

The Influence of Earning an Industry Certification in High School on Going to College: The Florida CAPE Act

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Abstract

Jobs that pay livable wages increasingly call for educational attainment beyond a high school diploma, but many of these jobs do not need a bachelor's degree. By earning industry certifications in high school, students may be better prepared for life after graduation. In 2007, Florida enacted the Career and Professional Education (CAPE) Act, through which schools receive support to give students the opportunity to earn industry certifications while in high school. Once the state enacted this policy, the number of students earning certifications increased dramatically. Using data from the Florida Department of Education's Education Data Warehouse, we compared college enrollment and degree attainment for certification earners to non-earners. Then, we compared outcomes for earners within each career cluster (such as Architecture & Construction) to the combined results for earners in all other career clusters. Relative to non-earners, certification earners had higher rates of immediate enrollment at 2-year colleges, and higher rates of earning an associate degree. Among certification earners, few career clusters had positive associations with postsecondary outcomes relative to other career clusters.

Keywords: high school, industry certifications, college preparation

Introduction

Jobs that pay livable wages increasingly call for educational attainment beyond a high school diploma. Formerly low-skilled jobs require more skills, and middle-skills jobs in areas like health, advanced manufacturing, and information technology (IT) require additional training (Holzer, 2015). Thus, those without high school diplomas—and even high school graduates without any postsecondary training—may struggle to attain middle-class status because of unemployment and lower earnings. Society loses out on the financial return of a well-educated population in the form of lower tax payments and more reliance on social support programs (Baum, Ma, & Payea, 2013). In the past decade, industries in the United States such as healthcare, business, computers, and architecture have seen the demand for workers exceed the supply (Restuccia, Taska, & Bittle, 2018); and appropriate training could help people better prepare to get these jobs.

In high school, aligning the educational training of students with the needs of employers will help them qualify for and succeed in some jobs, and industry certifications provide one path for students to obtain job skills. Industry certifications are independent, nationally-recognized credentials awarded by businesses or associations. Having these certifications can signal job

skills as they demonstrate proficiency in a given area. While policy makers believe certifications will link students to future employment, it is not clear whether or how earning certifications in high school influences educational attainment. Perhaps students believe their certification will suffice to get a good job, and they stop going to school upon earning a diploma. Perhaps other students see ways to build on their industry certifications by continuing into college. Performing well on an industry certification exam may increase a student's academic confidence, which may inspire him or her to continue in school. In recent years, states have expanded policies and programs promoting certification attainment for high school students (National Center for Education Statistics, 2016). However, little is known about the educational value of these credentials. Because different independent vendors develop and score industry certification examinations, comprehensive data linking certifications and academic outcomes have not historically been available. Therefore, the educational consequences of earning industry certifications in high school are not clear since there are no reliable national data on the number of certifications earned (Sykes, Szuplat, & Decker, 2014). States face challenges in accessing industry certification data from multiple vendors (Dalporto, 2019), so systematic studies have not linked earning industry certifications to students' academic outcomes.

In this study, we examined the influence of earning an industry certification during high school on postsecondary enrollment and degree attainment. Because earning industry certifications in Florida is a component in the state's report card, we were able to obtain information about both certification-earning and postsecondary educational attainment. Because students can pursue many different kinds of industry certifications, in addition to examining the overall influence of earning any certification, we looked at the influence of earning certifications in specific career clusters on these postsecondary outcomes.

Obtaining Job Skills in High School

Although many employers face a critical need for worker training, most scholars agree that not all students need to be steered into 4-year degree programs (Perna, 2013; Sparks & Waits, 2011). Carnevale, Strohl, Cheah, & Ridley (2017) found the share of good jobs—which he defined as full-time, paying at least \$35,000—for workers without BAs has declined since 1991. Specifically, the share of good jobs that do not require a BA has decreased in the blue-collar industries. However, the share of good jobs that do not require a BA has increased in the skilled service sector in areas like health care and IT. Although these jobs do not require a BA, they do tend to require more education than a high school diploma. Sub-baccalaureate degrees, employer training, and other programs are critical to link those without a bachelor's degree to “middle-skill” jobs providing decent wages, stable employment, and a viable career pathway (Burrowes, Young, Restuccia, Fuller, & Raman, 2014). Relative to a high school diploma on its own, sub-baccalaureate credentials can improve wages, increase employment, and promote job satisfaction (Carnevale, Rose, & Hanson, 2012; Rosenbaum & Rosenbaum, 2013).

In high school, focusing on Career and Technical Education (CTE) courses can give students job-related skills. Students can take individual CTE courses or programs of study in a particular career cluster. In 2008, nearly all regular high schools (94%) offer CTE courses, and full-time CTE schools represent 4% of all high schools (U.S. Department of Education, n.d-a). Most students (81%) earn at least one CTE credit during high school (U.S. Department of

Education, n.d-b) and approximately 22% of students who earned any CTE credits concentrated in a given career cluster (defined as taking at least three courses in a particular career cluster) (U.S. Department of Education, n.d-c). Between 1992 and 2013, the percentage of high school graduates who earned any CTE credits increased; however, the percentage of students concentrating decreased, indicating that students are increasingly sampling or exploring CTE classes (U.S. Department of Education, n.d-b).

