Appendix A. About the study

This section provides additional information about the study. It begins with a description of the relevance of career and technical education (CTE) credentials and then describes the Virginia context, including information about the state’s policies relevant to this study.

Relevance of career and technical education credentials

In recent years, states have rapidly increased their attention to policies on earning CTE credentials in high school (Education Strategy Group, Advance CTE, & Council of Chief State School Officers, 2018). From 2013 to 2015, 36 states adopted policies on such credentials (Association for Career and Technical Education & National Association of State Directors of Career Technical Education Consortium, 2014, 2015, 2016). By 2013, 42 states had K–12 pathways leading to CTE credentials (National Center for Education Statistics, 2016). In 2016, 11 states included attainment of industry-specific credentials in their school accountability systems as indicators of career readiness (Advance CTE, 2016).

States offering CTE credentials have reason to hypothesize that credentials will boost college enrollment and completion as well as improve workforce outcomes. Assessments that lead to industry credentials have the potential to signal to employers that individuals are prepared for entry-level employment (Bartlett, 2004). Because CTE credentialing assessments require students to demonstrate industry-specific levels of occupational skills and competencies, many states also see the potential for such assessments to add rigor to high school CTE programs and improve high school graduates’ readiness for college and additional training.

The Virginia context

Previous research shows that high school graduates who earn Virginia’s Standard diploma are less likely to enroll in, persist in, or complete college—including one-, two-, and four-year programs—compared with graduates who earn a college preparatory diploma (the Advanced Studies diploma). Research has shown this to be true for Standard diploma graduates who completed CTE programs of study (Jonas et al., 2014; Yamaguchi et al., 2014) and for Standard diploma graduates overall (Garland et al., 2011; Holian & Mokher, 2011; Jonas & Garland, 2014). For example, researchers estimated that, within four years of high school graduation, fewer than 8 percent of
Standard diploma graduates in the class of 2008 had earned any type of college credential, compared with 46 percent of Advanced Studies diploma graduates (Jonas & Garland, 2014).

In an economy in which most jobs require some type of college or training (Carnevale et al., 2013), the relatively low college enrollment and completion rates of graduates with the Standard diploma raise concerns about the value of this diploma. In response, Virginia joined states across the country looking to strengthen the college and career readiness of their high school graduates by adding CTE credentialing assessments to the requirements for earning the Standard diploma.

For several years, Virginia’s CTE education programs have offered students credentialing assessments and opportunities to earn state licensure in some programs. The state has conducted a long-term effort to increase the availability of these assessments in high school (figure A1). For example, legislation enacted in 2009 required the Virginia Board of Education to identify industry credentialing assessments that could substitute for assessments that were already required for graduation (Va. Code Ann., 1988/2009). Starting in the 2009/10 school year, the Virginia Department of Education (VDOE) began reporting the number of credentialing assessments that students took and passed in its annual Career and Technical Education Statewide Annual Performance Report, Perkins IV Performance Standards (VDOE, Office of Career and Technical Education Services, 2011). In 2011, the legislature required the Virginia Board of Education to develop a plan for increasing the number of graduates receiving industry credentials and state licenses as part of CTE programs. That same year, Virginia passed a law requiring students who entered grade 9 for the first time in 2013 or later to earn a CTE credential by passing a Virginia Board of Education–approved assessment to earn the Standard diploma (Va. Code Ann., 1999/2011).8

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Figure A1. Timeline of major Virginia legislative, state board, and department of education activities related to career and technical education credentials, 2009–17

- **Virginia legislature requires the Virginia Board of Education to:** identify industry credentialing assessments students can use toward high school graduation requirements (Code of Virginia, 2009).
- **Legislature requires the Virginia Board of Education to:** develop a plan to increase the number of graduates receiving industry credentials and state licensure as part of CTE programs (Code of Virginia, 2011).
- **Legislature requires students who entered grade 9 for the first time in 2013 or later to:** earn a CTE credential by passing a Virginia Board of Education–approved assessment to graduate with the Standard diploma (Va. Admin. Code, 1997/2018).
- **Legislature requires all students starting grade 9 for the first time in 2013 and graduating in 2018/19 to either (1) complete an Advanced Placement, honors, or International Baccalaureate course; or (2) earn a CTE credential.** The new requirement applies to all diplomas (VDOE, n.d.).

