IES Institute of Education Sciences

Career and Technical Education Credentials in Virginia High Schools: Trends in Attainment and College Enrollment Outcomes

Regional Educational Laboratory Appalachia

At SRI International

REL 2022-132
U.S. DEPARTMENT OF EDUCATION

A Publication of the National Center for Education Evaluation and Regional Assistance at IES

Career and Technical Education Credentials in Virginia High Schools: Trends in Attainment and College Enrollment Outcomes

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In Virginia, there has been a long-term effort to increase the number of graduates who earn career and technical education (CTE) credentials. These CTE credentials are intended to provide high school graduates with additional preparation for college and careers. In 2013, the Virginia Board of Education added a CTE credential requirement to the Standard diploma for students who entered grade 9 for the first time in 2013 or later. Graduates can complete this requirement by passing an approved assessment and do not have to take any CTE courses.

The CTE credential requirement was added to the Standard diploma because graduates earning this diploma are less likely to enroll in, persist in, or complete college than graduates who earn Virginia's other main diploma, the Advanced Studies diploma. In addition, this new policy is part of the state's efforts to eliminate racial and socioeconomic inequities in Virginia public schools. Graduates who are Black or Hispanic, who are English learner students, who are in economically disadvantaged circumstances, or who receive special education services are more likely than other groups of graduates to earn the Standard diploma rather than the Advanced Studies diploma.

At the request of Virginia CTE leaders, the Regional Educational Laboratory Appalachia conducted a descriptive study of attainment rates of CTE credentials, completion rates of CTE programs of study, and college enrollment rates for Standard diploma graduates from 2011 to 2017, the years before and after the policy change. Education stakeholders in Virginia and elsewhere can use the results of this study to inform their CTE policies.

From 2011 to 2017, the percentage of Standard diploma graduates who earned at least one CTE credential increased from 23 percent to 91 percent. A similar increase occurred among Advanced Studies diploma graduates, even though the CTE credential requirement applied only to Standard diploma graduates. The attainment rates of CTE credentials increased for all groups of Standard diploma graduates, including groups based on demographic characteristics, federal program participation, and academic achievement. While the percentages of Standard diploma graduates who earned a CTE credential increased consistently from 2011 to 2017, their college enrollment rates dropped. The percentage of Standard diploma graduates completing a CTE program of study, which requires taking CTE courses that are not required to earn a credential but may still be helpful for later student outcomes, decreased in 2016 and 2017.

The study findings suggest a need to examine workforce outcomes for Standard diploma graduates to fully understand whether this policy is meeting its intended goals. In addition, the findings suggest a need to consider other methods to address outcomes for Virginia's Standard diploma graduates, such as support for implementing practices with rigorous evidence of effectiveness for improving college and career outcomes.

Why this study?

Most jobs in today's economy require some type of college education or training (Carnevale et al., 2013). Median annual earnings for workers aged 25 to 34 who attended some college, regardless of whether they earned a degree, are higher compared to workers without a college education (National Center for Education Statistics [NCES], 2020a). Further, workers with a bachelor's degree earn nearly $20,000 more annually than workers with only a high school diploma (NCES, 2020a).

In Virginia, all high school graduates can earn one of two diplomas, a Standard diploma or an Advanced Studies diploma (see box 1 for definitions of key terms). The Advanced Studies diploma includes more course requirements than the Standard diploma and is designed to prepare graduates for enrollment in a four-year college. Thus, college outcomes for graduates often differ across the two types of diplomas. For example, graduates who earn Virginia's Standard diploma are less likely to enroll in, persist in, or complete college, including one-, two-, and four-year college programs (Garland et al., 2011; Holian & Mokher, 2011; Jonas et al., 2014; Jonas & Garland, 2014). This is perhaps not surprising as the Standard diploma has fewer course-taking requirements in courses such as math that are associated with success in a four-year college program (Adelman, 2006).

Graduates who are Black or Hispanic, who are English learner students, who are in economically disadvantaged circumstances, or who receive special education services are more likely than other groups of graduates to earn Virginia's Standard diploma. In 2019, for example, fewer than half of all high school graduates (41 percent) earned the Standard diploma, yet 60 percent or more of graduates who were English learner students, were in economically disadvantaged circumstances, or received special education services earned the Standard diploma. Further, more than half of Black and Hispanic graduates in Virginia earned the Standard diploma, compared to 38 percent or fewer of Asian, White, or multiracial graduates (Harris et al., 2021).

Black and Hispanic graduates are also less likely than graduates of other racial/ethnic groups to enroll in college. For example, in 2017, 73 percent of Virginia's White on-time graduates enrolled in college within 16 months of graduating from high school, whereas 64 percent of Black on-time graduates and 63 percent of Hispanic on-time graduates enrolled within the same time frame. College enrollment rates were even lower for graduates who were in economically disadvantaged circumstances (56 percent), were English learner students (60 percent), or received special education services (49 percent; Virginia Department of Education [VDOE], n.d.-d).

As one part of the effort to improve outcomes for Standard diploma graduates, Virginia's legislature enacted a policy in 2013 that required high school graduates earning the Standard diploma to also earn a career and technical education (CTE) credential. The policy requires nearly all graduates who earn the Standard diploma to pass an assessment in one of four categories to graduate: industry credential, state licensure, Workplace Readiness Skills assessment, and National Occupational Competency Testing Institute (NOCTI) assessment (see box 1).[1] This policy was intended to provide graduates with the opportunities they need to be on the path toward successful college and career opportunities. Strengthening opportunities for Standard diploma graduates has the potential to address a more recent policy goal of providing "a high-quality education for every child by eliminating racial and socioeconomic inequities in Virginia's public education system" (Virginia Board of Education, 2020).

There is limited empirical evidence about the role of CTE credentials in strengthening high school graduates' college and career outcomes. Studies on this topic often analyze data that predate the recent boom in high school CTE

For additional information, including background on the study, technical methods, and supporting analyses, access the report appendixes at https://go.usa.gov/xefDK.

[1] Virginia's policy allows certain graduates to satisfy the CTE credential requirement without passing one of the approved assessments, including accommodations for graduates who are in Individualized Education Programs or who receive special education services, or the use of the Student Competency Record for graduates who transfer into Virginia public schools during grade 12 and meet prescribed conditions (VDOE, 2016).

credentials and instead focus on outcomes related to CTE programs of study (Castellano et al., 2005; Haimson & VanNoy, 2004; Jacobson & Mokher, 2014; Randall & Zirkle, 2005). Unlike CTE programs of study, Virginia students can earn CTE credentials by passing an assessment without taking any CTE courses. Thus, it is not clear that findings related to CTE programs of study would hold for CTE credentials. Recent research suggests it may be important to consider the type of CTE credentials graduates earn because broad CTE credentials may hold little value in the labor market whereas narrowly aligned CTE credentials such as professional licenses are likely more valuable (Excel*in*ED & Burning Glass Technologies, 2019).

By increasing attainment rates of CTE credentials for Standard diploma graduates, Virginia expected to increase these graduates' options for a pathway into and through careers. In implementing this policy, VDOE envisioned this happening by graduates earning one or more CTE credentials that are narrowly aligned to their selected career concentration, equipping them with requisite technical skills (VDOE, 2016), or by encouraging more graduates to complete a CTE program of study, which requires CTE coursetaking and may lead to improved student outcomes but is not required for earning a CTE credential. Recognizing the limited number of industry credentials available to secondary students, VDOE also emphasized the importance of CTE credentials as an entry point or stepping-stone toward the completion of a certificate program at the postsecondary level and expected the policy to lead to more Standard diploma graduates enrolling in college (VDOE, 2008a, 2008b, 2011).

