of schools who offer certifications in Florida said they promoted certain career areas for local business reasons, such as a partnership with a local business. Based on our survey data (not reported), many schools do believe there is a link between employment demand and job opportunities and promote certifications to reflect that link, but local job demand is not reflected in the actual rates of certification in different career clusters. Future studies that connect high school certification and CTE data with student labor market outcomes would help test this finding and potentially refine our understanding of these relationships by career field.

Further studies examining how schools support and encourage students to earn certain certifications will also help increase our understanding of the role of high school certifications in career readiness. Students choose from the certifications offered at their schools, and as schools need to have qualified staff and necessary equipment to offer certifications, they may not be able to offer certifications that map directly to local jobs. Given that schools earn points in the School Report Card for the number of students taking advanced courses (including earning certifications), they may encourage students who are not academically focused to go ahead and get certain certifications to improve the school's accountability score.

Students choose to obtain a certification for any number of their own reasons as well. They may earn certifications with limited immediate value in the labor market but which they believe could build to more advanced credentials or degrees. Additional research is needed to investigate student decision-making around certifications and CTE coursework in high school and to examine whether students earn additional certifications or take college courses in the same field after high school.

Even if earning a certification is not directly linked to the job market, doing so may help

students prepare for life after high school. Navigating the process of getting a certification may prepare students for more demanding activities after high school even if students do not pursue additional studies or employment in a specific area. If evidence ultimately supports this possibility, then high school certification programs might be judged as successes on that basis alone.

References

- Achieve. (2019). *Making career readiness count 3.0*.
<https://www.achieve.org/publications/making-career-readiness-count-30>
- Advance CTE & Association for Career and Technical Education. (2020). *State policies impacting CTE: 2019 year in review*.
https://www.acteonline.org/wp-content/uploads/2020/01/State_Policies_Impacting_CTE_-_2019_Year_in_Review_Final.pdf
- Bartlett, K. R. (2012). *A theoretical review of the signaling role of certifications in career and technical education*. National Research Center for Career and Technical Education, U.S. Department of Education.
- Burning Glass Technologies. (n.d.). *Frequently asked questions*. Retrieved February 3, 2021, from <https://www.burning-glass.com/about/faq/>
- Baum, S., Ma, J., & Payea, K. (2013). *Education pays 2013: The benefits of higher education for individuals and society*. College Board.
<http://www.rilin.state.ri.us/Special/ses15/commdocs/Education%20Pays,%20The%20College%20Board.pdf>
- Carnevale, A. P., Jayasundera, T., & Repnikov, D. (2013). *Understanding online job ads data*. Georgetown University Center on Education and the Workforce.
<https://cew.georgetown.edu/wp-content/>

- [tent/uploads/2014/11/OCLM.Tech_ .Web .pdf](#)
- Dalton, B., Hensley, E., Studley, R., & Campbell, T. (2021). *Data and methods for calculating the Best High Schools rankings: Analytical methodology and technical appendices*. RTI International. <https://www.usnews.com/media/best-high-schools/best-high-schools-technical-appendix.pdf>
- Dougherty, S. (2018). The effect of career and technical education on human capital accumulation: Causal evidence from Massachusetts. *Education Finance and Policy*, 13(2), 119–48. https://doi.org/10.1162/edfp_a_00224
- Dougherty, S. M., & Lombardi, A. R. (2016). From vocational education to career readiness: The ongoing work of linking education and the labor market. *Review of Research in Education*, 40(1), 326–355. <https://doi.org/10.3102/0091732X16678602>
- Every Student Succeeds Act (ESSA) of 2015, Pub. L. No. 114-95 § 114 Stat. 1177 (2015–2016). <https://www.govinfo.gov/content/pkg/PLAW-114publ95/pdf/PLAW-114publ95.pdf>
- ExcelinEd & Burning Glass Technologies. (2019). *Credentials matter: A national landscape of high school student credential attainment compared to workforce demand*. <https://www.excelined.org/credentials-matter/>
- Florida Department of Education. (2017). *Industry certification pass rates, 2007–08 to 2015–16*. <http://www.fldoe.org/academics/career-adult-edu/research-evaluation/cape-industry-certification.stml>
- Florida Department of Education. (2018). *2018–19 CAPE industry certification funding list*. <http://www.fldoe.org/academics/career-adult-edu/cape-secondary/cape-industry-cert-funding-list-current.stml>
- Florida Department of Education. (2020). *CAPE-secondary*. <http://www.fldoe.org/academics/career-adult-edu/cape-secondary/>
- Glennie, E., Lauff, E., & Ottem, R. (2017). *Examining the influence of the Florida Career and Professional Education Act of 2007: Changes in industry certifications and educational and employment outcomes*. National Center for Innovation in Career and Technical Education, U.S. Department of Education. <http://files.eric.ed.gov/fulltext/ED584715.pdf>
- Goodman, T., Meyer, M., & Imperatore, C. (2014). Incorporating industry-recognized certifications. *Techniques*, 89(6), 14–19.
- Gordon, H. R. D., & Schultz, D. (2020). *The history and growth of career and technical education in America*. Waveland Press.
- Holzer, H. (2015). *Higher education and workforce policy: Creating more skilled workers (and jobs for them to fill)*. The Brookings Institution. https://www.brookings.edu/wp-content/uploads/2016/06/higher_ed_jobs_policy_holzer.pdf
- Holzer, H. J., & Baum, S. (2017). *Making college work: Pathways to success for disadvantaged students*. Brookings Institution Press.
- Hyslop, A. (2009). Developing technical skill assessments. *Techniques*, 84(1), 37–38.
- Leventoff, J. (2018). *Measuring non-degree credential attainment: 50-State scan*. Workforce Data Quality Campaign. <https://www.nationalskillscoalition.org/wp-content/uploads/2020/12/Measuring-Non-Degree-Credential-Attainment-50-State-Scan.pdf>
- Lippman, L. H., Ryberg, R., Carney, R., & Moore, K. A. (2015). *Workforce connections: Key “soft skills” that foster youth work-*