Beyond taking CTE courses, some students may obtain and demonstrate job skills by earning industry certifications, which can provide additional opportunities to acquire skills for rewarding careers (Carnevale, et al. 2012; Goldin & Katz, 2008). Certifications can give students the opportunity to show their proficiency with employer-determined skill standards, obtain occupational licenses, or earn postsecondary education credit (Castellano, Stone, & Stringfield, 2005; Goodman, Meyer, & Imperatore, 2014). Certifications give employees a way to signal their fit with a given job without requiring 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 customers, such as in Health Science or IT (Bartlett, 2012).

Policy-makers and businesses view earning certifications as a key to providing students and workers with highly relevant job training that leads to rewarding career tracks (Goodman et al, 2014). Because of growing interest, policies and programs promoting certification attainment for high school students have exploded in recent years—42 states now offer K-12 pathways leading to a certification (National Center for Education Statistics, 2016)—and some states have seen huge increases in the number of high school students earning certifications (Goodman et al, 2014).

Florida's Career and Professional Education Act

In 2007, the Florida legislature passed the Florida's Career and Professional Education (CAPE) Act to provide rigorous and relevant coursework that can lead to industry certification and college credit. This act promotes statewide planning between business and education to help attract high-value industries to the state. Because of this Act, Florida incorporated certification exam taking into its state longitudinal data system.

A central component of the Act is its focus on state-approved industry certifications considered critical to Florida employers. The Division of Career and Adult Education within Florida's Department of Education (FLDOE) selects a subset of these certifications for use at the secondary level. To qualify, certifications must be achievable by secondary students, require a minimum of 150 hours of instruction, and have been offered for at least 1 year in a school district. With the CAPE Act, students and their parents do not register for exams, pay examination costs, nor manage logistics of scheduling the exam and getting to a testing location. Further, before taking the exam, students have taken courses that should prepare them to pass the exam.

In Florida, industry certifications took on increased importance for schools in 2009–10 when they were incorporated into the state's high school grading and funding formula. Under the

INFLUENCE OF EARNING INDUSTRY CERTIFICATION

CAPE Act, schools get points in the School Report Card for those who passed an industry certification on Florida's Industry Certification Funding List, approved by the State Board of Education (Florida Department of Education, 2016a) This policy change was associated with enormous growth in these awards, with 954 awards in 2007-08, 66,320 in 2014-15, and 123,839 in 2017-18 (Florida Department of Education, 2016b).

Florida has continued to provide incentives for schools to promote certifications. Students are also incentivized to earn certifications by the prospect of earning postsecondary credit. FLDOE developed statewide articulation agreements that allowed students earning certain kinds of certifications, referred to as Gold Standard certifications, to receive potential postsecondary credit in related coursework leading to an Associate in Science (AS) degree (Goodman et al., 2014). Gold Standard Career Pathways Articulation Agreements are developed in conjunction with the Florida College System institutions based on industry certifications included in the Department of Education's CAPE Industry Certification Funding List. Approved by the State Board of Education, the Gold Standard Career Pathways Articulation Agreements allow students who earn certain industry certifications to have the potential to earn college credit toward the associate degree program identified in the articulation agreement (Florida Department of Education, 2020).

Industry certifications are nested within areas, or career clusters. In 2010-11, Florida students could earn certifications in the following clusters: Agriculture; Architecture & Construction; Arts, AV Technology, & Communication; Business Management & Administration; Engineering & Technology Education; Health Science; Hospitality & Tourism; Human Services; Information Technology; Law, Public Safety, & Security; Manufacturing; and Transportation & Distribution. Additionally, within every career cluster, some certifications were Gold Standard certifications.

Educational Benefits of Gaining Job Skills in High School

In general, research has shown that students who take CTE courses benefit academically. Taking more units of CTE was associated with on-time high school graduation (Gottfried & Plasman, 2017), and a mix of CTE and the core curriculum was associated with a lower likelihood of dropping out of high school (Plank, DeLuca, & Estacion, 2008). Some studies have shown that taking high school CTE courses is associated with community college success. In Arkansas, students who took an additional CTE course had higher high school graduation rates and were more likely to enroll in a community college (Dougherty, 2016). Once in community colleges, students who had participated in a CTE program during high school had higher odds of earning an associate degree than community college students who had taken a general education program (Dietrich, Lichtenberger & Kamalludeen, 2016). In particular, high school students who had taken dual credit CTE courses in high school had higher rates of continued enrollment and degree attainment in community college (Phelps & Chan, 2016). Similarly, students attending within-school career academies had higher high school graduation rates and, for boys, higher rates of postsecondary educational enrollment than those who did not attend the CTE program (Hemelt et al., 2019). Students participating in a CTE program of study tended to have higher GPAs at the end of high school, and their odds of dropping out declined as their exposure to the program of study increased (Castellano, Sundell, Overman, Richardson, & Stone, 2014).