Virginia CTE leaders asked the Regional Educational Laboratory Appalachia to examine these outcomes before and after the policy was in place. An earlier study presented descriptive information about the most commonly earned credentials Virginia high school graduates earned before and immediately after the policy requirement was in place (Harris et al., 2021). That study showed that the attainment rate of CTE credentials increased in Virginia from 2011 to 2017 and that the majority of the increase during this period resulted from graduates earning broad CTE credentials that apply to a wide range of occupations and industries. This second study examined three outcomes VDOE identified as part of the pathway to careers: earning one or more CTE credentials, completing a CTE program of study, and enrolling in college. This study examined those outcomes from 2011 to 2017, the period during which Virginia began implementing a plan to increase the attainment rate of CTE credentials and when the CTE credential requirement went into effect for Standard diploma graduates (see figure A1 in appendix A for a timeline of Virginia's legislative, state board, and department of education activities related to CTE credentials). Although earning a CTE credential was optional for Advanced Studies diploma graduates, the findings sometimes include their outcomes as a point of comparison.

This study adds to the limited literature about outcomes for graduates who earn different types of CTE credentials. It focuses on the benefits associated with the implementation of Virginia's policy, including earning multiple CTE credentials, completing a CTE program of study, and enrolling in college. Any of these outcomes could strengthen employment outcomes (for example, stable employment, higher salaries, improved benefits) for Standard diploma graduates. This could be particularly true if these graduates earn the types of CTE credentials that employers value, such as narrowly aligned credentials that validate skills aligned with labor market needs (see Harris et al., 2021, for further discussion) or credentials that align with additional college opportunities.

Box 1. Key terms

Advanced Studies diploma. The Advanced Studies diploma is one of two main diploma types available to all Virginia high school students and is considered a rigorous college preparatory high school diploma (Holian & Mokher, 2011; Jonas et al., 2012; Jonas et al., 2014). To graduate with the Advanced Studies diploma, students must earn at least 26 credits, including four credits each of English, mathematics, science, and history and three credits of a world language (Virginia Department of Education [VDOE], n.d.-c). Advanced Studies diploma graduates must also successfully pass associated end-of-course Standards of Learning tests or other assessments approved by the Virginia Board of Education for five of these courses (VDOE, n.d.-c).

Career and technical education (CTE). Virginia defines CTE as programs "designed to prepare young people for productive futures while meeting the commonwealth's need for well-trained and industry-certified technical workers" (VDOE, n.d.-b). Virginia has approved CTE courses within 16 career clusters. Each cluster contains multiple pathways to complete a credential. For example, the Health Science career cluster includes pathways for therapeutic services, biotechnology, and diagnostic services.

College enrollment rate. The college enrollment rate is the percentage of graduates who enrolled in credit-bearing courses in a two- or four-year college at some point during the first academic year after high school graduation.

CTE credential. A CTE credential certifies that a graduate has mastered specific CTE content. In Virginia, graduates earn a CTE credential by passing a qualifying assessment. VDOE's (n.d.-b) definition of CTE credentials includes industry credentials, state licensure examinations, the Virginia Workplace Readiness Skills (WRS) assessment, and National Occupational Competency Testing Institute assessments. (See appendix A for more information on CTE credentials in Virginia.)

CTE credential earner. A CTE credential earner is a graduate who has completed the requirements to earn a CTE credential by taking and passing an approved CTE credential assessment.

CTE credential type. VDOE's Office of Career and Technical Education Services (2016) created four categories of CTE credentials and approved 471 credentials for the 2016/17 school year. The four categories are industry credential, state licensure, WRS assessment, and National Occupational Competency Testing Institute assessments.

CTE program of study. CTE programs of study are not required for earning CTE credentials. They are a set of programs of study approved by VDOE that are designed to help graduates transition from secondary to postsecondary education and earn a credential or certificate at the postsecondary level (VDOE, n.d.-a). Each program of study has an associated course plan that includes academic and career and technical content as well as dual or concurrent enrollment opportunities. For this study, a graduate completed a CTE program of study if they earned two or more standard credits toward one of these CTE programs and was marked as a "CTE finisher" in the Virginia Longitudinal Data System (VLDS).

Diploma type. This study focused on Virginia's two diplomas available to all Virginia high school students: the Standard diploma and the Advanced Studies diploma. Although most Virginia graduates earn one of these two diplomas, other diploma types are also available, such as the Applied Studies diploma (for graduates who receive special education services and meet certain other requirements) and the General Achievement Adult High School Diploma (for graduates older than 18 who are not enrolled in school).

Economically disadvantaged. Graduates were in economically disadvantaged circumstances if they were eligible for free or reduced-price meals, received Temporary Assistance for Needy Families (TANF), were eligible for Medicaid, or were identified as either migrant or experiencing homelessness at any point during the school year (VLDS, 2020).

Federal program participation. For this study, federal program participation refers to participation in programs for English learner students, students in economically disadvantaged circumstances, or students who are eligible for special education services that are typically federally funded in Virginia. Participation includes graduates who were eligible for these programs at any point during their enrollment in a Virginia high school.

Industry credential. VDOE's definition of industry credentials includes broad CTE credentials that can apply to a wide range of occupations and industries (for example, the National Career Readiness Certificate) and narrowly aligned CTE credentials that support preparation for a specific occupation or industry (for example, the ServSafe Manager Certification). This definition differs from the way many other states define an industry credential (Excel*in*ED & Burning Glass Technologies, 2019).

National Occupational Competency Testing Institute (NOCTI) assessment. Virginia graduates can meet the CTE credential requirement by completing NOCTI Job Ready assessments. According to NOCTI (2020), its Job Ready assessments assess occupational technical skills; measure aspects of occupational competence such as factual and theoretical knowledge; and, as a group, aim to assess the skills at the secondary and postsecondary level. NOCTI offers both broad CTE credentials that can apply to a wide range of occupations and industries (for example, the 21st Century Skills for Workplace Success credential) and narrowly aligned CTE credentials that support preparation for a specific occupation or industry (for example, the Accounting-Basic credential).

Standard diploma. The Standard diploma is one of two main diploma types available to all Virginia high school students. To earn a Standard diploma, graduates must earn at least 22 credits, including four credits of English; three credits each of mathematics, laboratory science, and history and social sciences; and two credits of world language. Standard diploma graduates must also successfully pass associated end-of-course Standards of Learning tests or other assessments approved by the Virginia Board of Education for five of these courses (VDOE, n.d.-c). Students who graduated on time in 2017 with the Standard diploma were the first graduates required to earn a CTE credential (VDOE, n.d.-c).

State licensure. For this study, state licensure is a state-recognized professional license, such as a license to practice as a cosmetologist, that counts as a CTE credential.

Workplace Readiness Skills (WRS) assessment. WRS is an assessment option that VDOE helped develop to align with the statewide WRS framework. The assessment covers three domains that Virginia employers and educators identified as essential for success in the workplace: personal qualities, people skills, and professional abilities (Crespin, 2019). This is a broad CTE credential that can apply to a wide range of occupations and industries.