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CTE is career and technical education. VDOE is the Virginia Department of Education.

Note: The 2016 legislation does not apply to the graduates included in this study.

Source: Authors’ compilation from the sources cited in the figure.

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8 The Standard diploma is one of two federally recognized diplomas in Virginia. The other is the Advanced Studies diploma. See box 1 (key terms) in the main report for additional information on these two diplomas.
The rationale for this policy was in part to raise the bar on CTE knowledge and skills learned in high school and, by so doing, to strengthen the preparation of graduates with a Standard diploma for college and careers. In addition to viewing the CTE credential requirement as a way to increase graduates’ attainment in workplace and technical skills (VDOE, Office of Career and Technical Education Services, 2016), the credentials can serve as a stepping-stone toward achieving more advanced certification that may require additional college education or training (VDOE, 2008). Adding the CTE credential as a graduation requirement to the Standard diploma was a substantial change in policy that affected the graduating class of 2017 and beyond, potentially requiring 40 percent of high school graduates (approximately 34,000 graduates annually) to earn a CTE credential (VDOE, n.d.).

Graduates can meet the CTE credential requirement by passing one of four types of Virginia Board of Education–approved assessments:

- Industry-specific credentials issued by a third party such as a business (for example, Cisco, Microsoft), trade association (for example, National Healthcareer Association), or industry group (for example, National Institute for Automotive Service Excellence). These parties provide an independent assessment of specific technical competencies and knowledge.
- State licensure examinations required for certain occupations (for example, Cosmetology Licensure Examination administered by the Virginia Board of Barbers and Cosmetology).
- National Occupational Competency Testing Institute assessments that measure the specific knowledge and skills needed for a particular occupation (for example, the Accounting-Basic or Accounting-Advanced assessment).
- The Virginia Workplace Readiness Skills assessment that measures general skills needed for employment.

References


Appendix B. Methods
This section describes the study methods in more detail.

Data sources
This study used several student-level data elements from the Virginia Longitudinal Data System (VLDS; table B1). The VLDS is a federated data system that permits authorized users to merge de-identified state administrative data from multiple Virginia state agencies, including data from the Virginia Department of Education (VDOE), the State Council of Higher Education for Virginia (SCHEV), and the National Student Clearinghouse (NSC).