INFLUENCE OF EARNING INDUSTRY CERTIFICATION

Students who attended standalone CTE schools in Philadelphia had better attendance, higher GPAs, and more credits in college preparatory mathematics courses than those who were not accepted (Neild, Boccanfuso, & Byrnes, 2015). In Massachusetts, participation in regional technical vocational high school programs positively influenced high school graduation and attainment of industry credentials (Dougherty, 2018).

Unlike the outcomes of CTE coursetaking, little is known about the value of industry certifications despite their growing role in the U.S. education and training system. In addition to giving students the opportunity to gain technical skills associated with a specific job, students gain a recognized marker of success. Earning a certification requires preparing for and passing an assessment that goes beyond the requirements of regular high school coursework, as with taking Advanced Placement exams. Students can pass CTE courses without taking the exam. Doing so may build their confidence as they approach other academic assignments. Further, this certification signals not only skills associated with a particular occupation, but also general knowledge, persistence, and ambition; college admissions departments may recognize and reward students with these credentials (ExcelInED & Burning Glass Technologies, 2019).

Because industry certification examinations are developed and scored by various vendors, comprehensive data linking certifications and academic outcomes have not been historically available. Thus, researchers have been unable to demonstrate the educational benefits of certifications for high school students. Without access to reliable national data on the number of certifications being earned (Sykes, Szuplat, & Decker, 2014), there have not been systematic studies that link earning industry certifications to academic outcomes of students. The educational consequences of earning an industry certification are not clear. As more states implement policies to offer industry certifications to students, it is essential that we better understand the potential benefits for students' postsecondary trajectories. Only with more information about whether and how certifications improve students' life chances can the United States intelligently address the demand for a better educated workforce.

In this paper we examined the influence of earning industry certifications in high school on immediate postsecondary enrollment, and postsecondary degree completion. Analyses focused on the first cohort of Florida students in high school when Florida implemented the CAPE Act, - students who were first-time ninth-graders in 2007-08. Specifically, we asked the following questions:

1. Were industry certification-earners more likely to attend college and earn a degree than non-earners?
2. Were Gold Standard industry certification-earners more likely to attend college and earn a degree than regular certification earners?
3. Were benefits associated with earning industry certifications consistent across career clusters areas?

Method

Data

Data employed in this study came from Florida's Education Data Warehouse, which keeps demographic and longitudinal education data for all students in public high schools and colleges in Florida. To obtain information about enrollment at private colleges or out of state, we also matched records for 9th graders in 2007–08 who earned any type of high school credential by the end of 2010–11 to the National Student Clearinghouse data. The National Student Clearinghouse supplied postsecondary enrollment data and degree attainment data from the spring of 2011 through the summer of 2015.

FLDOE maintains records for every industry certification examination taken by high school students. The Education Data Warehouse provided data for all first-time 9th graders in 2007-08 (255,650 students). We created a dichotomous variable to identify students who earned certifications in 2009-10 and/or 2010-11, their typical junior or senior years. Given prerequisite course requirements for taking certification exams, few students could take examinations before 11th grade. For each student who takes an exam, data identify the certification exam and academic year, the career cluster of the exam, and whether the student passed. The certification records did not provide numeric scores for each attempt. Further, students who failed their certification exam could retake it, but FLDOE only keeps the final attempt in each year. If students attempt to earn more than one certification, FLDOE keeps results for both certification attempts.

Each student exam record includes the FLDOE code for the specific industry certification that was attempted or earned. To identify the career cluster of each certification we used Florida's 2013–14 Florida CAPE Industry Certification Funding List.¹ If the Industry Certification Funding List did not include a given certification career cluster, we identified career clusters based on the National Occupational Competency Testing Institute (NOCTI) website (www.nocti.org). Then we used the Florida State Board of Education listing of industry certifications to identify Gold Standard certifications. In 2009-10 and 2010-11, students in this cohort earned 19,075 certifications. Table 1 presents the number of all certifications earned by the students included in this analysis and the percentage of certifications earned in each career cluster. Students earned about half of all certifications in Arts, AV Tech & Communication (46%), but less than 1 percent of certifications in career clusters such as Agriculture, Food & Natural Resources; Business Management & Administration; Law, Public Safety, & Security; or Manufacturing.

¹ See <http://www.fldoe.org/academics/career-adult-edu/cape-secondary/index.stml> for further information regarding CAPE, the CAPE Industry Certification Funding Lists, DOE codes, and career clusters.