Research questions

This study answered three research questions about Standard diploma graduates to describe CTE credential attainment by CTE credential type and number of CTE credentials earned; completion rates of CTE programs of study; and college enrollment rates:

1. How did attainment rates of CTE credentials and completion rates of CTE programs of study vary by graduation year (2011–17)?
2. How did attainment rates of CTE credentials and completion rates of CTE programs of study vary by graduate characteristics (demographics, federal program participation, and academic achievement) and graduation year (2011–17)?
3. How did the college enrollment rate vary by graduation year (2011–17), CTE credential attainment, and completion of CTE programs of study?

Information about the data sources, study sample, and methods for addressing these questions is in box 2 and appendix B. Analytic findings for Advanced Studies diploma graduates are presented for comparison in the findings section and appendix C.

Box 2. Data sources, sample, and methods

Data sources. The Virginia Department of Education (VDOE) provided the data for these analyses through the Virginia Longitudinal Data System. The student-level de-identified administrative records included demographic variables, course records, career and technical education (CTE) credentials, CTE program of study participation, federal program participation, and achievement measures. There were no missing values in any of the demographics or CTE data. VDOE regularly conducts automated validity checks throughout data collection, which requires school divisions to include demographic characteristics such as race/ethnicity and gender in the files they submit. This process eliminates missing data on demographic characteristics. Although local errors are possible when submitting data to VDOE, the superintendent signs off on the accuracy of these records, and these files are subject to audit at the local level.

The dataset also included separate and linkable college enrollment records from the State Council of Higher Education for Virginia (SCHEV) and the National Student Clearinghouse (NSC). Graduates were considered enrolled in college if they appeared in either the SCHEV or NSC data, and graduates who did not appear in the data were assumed not to be enrolled. There could, however, be missing college enrollment records (if a graduate enrolled in college but does not show up in either source), but it is not possible to distinguish missing data from graduates who did not enroll in college.

Sample. The study population consisted of all Virginia public high school graduates who received either the Standard or the Advanced Studies diploma between 2011 and 2017. During this period, there were 246,819 Standard diploma graduates and 330,006 Advanced Studies diploma graduates. Although the CTE credential requirement applied only to Standard diploma graduates who graduated on time in 2017, similar statistics for Advanced Studies diploma graduates are included for portions

of the research questions to provide a point of reference. Additional results for Advanced Studies diploma graduates are in appendix C. The study includes graduates from years before 2017 to show how the attainment rate of CTE credentials changed over time. Due to data availability, 2011 graduates are the first class of graduates included in the study.

Methodology. The study used descriptive statistics to answer the research questions. (See appendix B for a more detailed description of the methodology.) Because this study is descriptive, any changes observed could be due to factors other than the new Standard diploma requirement. For example, the increase in CTE credential attainment could have been related to changes in the labor market; a shift in understanding of college readiness among graduates or school staff; or the additional, new graduation requirement of the Economics and Personal Finance course, which is tied to the W!se Financial Literacy Certification. Similarly, factors other than CTE credential attainment could have had an impact on college enrollment, such as the unemployment rate or the cost of tuition. Additionally, changes in college enrollment could be related to changes in program offerings in the Virginia Community College System (VCCS). In 2016, VCCS began enrolling students in noncredit credential programs as part of a Workforce Credential Grant program. This program enrolled 4,961 students in the 2016/17 school year and 3,670 students in the 2017/18 school year (State Council of Higher Education for Virginia, 2018, 2019). The average age of enrolled students was 35 in both years. Currently available data cannot determine how many of the program participants were Virginia high school graduates. Finally, there were changes in the characteristics of the population of Standard diploma graduates during the study's time period (see table C1 in appendix C).

For research question 1, the study team calculated the attainment rate of CTE credentials as the percentages of Standard diploma graduates who earned any type of CTE credential, earned each type of CTE credential, earned multiple CTE credentials, and completed a CTE program of study. The team calculated each of these percentages by graduation year.

For research question 2, the study team calculated the percentage of Standard diploma graduates who earned any type of CTE credential by graduate characteristics and graduation year. The team calculated these percentages across variables that capture demographics, federal program participation, and academic achievement (see appendix B for a list of variables).

For research question 3, the study team calculated the college enrollment rate as the percentage of Standard diploma graduates who enrolled in college at some point during the first year after graduation. The team calculated college enrollment rates by graduation year, for CTE credential earners and non-earners; by the number of CTE credentials earned; by the type of CTE credential earned; and by whether the graduate completed a CTE program of study.

The findings focus on differences of more than 2 percentage points between groups and across time.

Findings

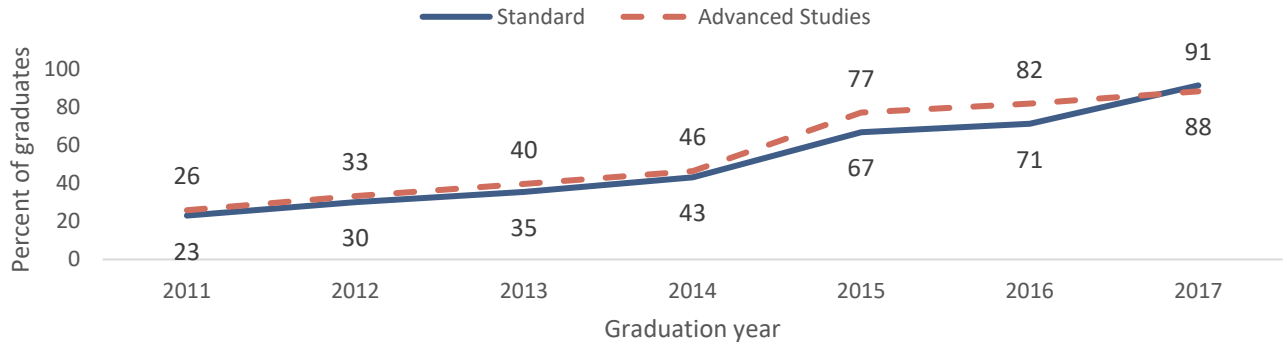
This section presents the main findings from the study. Supporting analyses are in appendix C.

The percentage of Standard and Advanced Studies diploma graduates who earned at least one career and technical education credential increased annually from 2011 to 2017

Although the CTE credential requirement applied only to Standard diploma graduates, a similar increase occurred among Advanced Studies diploma graduates. The percentage of graduates earning at least one CTE credential increased from 23 percent in 2011 to 91 percent in 2017 for Standard diploma graduates, and from 26 percent in 2011 to 88 percent in 2017 for Advanced Studies diploma graduates (figure 1).

The largest increase in the attainment rate of CTE credentials occurred before the new requirement went into effect (between 2014 and 2015). This earlier increase in the credential attainment rate could have been from schools and districts preparing for the new CTE credential requirement or from other legislation passed during this period (see figure A1 in appendix A). In particular, the 2015 graduating class was the first class required to pass an Economics and Personal Finance course to earn the Standard or Advanced Studies diploma. Many local school divisions use the W!se Financial Literacy Certification (W!se) as part of the course.