Table B1. Variables in the analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Career and technical education (CTE) data</td>
<td>An indicator for whether a graduate completed a CTE program of study. For this study, a graduate completed a CTE program of study if they earned two or more standard credits toward a state-approved CTE program and were marked as a “CTE finisher” in the Virginia Longitudinal Data System (VLDS).</td>
</tr>
<tr>
<td>Result of exam</td>
<td>An indicator for whether a graduate passed the CTE credential exam. A graduate earned the credential if they passed the exam. Not all CTE exams have an associated course or require course completion.</td>
</tr>
<tr>
<td>CTE credential type</td>
<td>Categorical variable including the following: Industry, National Occupational Competency Testing Institute, state professional license, and Workplace Readiness Skills.</td>
</tr>
<tr>
<td>Graduate demographics</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Binary variable including male or female.</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td>Categorical variable including the following: White, Asian, Black, and Hispanic. Graduates in other racial/ethnic categories, including graduates who are of more than one race, are included in the analysis, but the results broken down by race/ethnicity are not presented for these groups because they make up less than 5 percent of the population. If a graduate had conflicting race records, the analysis used the most common race. Hispanic or Latino is defined as a person of Cuban, Mexican, Puerto Rican, South American, Central American, or other Spanish culture or origin, regardless of race. Black or African American is defined as a person having origins in any of the Black racial groups of Africa.</td>
</tr>
<tr>
<td>Federal program participation</td>
<td></td>
</tr>
<tr>
<td>English learner status</td>
<td>Binary variable indicating whether a graduate was identified as an English learner student at any point while enrolled in a Virginia high school.</td>
</tr>
<tr>
<td>Economically disadvantaged status</td>
<td>Binary variable indicating whether a graduate was identified in economically disadvantaged circumstances at any point in a Virginia high school. A student in economically disadvantaged circumstances is one “who (1) is eligible for free or reduced-price meals, (2) receives Temporary Assistance for Needy Families (TANF), (3) is eligible for Medicaid, or (4) [is] identified as either migrant or experiencing homelessness at any point during the school year” (VLDS, 2020).</td>
</tr>
<tr>
<td>Special education status</td>
<td>Binary variable indicating whether a graduate was identified as being eligible to receive special education services at any point in a Virginia high school.</td>
</tr>
<tr>
<td>Academic achievement data</td>
<td></td>
</tr>
<tr>
<td>Gifted</td>
<td>Binary variable indicating that a graduate was placed in the gifted program or was referred to and found eligible for the gifted program at any point while enrolled in a Virginia high school.</td>
</tr>
<tr>
<td>Algebra II proficiency</td>
<td>Categorical variable for a graduate’s proficiency level on the Algebra II state assessment that is taken when a student is enrolled in Algebra II. Virginia’s state assessments, called Standards of Learning assessments, have three proficiency levels. Scores of 0–399 are</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>classified as below proficient, scores of 400–499 are classified as proficient, and scores of 500–600 are classified as advanced proficient. Scores of 400–600 (proficient and advanced proficient) are considered passing scores (Virginia Department of Education, n.d.). The report uses two categories: proficient (a score of 400 or higher) and not proficient (a score of 399 or lower, including students who did not take the assessment).</td>
</tr>
<tr>
<td>Writing proficiency</td>
<td>Categorical variable for a graduate’s proficiency level on the grade 11 writing assessment. The proficiency levels are the same as those for Algebra II.</td>
</tr>
<tr>
<td>Graduation data</td>
<td></td>
</tr>
<tr>
<td>Diploma type</td>
<td>Binary variable indicating whether a graduate earned a Standard or Advanced Studies diploma. If a graduate had records for multiple diploma types, Advanced diploma records were selected over Standard diploma records, and Standard diploma records were selected over the remaining types of diplomas. Students who earned neither a Standard nor an Advanced Studies diploma were not included in the analysis.</td>
</tr>
<tr>
<td>Graduation year</td>
<td>Year in which a graduate earned a diploma. If a graduate had graduation records from multiple years, the analysis used grade 12 records over other grades.</td>
</tr>
<tr>
<td>District and school ID</td>
<td>ID for the responsible district and school that a graduate attended upon graduation. District ID was used to identify the region a graduate was in.</td>
</tr>
<tr>
<td>College enrollment data</td>
<td></td>
</tr>
<tr>
<td>Enrollment within first 12 months</td>
<td>Binary variable indicating whether a graduate enrolled in college within 12 months after high school graduation. College enrollment includes two- and four-year institutions, public and private institutions, and in-state and out-of-state institutions.</td>
</tr>
<tr>
<td>College type</td>
<td>Binary variable indicating whether a graduate was enrolled in a two- or four-year institution.</td>
</tr>
</tbody>
</table>


There were no missing values in any of the demographic, course record, or CTE data. VDOE regularly conducts automated validity checks throughout data collection, a process that minimizes or eliminates missing data on demographic characteristics. For example, the data verification process requires records to include information about race/ethnicity, gender, and other demographic variables. Further, all students who take state assessments have data included in the state data system. Therefore, if a record lacks assessment data, either the graduate did not take the test or there is a data error, but this does not necessarily mean that data are missing. For example, graduates who do not take the Algebra II assessment can still earn a Standard diploma. A record therefore can be complete even if there is no score on the Algebra II assessment.