INFLUENCE OF EARNING INDUSTRY CERTIFICATION

Table 1: Number and percentage of certifications earned in each career cluster in 2009-10 or 2010-11 by students who were first-time 9th graders during 2007-08, by whether the certification was a regular certification or a Gold Standard certification

	All certifications		Regular certifications		Gold Standard certifications		Percent of certifications that were Gold Standard
	Number	%	Number	%	Number	%	
Agriculture, Food, Natural Resources	99	0.5	39	0.3	60	0.9	60.6
Architecture and Construction	1,210	6.3	224	1.8	986	14.2	81.5
Arts, AV Tech, Communication	8,801	46.1	5,420	44.6	3,381	48.8	38.4
Business Management and Administration	112	0.6	106	0.9	6	0.1	5.4
Engineering and Technology Ed	102	0.5	102	0.8	0	0.0	0.0
Health Science	3,516	18.4	3,484	28.7	32	0.5	0.9
Hospitality & Tourism	1,440	7.5	101	0.8	1,339	19.3	93.0
Human Services	2,169	11.4	2,047	16.9	122	1.8	5.6
Information Technology	1,128	5.9	197	1.6	931	13.4	82.5
Law, Public Safety and Security	113	0.6	113	0.9	0	0.0	0.0
Manufacturing	134	0.7	129	1.1	5	0.1	3.7
Transportation, Distribution, Logistics	251	1.3	179	1.5	72	1.0	28.7
Total	19,075	100.0	12,141	100.0	6,934	100.0	36.4

SOURCE: Florida Department of Education, PK–20 Education Data Warehouse; National Center for Education Statistics, Common Core of Data (CCD), “Public Elementary/Secondary School Universe Survey,” 2007–08; National Student Clearinghouse, StudentTracker Data.

Outcome Variables

Key outcomes include *immediate postsecondary enrollment* and *postsecondary degree attainment*. *Immediate postsecondary enrollment* identifies students who attended a postsecondary educational institution the fall term after they graduated from high school (i.e., attended a postsecondary institution during fall 2011) among all students who completed high school in 2010–11. *Postsecondary degree attainment* was calculated only for those with immediate enrollment at a 2-year or 4-year postsecondary institution because students who delayed entry into 4-year universities would not likely have had enough time to attain a degree within the window of time for which we have postsecondary data coverage. For each outcome, we compared students who obtained²:

1. any type of certification with those who did not obtain a certification;
2. a Gold Standard certification with those who obtained a regular certification; and
3. a certification in one of the six most common career clusters (as indicated on Table 1) with all of those who obtained a certification in the remaining five common career clusters (e.g., Health Science compared to all other certifications in this analysis).

These analyses allowed us to estimate the overall effect of receiving a certification, whether the effect of the Gold Standard certification differs from regular certifications, and whether the effect of certification varies by career cluster.

² Each certification career cluster has some Gold Standard certifications, so the second comparison does not omit any clusters, nor does the third comparison set Gold Standard against regular certifications within clusters.

Analytic Approach

Because students are not randomly assigned to certification programs, those who decide to get an industry certification may differ from those who do not in ways that could be associated with postsecondary enrollment. Therefore, any differences in the observed outcomes may result from selection bias. We used the method of propensity score matching to identify comparison group students who are very similar to the certification-earners – except that they did not earn certifications. This quasi-experimental method relies upon observable characteristics that might influence both the treatment and the outcome. With those observed characteristics, one estimates the probability of participating in a given treatment. Although this approach cannot account for unobserved characteristics, such as individual aspirations, it does balance treatment and comparison groups on a large number of observed covariates.

In developing the models for this propensity score analyses, we accounted for multiple student and school factors while controlling district effects, all of which could influence the likelihood of earning a certification as well as enrolling in a postsecondary educational institution and attaining a degree. For students, measures included a series of dichotomous variables for female, migrant, English language learner, free/reduced-price lunch eligible, identified as academically gifted, identified with disability, and race/ethnicity, with indicators for Black, Hispanic, and Other, with White as the reference category. Additionally, we included grade point average (GPA) from 9th grade. All of these variables are time-invariant or were measured before the treatment, earning a certification in 2009-10 or 2010-11. Any student factors that could have resulted from earning a certification, such as grade 12 GPA, were omitted.

School-level variables come from 2007-08, their 9th grade year. These measures include total student population, student-teacher ratio, percentage of students eligible for free or reduced-price lunch, and the racial/ethnic composition of the school by the percentage of students who are Black, Hispanic, White, or Other race/ethnicity. Then, we included dichotomous measures indicating whether the school is Title I school, a magnet school, or a charter school. In addition, we included the school's locale with dichotomous variables indicating suburban, rural, and town, with urban as the reference category. Finally, we included district-level fixed effects as one dichotomous variable for each district in Florida.

In this analysis, these propensity scores indicate the probability that each student would obtain an industry certification. We used propensity score analysis that was designed to meet What Works Clearinghouse (2020) group design standards with reservations as a quasi-experimental design. The models used to estimate propensity scores used the following equation

$$Y_i = \beta_0 + \beta_1 X_{stu} + \beta_2 X_{sch} + \alpha_i + \epsilon$$

where the treatment variable (Y_i) is predicted by a set of student-level characteristics (X_{stu}), a set of school-level characteristics (X_{sch}), and district-level fixed effects (α_i). Table 2 presents the results of the logistic regression model used to predict the probability of receiving any industry certification. These measures were included in this model and in all models predicting

INFLUENCE OF EARNING INDUSTRY CERTIFICATION

certification outcomes. Earning an industry certification is positively associated with being male, white, and having a higher GPA, and it is negatively associated with any exceptionality, including being academically gifted. In terms of school-level measures, high-poverty schools have a positive association with obtaining an industry certification.