Figure 1. Percentage of Standard and Advanced Studies diploma graduates who earned a career and technical education credential increased annually from 2011 to 2017

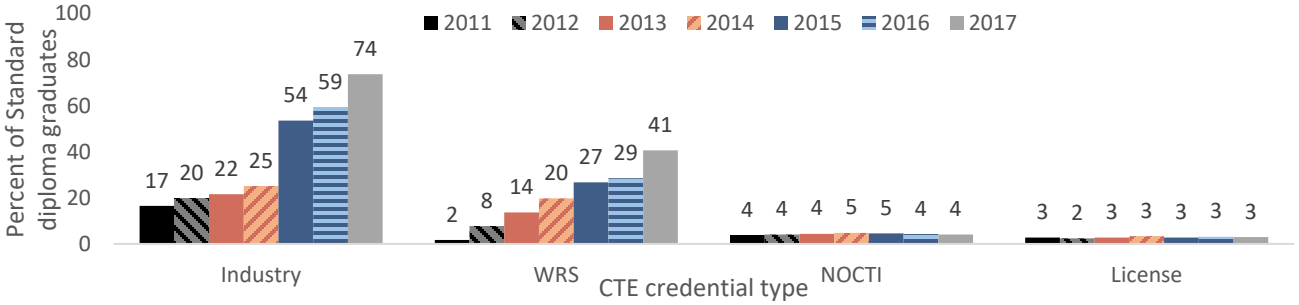


Note: The figure includes the attainment rate of career and technical education (CTE) credentials for graduates earning either the Standard or the Advanced Studies diploma. In Virginia, students can earn a CTE credential by passing a qualifying assessment, which certifies they have mastered specific CTE content. Although the CTE credential requirement first applied to 2017 Standard diploma graduates, there are a few possible reasons the data may show they did not earn a credential. Some graduates may have started high school before the requirement went into effect but did not graduate until 2017, so they were not subject to the requirement. Graduates may also have had an exemption determined in their Individualized Education Program (for graduates who received special education services), or they may have transferred into Virginia public schools during grade 12 and met prescribed conditions, which may allow the use of the Student Competency Record to meet the requirement (a record for keeping track of progress when traditional grades do not provide adequate documentation of achievement in competency-based education; Virginia Department of Education, 2016).
Source: Authors' calculations using data from the Virginia Longitudinal Data System.

The increase in the attainment rate of career and technical education credentials among Standard diploma graduates was largely driven by an increase in the percentage of graduates earning an industry credential or the Workplace Readiness Skills credential

The percentage of Standard diploma graduates who earned an industry credential increased from 17 percent in 2011 to 74 percent in 2017, and the percentage earning the Workplace Readiness Skills (WRS) credential increased from 2 percent to 41 percent over the same period. The percentage of Standard diploma graduates who earned a NOCTI credential or a professional license remained relatively stable (figure 2).[2]

Figure 2. Percentage of Standard diploma graduates who earned an industry credential or the Workplace Readiness Skills credential increased annually from 2011 to 2017, but the percentage who earned a National Occupational Competency Testing Institute credential or a professional license showed little to no change

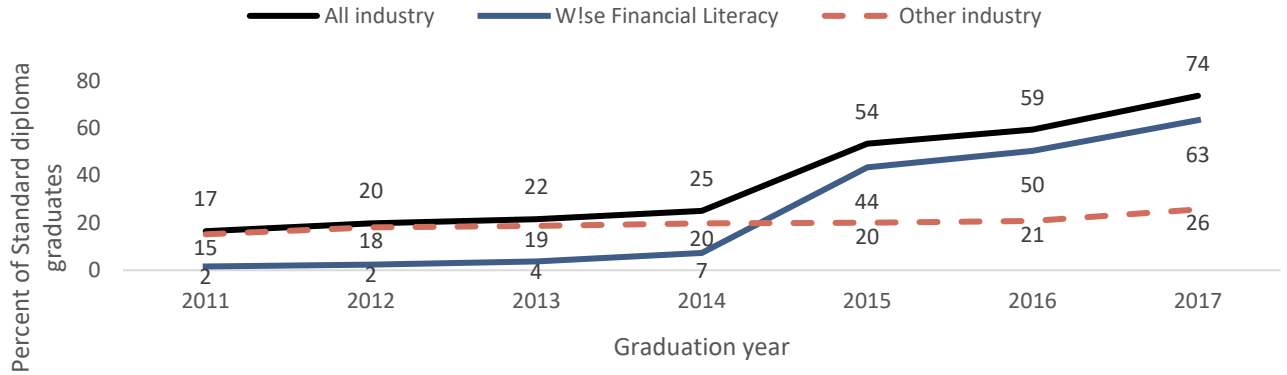


CTE is career and technical education. NOCTI is the National Occupational Competency Testing Institute. WRS is Workplace Readiness Skills.
Note: Percentages can total to more than 100 percent each year because graduates can earn multiple CTE credentials. The Virginia Department of Education's definition of industry credentials includes broad CTE credentials that apply to a wide range of occupations and industries and narrowly aligned credentials that support preparation for a specific occupation or industry. The range in the number of graduates earning each type of credential from 2011 to 2017 was 6,010–26,239 for industry credentials, 637–14,468 for WRS credentials, 1,438–1,468 for NOCTI credentials, and 1,018–1,075 for professional licenses. See table C2 in appendix C for the exact number of graduates earning each type from 2011 to 2017.
Source: Authors' calculations using data from the Virginia Longitudinal Data System.

[2] Graduates earning the Advanced Studies diploma had similar credential-earning patterns (see figure C1 in appendix C).

In Virginia, the industry credential category includes broad CTE credentials that apply to a wide range of occupations and industries, including broad CTE credentials such as W!se and the National Career Readiness Certificate, in addition to CTE credentials that are narrowly aligned to a specific occupation or industry. Industry credentials were the most common type of credential across this period, and, as noted above, the percentage of graduates earning any industry credential increased from 17 percent in 2011 to 74 percent in 2017. Within industry credentials, however, W!se was the main source of the increase from 2014 to 2017 and the most frequently earned credential from 2015 to 2017. The percentage of Standard diploma graduates earning this credential increased from 7 percent in 2014 to 63 percent in 2017, while the percentage of Standard diploma graduates earning some other industry credential increased from 20 percent to 26 percent during this period (figure 3). From 2011 to 2017, the combined increases in graduates earning the W!se and WRS credentials were the primary drivers of the total number and percentage of graduates earning CTE credentials (Harris et al., 2021).

Figure 3. The increase in the percentage of Standard diploma graduates who earned an industry credential was mostly driven by an increase in the percentage earning the W!se Financial Literacy Certification as opposed to other industry credentials



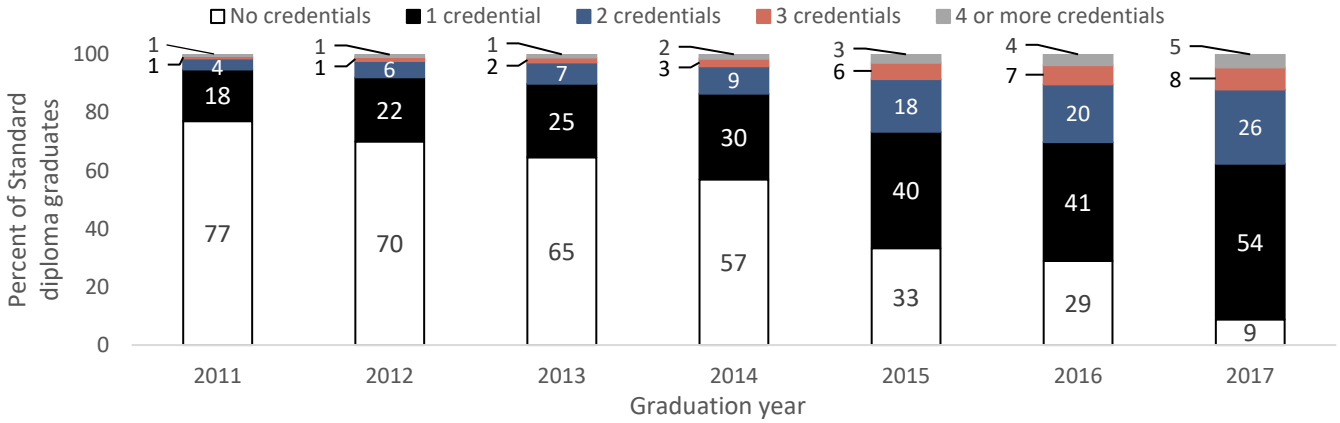
Note: Percentages can total to more than 100 percent each year because graduates can earn multiple credentials. The Virginia Department of Education's definition of industry credentials includes broad CTE credentials that apply to a wide range of occupations and industries and narrowly aligned credentials that support preparation for a specific occupation or industry.
Source: Authors' calculations using data from the Virginia Longitudinal Data System.