VDOE collects, analyzes, and reports these data as part of state and federal accountability requirements, and the data are subject to audit. These reports include credentialing data, which Virginia includes in accountability reporting for CTE programs’ federal accountability. This combination of factors is typically associated with increased data quality (Jonas, 2015) and is likely to reduce error.

The dataset also included college enrollment records from SCHEV and the NSC that are linked to the K–12 data from VDOE. Graduates were considered to be enrolled 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.

The combination of NSC data and SCHEV data should include the vast majority of high school graduates who have enrolled in college, both in and out of state. The vast majority of Virginia high school graduates who attend college stay in state (Jonas, 2015), and SCHEV data capture these enrollments for public and private institutions. Previous analysis of NSC data suggested that the NSC data include 97.4 percent of all Virginia college-enrolled graduates.
who were enrolled in-state as of 2011 (Dynarski et al., 2015). Additionally, NSC data capture approximately 4 percent more graduates than SCHEV each year (Jonas, 2015), and most of the increase is from graduates enrolled in colleges and universities outside of Virginia.

Sample and selection criteria
The study population consisted of all Virginia public high school graduates who received either the Standard or Advanced Studies diploma between 2011 and 2017. Although the policy that added a CTE credential requirement to the Standard diploma first applied to students who graduated on time in 2017, the analyses included earlier years and other diploma types to capture overarching trends in CTE credentials. VDOE did not start collecting student-level CTE credential data until the 2007/08 school year, when it began collecting a snapshot of these data at the end of each year. Thus, the 2011 graduating class is the first cohort for which the CTE credential data are complete. The study runs through the 2017 graduating class, as those graduates were the first to complete high school with the new requirement in place and 2017 was the last year with complete data at the time of the analyses. Between 2011 and 2017, there were 246,819 Standard diploma graduates and 330,006 Advanced Studies diploma graduates.

Analysis plan
This study used a descriptive approach to address the research questions, as detailed in this section. Using straightforward numbers provides stakeholders with the status of the population in terms of demographic characteristics and high school outcomes and helps frame the results of the study in the context of the graduate population at each time point. Further, because the sample includes the universe of graduates in the target population during the period being studied, one can reasonably take a population perspective of these data rather than treat them as a sample.9

Research question 1
To answer research question 1, the study team calculated the percentage of high school graduates who earned any type of CTE credential, by diploma type and graduate cohort, as shown in the equation below.

\[ P_{1a_{dc}} = \frac{N_{CTE\, credential, dc}}{N_{dc}} \]  

(B1)

\( P_{1a_{dc}} \) is the percentage of graduates with diploma type \( d \) (\( d = \) Standard, Advanced Studies) from cohort \( c \) (\( c = 2011, ..., 2017 \)) who earned any type of CTE credential.

The study team also calculated the percentage of high school graduates who earned each type of credential, by diploma type and graduate cohort, as shown in the equation below.

\[ P_{1b_{idc}} = \frac{N_{Idc}}{N_{dc}} \]  

(B2)

\( P_{1b_{idc}} \) is the percentage of graduates with diploma type \( d \) (\( d = \) Standard or Advanced Studies, Standard only, Advanced Studies only) from graduate cohort \( c \) (\( c = 2011, ..., 2017 \)) who earned CTE credential type \( i \) (\( i = 1, ..., 4 \)).

Next, the study team calculated the percentage of high school graduates who earned multiple CTE credentials, by graduate cohort and number of CTE credentials earned, as shown in the equation below.

\[ P_{1c_{ndc}} = \frac{N_{ndc}}{N_{dc}} \]  

(B3)

\( P_{1c_{ndc}} \) is the percentage of graduates with diploma type \( d \) (\( d = \) Standard or Advanced Studies, Standard only, Advanced Studies only) from graduate cohort \( c \) (\( c = 2011, ..., 2017 \)) who earned \( n \) CTE credentials.