Table 2: Results of logistic regression model predicting the likelihood of obtaining any certification

	Coefficient	Standard error	z	P> z
Student-level characteristics				
Male (reference category)	†	†	†	
Female	-0.12	0.05	-2.27	*
Race and ethnicity				
White (reference category)	†	†	†	
Black	-0.15	0.03	-4.84	***
Hispanic	-0.08	0.03	-3.28	**
Other	0.00	0.06	-0.08	
Migrant	0.04	0.18	0.20	
Limited English	0.02	0.03	0.45	
Eligible for free or reduced-price lunch	0.04	0.02	1.77	
Grade point average in 2007–08	0.31	0.04	7.69	***
Academically advanced	-0.22	0.04	-5.21	***
Disability	-0.32	0.08	-3.96	***
Additional disability	-0.08	0.13	-0.62	
School-level characteristics				
Student population size	0.00	0.00	0.47	
Student-to-teacher ratio	0.02	0.02	1.04	
Percentage of student population				
eligible for free or reduced-price lunch	1.01	0.44	2.30	*
Title I school	0.04	0.10	0.44	
Student-population race and ethnicity				
Percent white	-2.83	5.48	-0.52	
Percent black or African American	-2.33	5.65	-0.41	
Percent Hispanic	-3.12	5.59	-0.56	
Percent other	-5.56	6.02	-0.92	
Magnet school	-0.02	0.10	-0.23	
Charter school	-0.34	0.26	-1.28	
Locale				
Urban (reference category)	†	†	†	
Suburban	0.29	0.17	1.72	
Town	0.02	0.19	0.08	
Rural	0.27	0.21	1.28	

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

† Not applicable.

SOURCE: Florida Department of Education, PK–20 Education Data Warehouse; National Center for Education Statistics, Common Core of Data (CCD), “Public Elementary/Secondary School Universe Survey,” 2007–08, National Student Clearinghouse, StudentTracker Data.

Next, we used the propensity scores to calculate inverse probability weights (IPWs) to estimate the average treatment effect on the treated. When applied to outcome models, the IPWs weight the comparison group to appear statistically similar to the treatment group across the covariates used to estimate the propensity scores (Guo & Fraser, 2015):

$$\omega(W|X) = \frac{p}{1-p}$$

where $\omega(W, X)$ represents the inverse probability weight for a treatment assignment (W) given a set of covariates (X), and p represents the propensity score. For students in the comparison group this equation provides an IPW equal to the inverse probability of receiving the treatment. For students in the treatment group, the IPW is equal to 1. These weights are then used in a statistical model estimating the effect of certification status on student outcomes to estimate the effect of certification. We also included all covariates from the IPW model as covariates in the outcome statistical model.

To determine if the IPWs balanced the treatment and comparison groups, we next estimated the weighted group mean of each covariate used to predict receiving an industry certification. We considered characteristics to be balanced when the absolute value of the effect size was smaller than .25 standard deviations (What Works Clearinghouse, 2020). We estimated effect sizes using the following equation:

$$d = \frac{\bar{x}_t - \bar{x}_c}{\sqrt{\left(\frac{s_t^2 + s_c^2}{2}\right)}}$$

where the effect size (d) is equal to the difference between the treatment and comparison group means (\bar{x}_t and \bar{x}_c , respectively) are divided by the square root of the sum of the treatment and comparison group variances (s_t^2 and s_c^2 , respectively) divided by two.

Table 3 presents group means and effect sizes for each covariate used to predict receiving any industry certification. The effect sizes were between -0.25 and 0.25 standard deviations. This suggests that the IPWs sufficiently balanced the treatment and comparison groups.

Table 3: Unweighted means, weighted means, and standardized mean differences of covariates used to estimate propensity scores for postsecondary enrollment: Any certification vs. no certification

Unweighted Means	Weighted Means
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INFLUENCE OF EARNING INDUSTRY CERTIFICATION

	Any Certification	No Certification	Unweighted Bias	Any Certification	No Certification	Weighted Bias
Student Characteristics						
Female	0.512	0.515	-0.01	0.513	0.512	0.001
White	0.481	0.464	0.03	0.486	0.486	0.000
Black	0.193	0.214	-0.05	0.190	0.189	0.001
Hispanic	0.262	0.265	-0.01	0.260	0.260	0.000
Other	0.064	0.057	0.03	0.064	0.064	0.000
Migrant Status	0.006	0.006	0.00	0.006	0.006	0.000
Limited English	0.188	0.185	0.01	0.184	0.184	0.001
Eligible for FRPL	0.361	0.372	-0.02	0.356	0.356	0.000
GPA in 2007	2.921	2.731	0.27	2.935	2.936	-0.001
Gifted	0.076	0.075	0.00	0.077	0.077	0.000
Status as Exceptional	0.065	0.111	-0.16	0.063	0.063	0.001
Additional Exceptionality	0.012	0.027	-0.10	0.011	0.011	0.000
School Characteristics						
School Population	2,190.1	2,179.5	0.01	2,189.4	2,188.8	0.001
Student Teacher ratio	18.09	18.19	-0.04	18.09	18.09	0.003
Percent Eligible for FRPL	0.347	0.337	0.06	0.345	0.346	-0.002
Eligible Title I	0.295	0.268	0.06	0.291	0.290	0.001
Percent White Students	0.491	0.497	-0.02	0.494	0.494	0.000
Percent Black Students	0.224	0.216	0.04	0.222	0.222	-0.001
Percent Hispanic Students	0.235	0.234	0.01	0.234	0.234	0.001
Percent Other Students	0.026	0.029	-0.15	0.026	0.026	-0.002
Magnet Schools	0.308	0.278	0.07	0.306	0.307	-0.001
Charter Schools	0.015	0.016	0.00	0.016	0.015	0.003
Urbanicity						
Urban	0.202	0.244	-0.10	0.201	0.201	0.000
Suburban	0.548	0.507	0.08	0.549	0.549	0.001
Town	0.043	0.052	-0.04	0.043	0.043	0.000
Rural	0.206	0.198	0.02	0.207	0.207	-0.001