WRS is an assessment option that VDOE helped develop with a consortium of states to align with the statewide WRS framework, which defines a set of "personal qualities, people skills, and professional abilities Virginia employers and educators identified as essential for success in the workplace" (Crespin, 2019). The Virginia Board of Education adopted the WRS credential for statewide use in 2011 (Career and Technical Education Consortium of States, 2011), and the percentage of graduates earning this credential has increased every year since its adoption.

The percentage of Standard diploma graduates who earned multiple career and technical education credentials increased from 2011 to 2017

In addition to an increase in the percentage of graduates earning at least one CTE credential, the percentage earning multiple CTE credentials increased. In 2011, 6 percent of graduates earned more than one CTE credential, and in 2017 this percentage increased to 39 percent (figure 4). Most of this increase came from the percentage of graduates who earned two CTE credentials, which increased from 4 percent to 26 percent over this period.

Figure 4. Percentage of Standard diploma graduates who earned one or more career and technical education credentials increased annually from 2011 to 2017

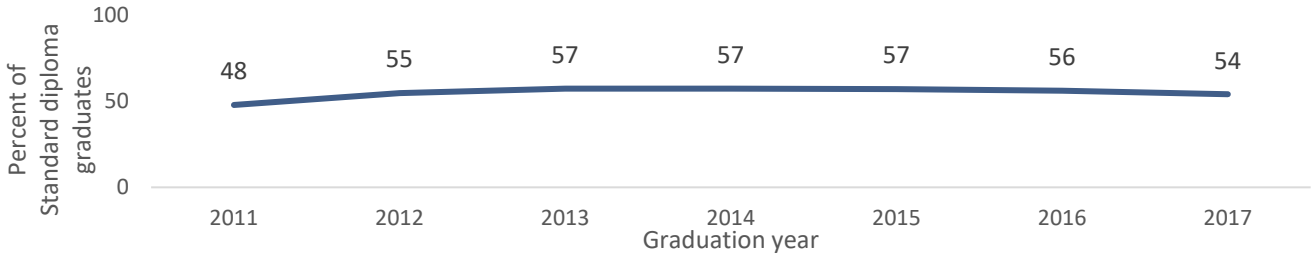


Note: The number of Standard diploma graduates was 36,458 in 2011, 35,706 in 2012, 35,238 in 2013, 34,384 in 2014, 33,757 in 2015, 35,678 in 2016, and 35,604 in 2017. See table C3 in appendix C for the number of graduates earning each number of credentials from 2011 to 2017.
Source: Authors' calculations using data from the Virginia Longitudinal Data System.

Although the attainment rate of career and technical education credentials for Standard diploma graduates consistently increased from 2011 to 2017, the percentage completing a career and technical education program of study was relatively stable during this period

From 2011 to 2013, the percentage of Standard diploma graduates completing a CTE program of study increased from 48 percent to 57 percent (figure 5). The largest increase (7 percentage points) occurred between 2011 and 2012. The percentage remained stable until 2015, when it began to decrease.

Figure 5. Percentage of Standard diploma graduates who completed a career and technical education program of study increased from 2011 to 2013 but decreased in 2016 and 2017



Note: Graduates were considered to have completed a career and technical education (CTE) program of study if they finished a CTE sequence of courses and were marked as "CTE finishers" in the Virginia Longitudinal Data System. The number of Standard diploma graduates was 36,458 in 2011, 35,706 in 2012, 35,238 in 2013, 34,384 in 2014, 33,757 in 2015, 35,678 in 2016, and 35,604 in 2017.
Source: Authors' calculations using data from the Virginia Longitudinal Data System.

From 2011 to 2017, the attainment rate of career and technical education credentials increased for all groups of Standard diploma graduates

The percentage of Standard diploma graduates who earned at least one CTE credential increased for all groups, including demographic, federal program participation, and academic achievement groups analyzed during this period (table 1).[3] The largest increases were among Black and Hispanic graduates (71 percentage points for both groups), graduates who were not proficient in writing (71 percentage points), and graduates designated as gifted (70 percentage points). The smallest increases were among White graduates, English learner graduates, and graduates who received special education services (66 percentage points for each group).

[3] See tables C4–C6 in appendix C for similar analyses by credential type, number of credentials, and completion status for CTE programs of study.

The difference in the attainment rate of career and technical education credentials between groups of Standard diploma graduates decreased for some groups and increased for others

Because the attainment rate of CTE credentials for Standard diploma graduates grew differently for various groups, the difference between some groups decreased between 2011 and 2017 (see table 1 in this report and table C7 in appendix C).[4] The differences in the attainment rate of CTE credentials between Black and White graduates and between Hispanic and White graduates decreased during this period. Similarly, the gap between the attainment rates of CTE credentials for graduates who were not proficient in Algebra II at any point during high school and those who were proficient in Algebra II narrowed from 2011 to 2017.

Table 1. Percentage of Standard diploma graduates who earned a career and technical education credential, by characteristic, 2011–17

Characteristic	2011	2012	2013	2014	2015	2016	2017	Increase from 2011 to 2017
Gender								
Female	23	29	34	43	65	70	91	68
Male	23	31	36	43	68	72	91	68
Race/ethnicity								
Asian	21	25	28	36	67	65	88	67
Black	19	25	31	38	60	64	90	71
Hispanic	17	21	24	33	62	66	88	71
White	28	35	42	49	72	78	94	66
Federal program participation								
English learner	17	20	23	25	52	54	83	66
Non–English learner	24	31	37	45	68	73	92	69
Economically disadvantaged	21	28	33	41	63	67	90	69
Non–economically disadvantaged	25	32	38	46	72	77	93	68
Received special education services	20	25	28	35	58	63	86	66
Did not receive special education services	24	31	37	45	69	73	93	69
Academic achievement measures								
Gifted	24	32	36	47	77	80	94	70
Non-gifted	23	30	35	43	66	70	91	68
Proficient in Algebra II	28	37	43	50	76	80	94	67
Not proficient in Algebra II	20	26	33	41	63	67	90	69
Proficient in writing	24	31	36	45	69	73	92	69
Not proficient in writing	11	12	13	23	45	51	82	71
Total number of graduates	36,458	35,706	35,232	34,384	33,757	35,678	35,604	

Note: Federal program participation refers to graduates who participated in or were eligible for federal programs for English learner students, students in economically disadvantaged circumstances, or students who received special education services at any point during their enrollment in a Virginia high school. Although the career and technical education credential requirement first applied to 2017 Standard diploma graduates, there are a few possible reasons the data may show they did not earn a credential. Some graduates may have started high school before the requirement went into effect but did not graduate until 2017, so they were not subject to the requirement. Graduates may also have had an exemption determined in their Individualized Education Program (for graduates who received special education services), or they may have transferred into Virginia public schools during grade 12 and met prescribed conditions, which may allow the use of the Student Competency Record (a record for keeping track of progress when traditional grades do not provide adequate documentation of achievement in competency-based education; Virginia Department of Education, 2016). The number of graduates earning a Standard diploma increased between 2015 and 2016 because during this period Virginia updated accommodations for students who received special education services to help them earn the Standard diploma instead of the modified Standard diploma.