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9 Seastrom (2017) describes potential benefits and drawbacks of treating state administrative data as a population or a sample from which one can derive estimates for purposes of school accountability. Similar principles apply here.
\( P_{1cndc} \) is the percentage of graduates with diploma type \( d \) (\( d = \text{Standard, Advanced Studies} \)) from graduate cohort \( c \) (\( c = 2011, \ldots, 2017 \)) who earned \( n \) (\( n = 1, 2, 3, \text{more than 3} \)) CTE credentials.

Finally, the study team calculated the percentage of high school graduates who completed a CTE program of study, by diploma type and graduate cohort, as shown in the equation below.

\[
P_{1d_{dc}} = \frac{N_{\text{program of study}, dc}}{N_{dc}} \tag{B4}
\]

\( P_{1d_{dc}} \) is the percentage of graduates with diploma type \( d \) (\( d = \text{Standard, Advanced Studies} \)) from graduate cohort \( c \) (\( c = 2011, \ldots, 2017 \)) who completed a CTE program of study.

**Research question 2**

To answer research question 2, the study team calculated the percentage of Standard diploma graduates earning any type of CTE credential, by characteristics and graduate cohort, as shown in the equation below.

\[
P_{1sc} = \frac{N_{\text{CTE credential}, sc}}{N_{sc}} \tag{B5}
\]

\( P_{1sc} \) is the percentage of graduates who have the student-level characteristic \( s \) and were in graduate cohort \( c \) (\( c = 2011, \ldots, 2017 \)) who earned any type of CTE credential. The study team examined the following student-level characteristics:

- Demographics
  - Gender
  - Race/ethnicity
- Federal program participation
  - Economically disadvantaged status
  - English learner status
  - Special education status
- High school academic achievement
  - Gifted status
  - Outcomes on the state writing and Algebra II assessments

**Research question 3**

To answer research question 3, the study team calculated the percentage of graduates who enrolled in college, by diploma type and graduate cohort, as shown in the equation below.

\[
P_{3a_{dc}} = \frac{N_{\text{enrolled in college}, dc}}{N_{dc}} \tag{B6}
\]

\( P_{3a_{dc}} \) is the percentage of graduates with diploma type \( d \) (\( d = \text{Standard, Advanced Studies} \)) from graduate cohort \( c \) (\( c = 2011, \ldots, 2017 \)) who enrolled in college.

The study team also calculated the percentage of graduates with at least one CTE credential who enrolled in college, by diploma type and graduate cohort, as shown in the equation below.

\[
P_{3b_{dc}} = \frac{N_{\text{enrolled in college}, dc}}{N_{\text{CTE credential}, dc}} \tag{B7}
\]
P3b_{dc} is the percentage of CTE credential earners with diploma type \( d \) (\( d = \text{Standard, Advanced Studies} \)) from graduate cohort \( c \) (\( c = 2011, \ldots, 2017 \)) who enrolled in college. The study team computed similar percentages for the group of graduates who did not earn a CTE credential.

Next, the study team calculated the percentage of graduates who enrolled in college, by diploma type, number of CTE credentials earned, and graduate cohort, as shown in the equation below.

\[
P_{3c_{ndc}} = \frac{N_{enrolled\ in\ college\ ndc}}{N_{ndc}} \tag{B8}
\]

\( P_{3c_{ndc}} \) is the percentage of graduates with diploma type \( d \) (\( d = \text{Standard, Advanced Studies} \)) from graduate cohort \( c \) (\( c = 2011, \ldots, 2017 \)) with \( n \) (\( n = 1, 2, 3, \text{more than 3} \)) CTE credentials who enrolled in college.