- force success: Toward a consensus across fields.* Child Trends.
<https://www.childtrends.org/wp-content/uploads/2015/06/2015-24WFCSOftSkills.pdf>
- Liu, A. Y., & Burns, L. (2020). *Public high school students' career and technical education coursetaking: 1992 to 2013* [Stats in brief]. National Center for Education Statistics, U.S. Department of Education.
<https://nces.ed.gov/pubs2020/2020010.pdf>
- Mathers, K. (2019). High-quality career readiness for all students. *State Education Standard*, 19(3), 4–9.
https://nasbe.nyc3.digitaloceanspaces.com/2019/09/Mathers_September-2019-Standard.pdf
- McMurrer, J., Frizzell, M., & McIntosh, S. (2013). *Career readiness assessments across states: A summary of survey findings.* Center on Education Policy.
<https://files.eric.ed.gov/fulltext/ED554578.pdf>
- Muller, R. D., & Beatty, A. (2017). *Work readiness certifications and industry credentials: What do state high school policy makers need to know?* Achieve.
<https://www.achieve.org/files/WorkReadinessCertificationandIndustryCredentials.pdf>
- Munyofu, P., & Kohr, R. (2009). A calculus of occupational skill attainment: Building more validity into a valid assessment system. *Journal of STEM Teacher Education*, 46(2), 75–113.
<https://ir.library.illinoisstate.edu/cgi/viewcontent.cgi?article=1092&context=jstewcon->
- Papadimitriou, M. (2014). High school students' perceptions of their internship experiences and related impact on career choices and changes. *Online Journal for Workforce Education & Development*, 7(1), Article 8.
<https://opensiuc.lib.siu.edu/cgi/viewcontent.cgi?article=1157&context=ojwed>
- Perna, L. W. (2013). *Preparing today's students for tomorrow's jobs in metropolitan America.* University of Pennsylvania Press.
- Plesnarski, C. E. (2018). *Measures of technical skill attainment and their predictive value on positive post-program placement of Pennsylvania secondary career and technical students* (Publication No. 10841257) [Doctoral dissertation, Delaware Valley University]. ProQuest Dissertations and Theses Global.
- Restuccia, D., Taska, B., & Bittle, S. (2018). *Different skills, different gaps: Measuring & closing the skills gap.* Burning Glass Technologies.
- Rojewski, J. W. (2002). *Preparing the workforce of tomorrow: A conceptual framework for career and technical education.* National Dissemination Center for Career and Technical Education.
- Sparks, E., & Waits, M. J. (2011). *Degrees for what jobs? Raising expectations for universities and colleges in a global economy.* National Governors Association.
<https://files.eric.ed.gov/fulltext/ED517709.pdf>
- Stone, J. R., III. (2017). Introduction to pathways to a productive adulthood: The role of CTE in the American high school. *Peabody Journal of Education*, 92(2), 155–165.
<https://doi.org/10.1080/0161956X.2017.1302207>
- Sublett, C., & Griffith, D. (2019). *How aligned is career and technical education to local labor markets?* Thomas B. Fordham Institute.
<https://fordhaminstitute.org/national/research/how-aligned-career-and-technical-education-local-labor-markets>
- Tyner, A., & Petrilli, M. (2018). The case for holding students accountable: How extrinsic motivation gets kids to work harder and learn more. *Education Next*, 18(3), 26–33.

Warner, M., Harris, J., Yarnall, L., Ball, A., & Jonas, D. (2019). *Measuring career readiness in high school literature scan* (SRI 24875). SRI International.
<https://ies.ed.gov/ncee/edlabs/regions/appalachia/events/materials/07-23-19-Career-Readiness-Lit-Scan-508.pdf>

Xing, X., Garza, T., & Huerta, M. (2019). Factors influencing high school students' career and technical education enrollment patterns. *Career and Technical Education Research*, 44(3), 53–70.
<https://doi.org/10.5328/cter44.3.53>

Authors

Ben Dalton is a Research Director in the Education and Workforce Development division at RTI International, 3040 East Cornwallis Rd, P.O. Box 12194, Research Triangle Park, NC 27709-2194, 919-541-7228, bdalton@rti.org.

Elizabeth Glennie is a Senior Research Education Analyst in the Education and Workforce Development division at RTI International, 3040 East Cornwallis Rd, P.O. Box 12194, Research Triangle Park, NC 27709-2194, 919-541-6434, eglennie@rti.org.

Roger Studley is a Research Education Analyst in the Education and Workforce Development division at RTI International, 2150 Shattuck Ave, Berkeley, CA, 94704, 510-665-8216, rstudley@rti.org.

Siri Warkentien is a Research Education Analyst in the Education and Workforce Development division at RTI International, 701 13th Street NW, Suite 750, Washington, DC 20005-3967, 202-728-2467, swarkentien@rti.org.

Erich Lauff is a Research Education Analyst in the Education and Workforce Development division at RTI International, 3040 E East Cornwallis Rd, P.O. Box 12194, Research Triangle Park, NC 27709-2194, 919-541-7014, erichlauff@rti.org.

Acknowledgements

This work was funded by Grant No. #R305A170222 from the Institute of Education Sciences, U.S. Department of Education. We wish to acknowledge the helpful assistance of staff at FLDOE for preparing and answering questions about Florida administrative data.