SOURCE: Florida Department of Education, PK–20 Education Data Warehouse; National Center for Education Statistics, Common Core of Data (CCD), "Public Elementary/Secondary School Universe Survey," 2007-08

Results

First, we examined whether certification earners were more likely than non-earners to immediately enroll in a 2-year or 4-year college. Table 4 presents these results. The rate at which students with any certification immediately enrolled in community colleges was about 2.9 percentage points higher than students without any certification after controlling for student- and school-level characteristics. Given that Gold Standard certifications give students the potential for college credit, we expected to find a closer association between earning a Gold Standard certification and going to college. However, students who obtained a Gold Standard certification were not more likely to enroll in a 2-year college than students who obtained a regular certification. They were as likely to do so. When comparing differences within certification

INFLUENCE OF EARNING INDUSTRY CERTIFICATION

career clusters, Health Sciences and IT were less likely to enroll in community college (3.3 and 4.2 percent, respectively).

Table 4: The effect of earning an industry certification on enrollment in a community college or university, by certification type and career cluster

	<i>n</i>	Certification earners	Comparison	Average Marginal Effect	P> z
Community college					
Any certification vs. no certification	79,816	51.1	48.2	2.9	***
Gold-standard certification vs. regular certification	9,357	52.1	52.0	0.1	
Architecture & Construction vs. other certifications	7,540	53.3	50.7	2.7	
Arts, AV Technology, & Communication vs. other certifications	9,201	53.1	51.0	2.1	
Health Science vs. other certifications	9,010	46.4	49.7	-3.3	*
Hospitality & Tourism vs. other certifications	8,902	52.4	51.8	0.6	
Human Services vs. other certifications	8,438	53.1	54.1	-1.0	
Information Technology vs. other certifications	8,957	43.5	47.7	-4.2	*
University					
Any certification vs. no certification	50,452	65.0	66.7	-1.6	**
Gold-standard certification vs. regular certification	5,991	64.5	64.6	-0.1	
Architecture & Construction vs. other certifications	4,888	60.7	64.0	-3.3	
Arts, AV Technology, & Communication vs. other certifications	5,942	63.2	66.4	-3.2	*
Health Science vs. other certifications	5,811	65.9	63.2	2.7	
Hospitality & Tourism vs. other certifications	5,731	63.1	62.0	1.1	
Human Services vs. other certifications	5,492	63.7	62.0	1.8	
Information Technology vs. other certifications	5,828	69.3	66.9	2.3	

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

¹ Marginal effect size represents difference between the treatment and comparison group students, holding covariates at their mean values. Models include all covariates presented in Table 2.

NOTE: Sample is limited to all students who obtained a high school diploma by 2011.

SOURCE: Florida Department of Education, PK–20 Education Data Warehouse; National Center for Education Statistics, Common Core of Data (CCD), "Public Elementary/Secondary School Universe Survey," 2007–08; National Student Clearinghouse, StudentTracker Data.

Among students who completed high school, we found that a smaller proportion of certification-earners immediately enrolled in a 4-year college relative to non-earners. When examining certification types, we found no difference between regular and Gold Standard certification earners in terms of the rate at which they immediately enrolled in a 4-year college. Similarly, comparisons of certification career clusters showed only one difference in enrollment rates. Among certification earners, we found that Arts, AV, and Communication certification earners were less likely to enroll in a 4-year college than other certification-earners were (63 percent versus 66 percent).

Next, we looked at the rates at which students earned an associate's or bachelor's degree among students who enrolled in a 2- or 4-year college immediately after completing high school. In the United States, many students who enroll in postsecondary educational institutions leave before earning a degree. Seventy-two percent of American high school students who graduated in the class of 2009 and entered a 4-year university completed a degree within six years, and 38 percent of those entering a community college did so within six years (Shapiro et al. 2015).

INFLUENCE OF EARNING INDUSTRY CERTIFICATION

Within four years of immediate enrollment at a community college, the rate at which certification earners attained an AA degree was 4.5 percentage points higher than students who did not earn a certification (Table 5). There was no difference in degree attainment for Gold Standard certification earners compared with regular certification earners, or for any certification career cluster. Among those who enrolled in a 4-year university after completing high school, the rate of obtaining a bachelor's degree was *lower* for certification earners than non-earners (4.6 percent).