Source: Authors' calculations using data from the Virginia Longitudinal Data System.

At the same time, the difference between some groups increased during the study period (see table 1). For example, the attainment rate of CTE credentials for Standard diploma graduates increased more quickly for non–

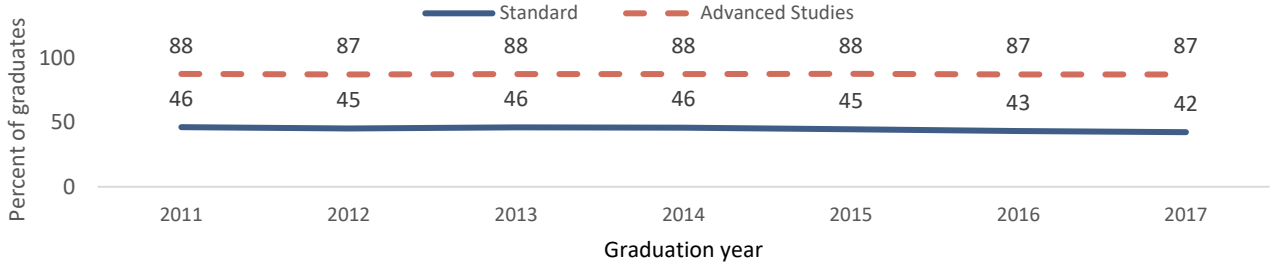
[4] Due to rounding, some of the differences across groups in table 1 do not appear to match table C6 in appendix C. The narrative in the body of the report refers to the numbers presented in table 1.

English learner graduates, compared to the rate for English learner graduates. The gap between these two groups began at 7 percentage points in 2011, reached a high of 20 percentage points in 2014, and ended at 9 percentage points in 2017. Similarly, the difference between graduates who received special education services and those who did not increased from 4 percentage points to 7 percentage points.

Although the attainment rate of career and technical education credentials for Standard diploma graduates increased from 2011 to 2017, their college enrollment rate decreased

From 2011 to 2017, the college enrollment rate for Standard diploma graduates decreased from 46 percent to 42 percent (figure 6), while the attainment rate of CTE credentials rose during this same period (see figure 1).[5] The college enrollment rate of Advanced Studies diploma graduates was stable during this period (see figure 6). Therefore, the difference in college enrollment rates between Standard and Advanced Studies diploma graduates increased during the study period. In addition, the decrease in the college enrollment rate of Standard diploma graduates during this period was larger than the decrease in the national college enrollment rate, which decreased by 1.5 percentage points during this period (NCES, 2020b).[6] The decrease in college enrollment rates of Standard diploma graduates is a function of a smaller percentage of graduates enrolling in two-year colleges, as there was no change in the enrollment rate in four-year colleges (see figure C4 in appendix C).

Figure 6. Percentage of Standard diploma graduates who enrolled in college within 12 months of graduating decreased from 2011 to 2017 but was more stable for Advanced Studies diploma graduates



Note: College enrollment includes two- and four-year institutions, public and private institutions, and in-state and out-of-state institutions. The number of Standard diploma graduates was 36,458 in 2011, 35,706 in 2012, 35,238 in 2013, 34,384 in 2014, 33,757 in 2015, 35,678 in 2016, and 35,604 in 2017. The number of Advanced Studies diploma graduates was 45,594 in 2011, 46,439 in 2012, 46,980 in 2013, 46,954 in 2014, 46,915 in 2015, 48,381 in 2016, and 48,743 in 2017.
Source: Authors' calculations using data from the Virginia Longitudinal Data System.

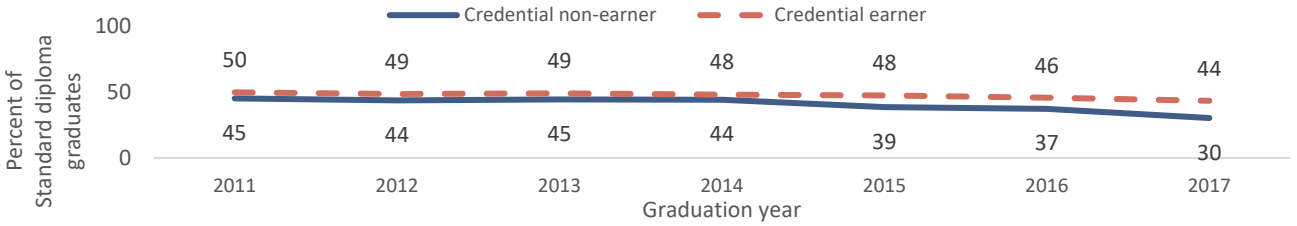
During the study period, a change in diploma offerings in Virginia resulted in a larger number of graduates who received special education services earning the Standard diploma in 2017. However, college enrollment rates for Standard and Advanced Studies diploma graduates remained unchanged after removing graduates who received special education services from the analytic sample (see table C10 in appendix C).

For Standard diploma graduates, the college enrollment rate decreased for both earners and non-earners of career and technical education credentials, with non-earners experiencing a steeper decrease

The college enrollment rate decreased more gradually (from 50 percent to 44 percent) for Standard diploma graduates who earned any CTE credential than for those who did not earn a CTE credential (from 45 percent to 30 percent; figure 7). The largest decrease in the college enrollment rate occurred in later years, for both CTE credential earners and non-earners.[7]

[5] See tables C8 and C9 in appendix C for college enrollment rates of Standard diploma graduates and Advanced Studies diploma graduates across graduate characteristics.
[6] NCES (2020b) calculated the percentage of high school graduates who enrolled in college for the fall semester after high school graduation, as opposed to within 12 months of high school graduation.
[7] The college enrollment rate for Advanced Studies diploma graduates was relatively stable for CTE credential earners and non-earners (see figure C5 in appendix C).

Figure 7. Percentage of Standard diploma graduates who enrolled in college within 12 months of graduating decreased from 2011 to 2017 for both career and technical education credential earners and non-earners



Note: College enrollment includes two- and four-year institutions, public and private institutions, and in-state and out-of-state institutions. Although the career and technical education credential requirement first applied to 2017 Standard diploma graduates, there are a few possible reasons the data may show they did not earn a credential. Some graduates may have started high school before the requirement went into effect but did not graduate until 2017, so they were not subject to the requirement. Graduates may also have had an exemption determined in their Individualized Education Program (for graduates who received special education services), or they may have transferred into Virginia public schools during grade 12 and met prescribed conditions, which may allow the use of the Student Competency Record (a record for keeping track of progress when traditional grades do not provide adequate documentation of achievement in competency-based education; Virginia Department of Education, 2016). The number of earners of Standard diploma graduate credentials was 8,403 in 2011, 10,700 in 2012, 12,474 in 2013, 14,777 in 2014, 22,517 in 2015, 25,357 in 2016, and 32,4884 in 2017. The number of non-earners of Standard diploma graduate credentials was 28,055 in 2011, 25,006 in 2012, 22,758 in 2013, 19,607 in 2014, 11,240 in 2015, 10,321 in 2016, and 3,116 in 2017.
Source: Authors' calculations using data from the Virginia Longitudinal Data System.