In addition, the study team calculated the percentage of graduates who enrolled in college, by diploma type, credential type, and graduate cohort, as shown in the equation below.

\[
P_{3d_{idc}} = \frac{N_{enrolled\ in\ college\ idc}}{N_{idc}} \tag{B9}
\]

\( P_{3d_{idc}} \) is the percentage of graduates with diploma type \( d \) (\( d = \text{Standard, Advanced Studies} \)) and CTE credential type \( i \) (\( i = 1, \ldots, 4 \)) from graduate cohort \( c \) (\( c = 2011, \ldots, 2017 \)) who enrolled in college.

Finally, the study team calculated the percentage of graduates who completed a CTE program of study who enrolled in college, by diploma type and graduate cohort, as shown in the equation below.

\[
P_{3e_{pdc}} = \frac{N_{enrolled\ in\ college\ pdc}}{N_{pdc}} \tag{B10}
\]

\( P_{3e_{pdc}} \) is the percentage of graduates with program of study completer status \( p \) (\( p = 0, 1 \)) with diploma type \( d \) (\( d = \text{Standard, Advanced Studies} \)) from graduate cohort \( c \) (\( c = 2011, \ldots, 2017 \)) who enrolled in college. The study team computed similar percentages for the group of graduates who did not complete a CTE program of study.

References


Appendix C. Supporting analyses

This appendix includes results for Advanced Studies diploma graduates and other supporting analyses relevant to Standard diploma graduates. Stakeholders may be interested in comparing the results for Advanced Studies diploma graduates to those of Standard diploma graduates, or they may find value in better understanding how credential-earning and college enrollment rates have changed over time for this group of graduates.

Figure C1. The percentage of Advanced Studies diploma graduates who earned an industry or Workplace Readiness Skills credential increased annually from 2011 to 2017, but there was little to no change in the percentage who earned a credential from a state professional license or the National Occupational Competency Testing Institute.

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 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.
### Table C1. Percentage of Standard diploma graduates, by characteristic, 2011–17

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>45</td>
<td>44</td>
<td>44</td>
<td>44</td>
<td>44</td>
<td>44</td>
<td>44</td>
</tr>
<tr>
<td>Asian</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Black</td>
<td>33</td>
<td>33</td>
<td>31</td>
<td>31</td>
<td>30</td>
<td>31</td>
<td>31</td>
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<td>Hispanic</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>12</td>
<td>13</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>White</td>
<td>50</td>
<td>50</td>
<td>49</td>
<td>50</td>
<td>49</td>
<td>47</td>
<td>46</td>
</tr>
<tr>
<td>English learner</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Economically disadvantaged</td>
<td>51</td>
<td>52</td>
<td>54</td>
<td>56</td>
<td>57</td>
<td>59</td>
<td>61</td>
</tr>
<tr>
<td>Gifted</td>
<td>10</td>
<td>10</td>
<td>11</td>
<td>11</td>
<td>9</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Receiving special education services</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td>20</td>
<td>20</td>
<td>21</td>
<td>23</td>
</tr>
<tr>
<td>Proficient in Algebra II</td>
<td>39</td>
<td>33</td>
<td>26</td>
<td>27</td>
<td>30</td>
<td>32</td>
<td>33</td>
</tr>
<tr>
<td>Proficient in writing</td>
<td>96</td>
<td>96</td>
<td>96</td>
<td>93</td>
<td>91</td>
<td>91</td>
<td>91</td>
</tr>
<tr>
<td>Total number of Standard diploma graduates</td>
<td>36,456</td>
<td>35,703</td>
<td>35,232</td>
<td>34,383</td>
<td>33,757</td>
<td>35,678</td>
<td>35,603</td>
</tr>
</tbody>
</table>

Note: For binary characteristics (all characteristics other than race/ethnicity), the table shows the results for only one of the two groups because the values for the two groups always sum to 100 percent.