Table 5: The effect of earning an industry certification on obtaining an associate or bachelor's degree within 4 years of high school graduation, by certification type and career cluster

	<i>n</i>	Certification earners	Comparison	Average Marginal Effect	P> z
Community college					
Any certification vs. no certification	41,306	32.7	28.2	4.5	***
Gold-standard certification vs. regular certification	4,813	32.0	31.1	0.9	
Architecture & Construction vs. other certifications	4,519	27.7	31.1	-3.4	
Arts, AV Technology, & Communication vs. other certifications	4,741	31.8	31.8	0.0	
Health Science vs. other certifications	4,614	36.4	38.3	-1.8	
Hospitality & Tourism vs. other certifications	4,289	30.3	31.4	-1.0	
Human Services vs. other certifications	4,070	33.7	31.2	2.5	
Information Technology vs. other certifications	4,754	37.7	32.0	5.7	*
University					
Any certification vs. no certification	33,138	32.1	36.7	-4.6	***
Gold-standard certification vs. regular certification	3,832	28.9	29.5	-0.7	
Architecture & Construction vs. other certifications	3,091	28.4	31.9	-3.5	
Arts, AV Technology, & Communication vs. other certifications	3,794	30.2	31.7	-1.5	
Health Science vs. other certifications	3,436	35.4	33.8	1.7	
Hospitality & Tourism vs. other certifications	3,507	26.5	29.9	-3.4	
Human Services vs. other certifications	3,343	34.4	31.6	2.8	
Information Technology vs. other certifications	3,847	34.4	40.4	-6.0	

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

¹ Marginal effect size represents difference between treatment and comparison group students holding model covariates at their mean values. Models include all measures presented in Table 2.

² Among students who immediately enrolled in a community college or 2-year school

³ Among students who immediately enrolled in a university or 4-year school

SOURCE: Florida Department of Education, PK–20 Education Data Warehouse; National Center for Education Statistics, Common Core of Data (CCD), “Public Elementary/Secondary School Universe Survey,” 2007–08; National Student Clearinghouse, StudentTracker Data.

Conclusion

Once Florida established the CAPE Act, the number of certifications high school students earned ballooned. Students earned certifications more frequently in some career clusters, such as Arts, AV Technology & Communication, Health Sciences, and Human Services. A national examination of CTE coursetaking at this time found that information technology was the most popular field to earn a CTE credit, followed by arts and architecture & construction (U.S. Department of Education, 2017). Our data cannot inform us about why students chose certifications in different career clusters. The differences may reflect student interests, their beliefs about how particular certifications would affect their future employment, or their school

and district priorities in offering and promoting some career clusters more than others. Future research should examine the ways in which schools and districts implement this program and student motivation to earn any certifications as well as their interest in earning them in specific career clusters.

This paper focused on the link between certifications and educational attainment. Although more states are incorporating certifications into high school curricula, little is known about whether industry certifications influence educational attainment. Some policy makers believe that earning an industry certification in high school could help students pursue education as well as employment. As CTE programs have been prevalent in high school for decades, studies have examined the influence of CTE concentration on educational outcomes. However, earning an industry certification is distinct from CTE coursetaking and may have a different influence on college going. Although CTE courses give students experience using skills needed for different kinds of semi-skilled or skilled jobs, earning a certification may provide other tangible benefits. Like taking Advanced Placement exams in addition to taking an Advanced Placement course, pursuing an industry certification in high school requires effort that goes beyond taking a CTE course. Putting forth this extra effort may increase a student's academic confidence as well as teach the student more about the requirements of different kinds of jobs within an industry. With that information, a student may better understand the benefits of further education to certain jobs and prepare for postsecondary education. Additionally, as ExcellnEd & Burning Glass Technologies (2019) note, these credentials can strengthen college applications as gatekeepers recognize skills that go beyond any specific job requirement, such as motivation and persistence.

Promoting industry certifications in high school is a relatively recent phenomenon. Because industry certification examinations are designed and scored by industry vendors rather than the College Board or the state educational system, data have not been available to analyze the influence of industry certification on educational attainment. Therefore, not much research has addressed this question.

This paper uses Florida's statewide longitudinal data system to track academic progress of first-time 9th graders in 2007–08, who were the first cohort to experience the CAPE Act. We examined whether earning industry certifications influenced college enrollment and degree attainment overall, by type of certification and by career cluster. Here, we focused on the initial rollout of the program to examine the career clusters in which students earn certifications and whether certifications are associated with immediate postsecondary enrollment and degree attainment. Then, we examined whether the certification type or career cluster influenced these outcomes differently. Since the initial program rollout, the same overall CAPE program policies and practices have persisted in Florida, but given that the program has continued to expand, future research should examine whether these relationships between earning a certification and post-secondary enrollment and success have persisted.