The larger drop in college enrollment for graduates who did not earn a CTE credential coincided with a change in the size and characteristics of graduates in this group. First, the percentage of Standard diploma graduates who earned a CTE credential increased from 23 percent in 2011 to 91 percent in 2017 (see figure 1). This means that the percentage of non-earners decreased from 77 percent to only 9 percent of these graduates. Along with this decrease came a change in the demographic characteristics of these graduates. Compared to the group of non-earners in 2011, the small group of non-earners in 2017 had higher percentages of English learner graduates (20 percent versus 10 percent), graduates in economically disadvantaged circumstances (70 percent versus 52 percent), and graduates who received special education services (37 percent versus 20 percent). At the same time, compared to non-earners in 2011, non-earners in 2017 were less likely to be proficient in writing (81 percent versus 95 percent) and Algebra II (21 percent versus 36 percent; table 2).

Table 2. Characteristics of credential earners and non-earners for Standard diploma graduates, 2011 and 2017

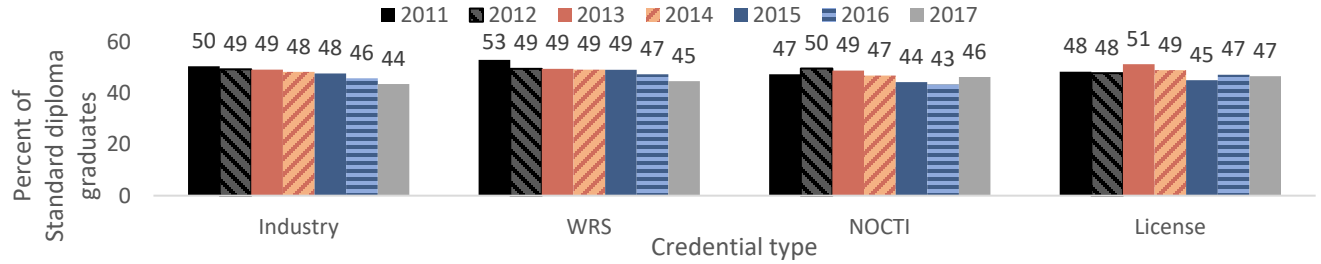
Characteristic	CTE credential earners 2011	CTE credential earners 2017	Change from 2011 to 2017	CTE credential non-earners 2011	CTE credential non-earners 2017	Change from 2011 to 2017
Gender						
Percent female	44	44	0	45	44	-1
Race/ethnicity						
Percent Asian	3	3	0	4	5	1
Percent Black	27	30	3	35	37	2
Percent Hispanic	7	14	7	11	20	9
Percent White	60	48	-12	47	35	-12
Federal program participation						
Percent English learner	7	9	2	10	20	10
Percent economically disadvantaged	47	60	13	52	70	18
Percent received special education services	16	21	5	20	37	17
Academic achievement measures						
Percent gifted	11	6	-5	10	4	-6
Percent proficient in Algebra II	46	35	-11	36	21	-15
Percent proficient in writing	98	92	-6	95	81	-14
Total number of graduates	8,403	32,488	24,085	28,055	3,116	-24,939

CTE is career and technical education.
Note: For binary characteristics such as gender, the table shows the results for only one of the two groups because the values for the two groups total to 100 percent. Federal program participation refers to graduates who participated in or were eligible for federal programs for English learner students, students who were in economically disadvantaged circumstances, or students who received special education services at any point during their enrollment in a Virginia high school. Although the CTE credential requirement first applied to 2017 Standard diploma graduates, there are a few possible reasons the data may show they did not earn a credential. Some graduates may have started high school before the requirement went into effect but did not graduate until 2017, so they were not subject to the requirement. Graduates may also have had an exemption determined in their Individualized Education Program (for graduates who received special education services), or they may have transferred into Virginia public schools during grade 12 and met prescribed conditions, which may allow the use of the Student Competency Record to meet the requirement (a record for keeping track of progress when traditional grades do not provide adequate documentation of achievement in competency-based education; Virginia Department of Education, 2016). Percentages for 2011 to 2017 are in table C11 in appendix C.
Source: Authors' calculations using data from the Virginia Longitudinal Data System.

College enrollment rates for Standard diploma graduates decreased the most for graduates who earned the Workplace Readiness Skills credential or an industry credential

Among Standard diploma graduates, the college enrollment rate decreased from 2011 to 2017 by 8 percentage points for those who earned the WRS credential and by 6 percentage points for those who earned an industry credential, including W!se (figure 8). These were the two types of credentials that Standard diploma graduates began earning more frequently between 2011 and 2017 (see figure 2). On the other hand, the college enrollment rate for graduates who earned a professional license or NOCTI credential were more stable during this period. Thus, the decline in the college enrollment rate between 2011 and 2017 is mostly accounted for by graduates who earned an industry credential or the WRS credential.

Figure 8. Percentage of Standard diploma graduates who enrolled in college within the first 12 months of graduation decreased from 2011 to 2017 for graduates earning an industry or Workplace Readiness Skills credential, while the enrollment rate was more stable for graduates who earned a National Occupational Competency Testing Institute credential or professional license

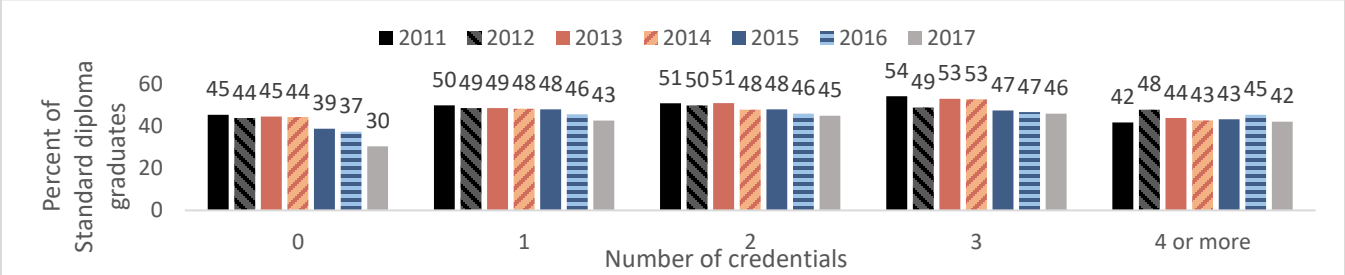


NOCTI is the National Occupational Competency Testing Institute. WRS is Workplace Readiness Skills.
Note: College enrollment includes two- and four-year institutions, public and private institutions, and in-state and out-of-state institutions. The range in the number of graduates earning each type of credential from 2011 to 2017 was 6,010–26,239 for industry, 637–14,468 for WRS, 1,438–1,468 for NOCTI, and 1,018–1,075 for professional license.
Source: Authors' calculations using data from the Virginia Longitudinal Data System. See table C3 in appendix C for the exact number of graduates earning each type from 2011 to 2017.

College enrollment rates for Standard diploma graduates were lower among graduates who earned four or more career and technical education credentials

Standard diploma graduates who earned zero or four or more CTE credentials had lower college enrollment rates than graduates who earned one, two, or three CTE credentials in most years. The number of Standard diploma graduates earning four or more CTE credentials was relatively small, however (242 in 2011 and 1,614 in 2017). The college enrollment rates among Standard diploma graduates who earned one, two, or three CTE credentials were lower in 2017 than in 2011 (figure 9).