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

### Table C2. Number of Standard diploma graduates who earned each credential type, 2011–17

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>6,010</td>
<td>7,060</td>
<td>7,598</td>
<td>8,638</td>
<td>18,072</td>
<td>21,190</td>
<td>26,237</td>
</tr>
<tr>
<td>Workplace Readiness Skills</td>
<td>637</td>
<td>2,792</td>
<td>4,817</td>
<td>6,794</td>
<td>9,007</td>
<td>10,169</td>
<td>14,466</td>
</tr>
<tr>
<td>National Occupational Competency Testing Institute</td>
<td>1,438</td>
<td>1,480</td>
<td>1,567</td>
<td>1,644</td>
<td>1,542</td>
<td>1,544</td>
<td>1,468</td>
</tr>
<tr>
<td>Professional license</td>
<td>1,018</td>
<td>861</td>
<td>977</td>
<td>1,167</td>
<td>962</td>
<td>1,109</td>
<td>1,075</td>
</tr>
</tbody>
</table>

Source: Authors’ calculations using data from the Virginia Longitudinal Data System.
Figure C2. The percentage of Advanced Studies diploma graduates who earned one or more career and technical education credentials increased annually from 2011 to 2017, but most graduates who earned a credential earned only one credential.

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

Table C3. Number of Standard diploma graduates by number of credentials earned, 2011–17

<table>
<thead>
<tr>
<th>Number of credentials</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>28,055</td>
<td>25,006</td>
<td>22,758</td>
<td>19,607</td>
<td>11,240</td>
<td>10,321</td>
<td>3,116</td>
</tr>
<tr>
<td>One</td>
<td>6,482</td>
<td>7,890</td>
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</table>

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

Figure C3. The percentage of Advanced Studies diploma graduates who completed a career and technical education program of study increased from 2011 to 2014 but decreased in 2016 and 2017.

Note: A graduate completed a career and technical education (CTE) program of study after they finished a CTE sequence of courses and were marked as a “CTE finisher” in the Virginia Longitudinal Data System.

Source: Authors’ calculations using data from the Virginia Longitudinal Data System.
Table C4. Percentage of Standard diploma graduates who earned each type of credential, by characteristic, 2011 and 2017

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<td>34</td>
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</tbody>
</table>

NOCTI is the National Occupational Competency Testing Institute. WRS is Workplace Readiness Skills.
Note: Percentages can total to more than 100 percent each year within a group 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. 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 career and technical education (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 students 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).
Source: Authors’ calculations using data from the Virginia Longitudinal Data System.
Table C5. Percentage of Standard diploma graduates who earned one, two, three, or for or more credentials, by characteristic, 2011 and 2017

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<th>Characteristic</th>
<th>One credential 2011</th>
<th>One credential 2017</th>
<th>Two credentials 2011</th>
<th>Two credentials 2017</th>
<th>Three credentials 2011</th>
<th>Three credentials 2017</th>
<th>Four or more credentials 2011</th>
<th>Four or more credentials 2017</th>
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<td>7</td>
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</table>

Note: 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 career and technical education (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 students 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).

Source: Authors’ calculations using data from the Virginia Longitudinal Data System.
Table C6. Percentage of Standard diploma graduates who completed a career and technical education program of study, by characteristic, 2011–17

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<td>51</td>
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<td>34,384</td>
<td>33,757</td>
<td>35,678</td>
<td>35,604</td>
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</table>

Note: 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 career and technical education (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 students 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).

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

Table C7. Difference in the credential earning rate between various groups of graduates, 2011–17

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<td>12</td>
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<td>12</td>
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<td>19</td>
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Source: Authors’ calculations using data from the Virginia Longitudinal Data System.
Table C8. Percentage of Standard diploma graduates who enrolled in college within 12 months of graduating, by characteristic, 2011–17

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Note: 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.