Studies of CTE coursetaking have consistently found an association between a CTE focus and 2-year college enrollment and success (Dougherty, 2016; Dietrich, Lichtenberger & Kamalludeen, 2016; Phelps & Chan, 2016). Similar to CTE coursetaking, we found a positive association between earning certifications and immediate postsecondary enrollment at 2-year

programs. Students preparing to go to a 2-year community college may perceive a more direct link between their certification and 2-year college enrollment. Like CTE coursetaking, earning a certification is a mechanism that influences community college enrollment. A limitation of this work is that our data did not permit identifying whether students had concentrated in a given career cluster by taking at least three courses within it. Further, we did not have a directory listing the requirements for each certification and cannot identify the pathway of courses that students took to prepare for the examination. As this work focuses on the initial implementation of the CAPE Act, schools and districts may have been creating and adjusting course requirements for exams, and course requirements may not have been set. We expect that most of these courses would be within CTE, but some may not have been. For example, students may take biology classes to prepare for a certification in Health Science certification. Future research should disentangle the effects of CTE coursetaking from industry certifications.

In contrast, we found a negative association with certification earning and enrollment in 4-year programs. Those who always planned to go to a 4-year university may have bypassed getting a certification, believing that certifications would not benefit them in the way that taking Advanced Placement exams would.

To focus on degree attainment, we limited our sample to students who had enrolled in college. We found positive association between earning an industry certification and obtaining an associate degree, but a negative association between certification-earning and BA attainment. Our 2-year college degree results are similar to those of Phelps and Chan (2016), who found that advanced CTE coursetaking set the pathway for success in 2-year college. However, certification earners who enrolled in 4-year institutions are less likely to complete a BA degree than non-earners. The data only included the first 4 years after high school completion, and some students may have taken longer to earn their degree. Additionally, some may have transferred to a community college to pursue an associate degree, or left school to go to work. With an industry certification in hand, they may have been better able to obtain a job without a BA degree. If certification-earning students leave 4-year colleges to pursue a 2-year degree or work, then a 4-year college may not have been the best fit for them. Given the cost of 4-year college, students who pursue certifications could benefit from counseling about the type of college program that would best prepare them for their futures. For some, a 4-year college may be the best fit, but others may benefit more from a 2-year college.

In Florida, Gold Standard certifications give students the potential to earn college credit from a 2-year college. Although students who obtained any industry certification were more likely to enroll in community college and earn a degree compared with students who did not obtain a certification, earning a Gold Standard Certification did not confer additional benefits over a regular certification. Gold Standard certification earners were no more likely to enroll in a 2-year college than regular certification earners. Students earning certifications might not have known that Gold Standard certifications may convert to college credits and did not align their certification-taking with their college plans. As noted above, because Florida postsecondary educational institutions do not report the extent to which students earned college credit for their Gold Standard certifications, we cannot determine whether any of the Gold Standard certification earners who enrolled in community college received this benefit. Florida colleges should report the numbers of credits earned through high school certifications so that students and schools

could directly see this benefit certification earning. In promoting the certification program, schools need to articulate the benefits of Gold Standard certifications more clearly. Future research should examine whether students earn college credits through their certifications, and whether some career clusters are better suited to having students take advantage of this option. Even if students do not get college credit for their industry certification, these credentials may provide a foundation for college learning.

Comparisons of postsecondary educational outcomes by career cluster showed few differences. We noted that, relative to those earning certifications in other career clusters, those with certifications in Health Sciences are less likely to enroll in a 2-year program, and Arts, AV Technology, & Communication are less likely to enroll in a 4-year program. Jobs in those fields may not require postsecondary degrees. When examining degree attainment, we found no differences by career cluster for either associate degree or bachelor's degree attainment. Among certification earners, patterns of postsecondary degree attainment look similar across career cluster. It is not clear whether earning an industry certification in high school is integrated with college learning. Some students may earn a certification and never revisit that topic, while others may build on their certifications in college and work. The chances to build upon high school certification-earning may depend on career cluster. Future work should examine this question.

Our analyses focused on the first cohort of students for whom the CAPE Act was in place. Schools and districts were responding to a new policy, and students and parents in this cohort may not have fully understood how to take advantage of it. Even so, we found a modest association between earning certifications, enrolling in a 2-year college, and getting an associate degree. As districts and schools became more accustomed to administering the CAPE Act, and students and their parents became more aware of the opportunities the CAPE Act provides, the relationship between earning an industry certification and college going and success may have become stronger. We know that the rates of earning certifications increased in Florida over the next several years. As certification-earning became more popular, the relationship between earning a certification and enrolling in a 2 or 4-year college may have shifted. Further, as certifications became more popular, more students in the college preparatory track may see their value and pursue them. If so, the association between earning a certification and enrollment and degree attainment in a 4-year college may be neutral or positive. Future work should examine subsequent cohorts to see how industry certifications influence postsecondary educational attainment.

As more high school students are getting the opportunities to earn industry certifications, it is important to examine how these certifications affect their education pathways. In addition to giving them job skills, certifications may help students prepare for postsecondary education, particularly at the 2-year college level. In getting a certification, they may better see how further education is relevant to their future plans, and they may have more confidence that comes from accepting a challenge and persisting with it.

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