Figure 9. Percentage of Standard diploma graduates who enrolled in college within the first 12 months of graduation was lowest for career and technical education credential earners who earned four or more credentials

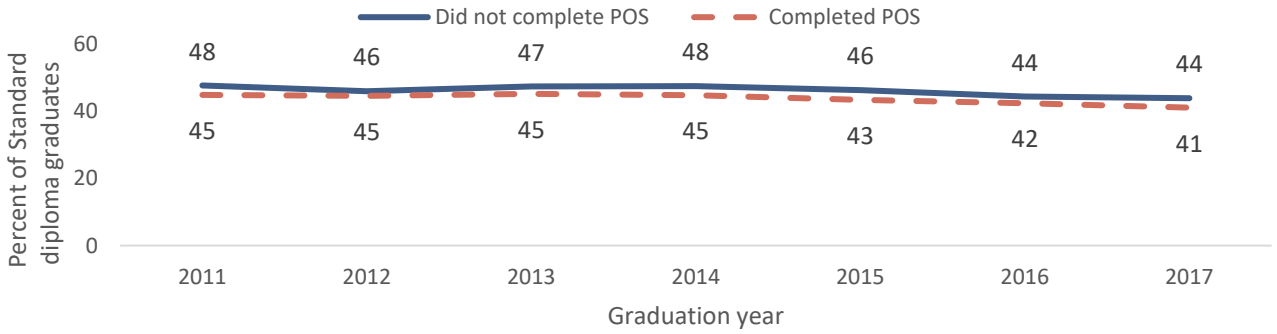


Note: College enrollment includes two- and four-year institutions, public and private institutions, and in-state and out-of-state institutions. The range in the number of graduates earning each number of credentials from 2011 to 2017 was 28,055–3,116 for zero credentials, 6,482–19,075 for one, 1,374–9,085 for two, 305–2,714 for three, and 242–1,614 for four or more.
Source: Authors' calculations using data from the Virginia Longitudinal Data System. See table C3 in appendix C for the exact number of graduates earning each number of CTE credentials from 2011 to 2017.

College enrollment rates for Standard diploma graduates were higher among graduates who did not complete a career and technical education program of study

The college enrollment rates of Standard diploma graduates who completed a CTE program of study were typically 2 to 3 percentage points lower than they were for Standard diploma graduates who did not complete a CTE program of study (figure 10). The college enrollment rate decreased by 4 percentage points for both groups between 2011 and 2017.

Figure 10. Percentage of Standard diploma graduates who enrolled in college within the first 12 months of graduation was lower for graduates who completed a career and technical education program of study



POS is program of study.

Note: Graduates completed a career and technical education (CTE) program of study if they finished a CTE sequence of courses and were marked as a "CTE finisher" in the Virginia Longitudinal Data System. College enrollment includes two- and four-year institutions, public and private institutions, and in-state and out-of-state institutions. The number of Standard diploma graduates who completed a program of study was 17,469 in 2011, 19,559 in 2012, 20,211 in 2013, 19,731 in 2014, 19,265 in 2015, 20,048 in 2016, and 19,260 in 2017. The number of Standard diploma graduates who did not complete a program of study was 18,989 in 2011, 16,147 in 2012, 15,021 in 2013, 14,653 in 2014, 14,492 in 2015, 15,630 in 2016, and 16,344 in 2017.

Source: Authors' calculations using data from the Virginia Longitudinal Data System.

Implications

This study was one of the first to describe high school graduates' outcomes in high school and within one year of high school graduation after a state-implemented policy requiring a significant percentage of graduates to earn a CTE credential. VDOE expected to see increases in the percentage of Standard diploma graduates earning one or more CTE credentials that are narrowly aligned to their selected career concentration, completing a CTE program of study, and enrolling in college, as mechanisms to strengthen career outcomes. Results showed that Virginia's first class of Standard diploma graduates who were required to earn a CTE credential did not demonstrate some of the changes in outcomes expected within one year of graduation. There could have been other changes during the study's time period that influenced students' chances of achieving these outcomes, however. For example, during this time, there was an increase in the percentage of Standard diploma graduates who received special education services or who were in economically disadvantaged circumstances (see table C1 in appendix C). Additionally, the Virginia Community College System began offering noncredit workforce credentials in July 2016. Students in these programs were not included in the college enrollment data used in this study, which may have impacted the results.

While the outcomes examined in this study fell short of VDOE's expectations, there were other intended outcomes of the policy that this study did not examine. VDOE may consider examining the outcomes of this policy more deeply to inform potential improvements.

To fully understand whether the career and technical education credential requirement is benefitting Standard diploma graduates, Virginia policymakers and researchers could examine workforce outcomes

The study results signal that after high school, most Standard diploma graduates who earned CTE credentials were doing something other than enrolling in credit-bearing college courses (see figure 7). Further, the college

enrollment rate for graduates earning an industry credential dropped by 6 percentage points from 2011 to 2017 (see figure 8). To better understand what these students are doing after high school, linking secondary data to workforce data would be beneficial.

Further examination could determine whether Standard diploma graduates who earned narrowly aligned CTE credentials, earned multiple credentials, or completed a CTE program of study had higher employment rates and more stable employment and wages compared to Standard diploma graduates who earned broad CTE credentials, earned fewer CTE credentials, or did not complete a CTE program of study. The current study was not able to address these outcomes because the requisite data were not available through the Virginia Longitudinal Data System, which cannot link high school records to employment records except in unique cases (for example, when graduates subsequently enroll in a Virginia institution of higher education; Jonas & Garland, 2014; Yamaguchi et al., 2014). VDOE could investigate whether it can access relevant data and reports for high school graduates in partnership with a federal statistical research data center and, if not, consider primary data collection on a randomly selected and generalizable sample of graduates to examine these outcomes.

It could be important to examine workforce outcomes for Standard diploma graduates who did not earn a CTE credential. Although representing a relatively small group, these graduates had the lowest college enrollment rates. This group also included higher percentages of graduates who were English learner students, received special education services, or had lower achievement in writing and Algebra II (see table 2). Further examination could determine whether these graduates received additional supports for career training and success in the labor market, such as high-quality apprenticeships or support through the Workforce Innovation and Opportunity Act.

Virginia could examine the components of career and technical education programs of study to identify those with the greatest impact on graduates' outcomes

Previous research suggests that completing a CTE program of study is associated with an increased likelihood that students will graduate from high school and be employed or enrolled in a two-year college within one year, relative to similar students who do not complete a CTE program of study (Dougherty, 2016). This study found no increase in college enrollment rates for students completing a CTE program of study. To better understand this outcome, VDOE might conduct additional research that accounts for other factors that might be related to the outcomes, such as student background characteristics, or examine enrollment in the noncredit workforce credential programs that the Virginia Community College System started offering in July 2016. Similarly, VDOE might compare the specific components of Virginia's CTE programs to programs in other states that demonstrated more favorable results (for example, Dougherty, 2016) to try to identify components that make Virginia's results differ. In addition, researchers could help Virginia's state and local leaders identify evidence-based and promising programs, support local implementation, and test the impact of those programs on the career and educational outcomes of Standard diploma graduates and the return on investment.

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REL 2022–132

December 2021

This report was prepared for the Institute of Education Sciences (IES) under Contract ED-IES-17-C-0004 by Regional Educational Laboratory Appalachia administered by SRI International. The content of the publication does not necessarily reflect the views or policies of IES or the U.S. Department of Education nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government.

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