Source: Authors’ calculations using data from the Virginia Longitudinal Data System.
Table C9. Percentage of Advanced Studies diploma graduates who enrolled in college during within 12 months of graduating, by characteristic, 2011–17

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

Figure C4. The percentage of Standard diploma graduates who enrolled in a two-year college within 12 months of graduating decreased from 2011 to 2017, while the percentage enrolling in a four-year college remained relatively stable

![Bar chart showing the percentage of Standard diploma graduates enrolling in college by graduation year and two-year versus four-year institutions. The percentage enrolling in a two-year college decreased from 2011 to 2017, while the percentage enrolling in a four-year college remained relatively stable.]

Note: College enrollment includes two- and four-year institutions, public and private institutions, and in-state and out-of-state institutions. If graduates had records at both two- and four-year colleges, they were classified as enrolling in a four-year college. The number of Standard diploma graduates, by year from 2011 to 2017, 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.
Table C10. Percentage of graduates who enrolled in college within 12 months of graduating, with and without graduates who received special education services, 2011–17

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<th>2016</th>
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Note: College enrollment includes two- and four-year institutions, public and private institutions, and in-state and out-of-state institutions.
Source: Authors’ calculations using data from the Virginia Longitudinal Data System.

Figure C5. The percentage of Advanced Studies diploma graduates who enrolled in college within 12 months of graduating was stable for both career and technical education credential earners and non-earners

Note: College enrollment includes two-year and four-year institutions, public and private institutions, and in-state and out-of-state institutions.
Source: Authors’ calculations using data from the Virginia Longitudinal Data System.
Table C11. Percentage of Standard diploma graduates, by characteristic and by career and technical education credential attainment status, 2011–17

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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not earn</td>
<td>36</td>
<td>30</td>
<td>23</td>
<td>24</td>
<td>22</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>Earned</td>
<td>46</td>
<td>41</td>
<td>31</td>
<td>31</td>
<td>34</td>
<td>36</td>
<td>35</td>
</tr>
<tr>
<td>Percent proficient in writing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not earn</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>91</td>
<td>86</td>
<td>84</td>
<td>81</td>
</tr>
<tr>
<td>Earned</td>
<td>98</td>
<td>99</td>
<td>99</td>
<td>96</td>
<td>94</td>
<td>94</td>
<td>92</td>
</tr>
<tr>
<td>Total number of graduates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not earn</td>
<td>28,053</td>
<td>25,003</td>
<td>22,758</td>
<td>19,606</td>
<td>11,240</td>
<td>10,321</td>
<td>3,115</td>
</tr>
<tr>
<td>Earned</td>
<td>8,403</td>
<td>10,700</td>
<td>12,474</td>
<td>14,777</td>
<td>22,517</td>
<td>25,357</td>
<td>32,488</td>
</tr>
</tbody>
</table>

Table reads: “45 percent of Standard diploma graduates who did not earn a CTE credential were female and 44 percent of Standard diploma graduates who earned a CTE credential were female.”

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 always sum to 100 percent. Although the career and technical education (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 students 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).

Source: Authors’ calculations using data from the Virginia Longitudinal Data System.
Figure C6. The percentage of Advanced Studies diploma graduates who enrolled in college within 12 months of graduating decreased from 2011 to 2017 for graduates earning an industry, Workplace Readiness Skill, or National Occupational Competency Testing Institute credential, while the enrollment rate increased for graduates who earned a 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.
Source: Authors’ calculations using data from the Virginia Longitudinal Data System.

Figure C7. The percentage of Advanced Studies diploma graduates who enrolled in college within 12 months of graduating was fairly similar, regardless of the number of credentials earned.

Note: College enrollment includes two- and four-year institutions, public and private institutions, and in-state and out-of-state institutions.
Source: Authors’ calculations using data from the Virginia Longitudinal Data System.
Figure C8. The percentage of Advanced Studies diploma graduates who enrolled in college within 12 months of graduating 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.

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

Reference
