

Fall 12-2020

The Relationship Between the Earning of Career and Technical Industry Credentials and the Virginia Economy

Anjanette McFadden Hendricks
Old Dominion University, ahend015@odu.edu

Follow this and additional works at: https://digitalcommons.odu.edu/efl_etds



Part of the [Educational Leadership Commons](#), [Labor Economics Commons](#), and the [Vocational Education Commons](#)

Recommended Citation

Hendricks, Anjanette M.. "The Relationship Between the Earning of Career and Technical Industry Credentials and the Virginia Economy" (2020). Doctor of Philosophy (PhD), Dissertation, Educational Foundations & Leadership, Old Dominion University, DOI: 10.25777/5ms6-nn07
https://digitalcommons.odu.edu/efl_etds/251

This Dissertation is brought to you for free and open access by the Educational Foundations & Leadership at ODU Digital Commons. It has been accepted for inclusion in Educational Foundations & Leadership Theses & Dissertations by an authorized administrator of ODU Digital Commons. For more information, please contact digitalcommons@odu.edu.

**THE RELATIONSHIP BETWEEN THE EARNING OF CAREER AND TECHNICAL
INDUSTRY CREDENTIALS AND THE VIRGINIA ECONOMY**

by

Anjanette McFadden Hendricks

A Dissertation Submitted to the Faculty of Old Dominion University in Partial
Fulfilment of the Requirements for the Degree of

DOCTOR OF PHILOSOPHY

EDUCATIONAL LEADERSHIP

OLD DOMINION UNIVERSITY
DECEMBER 2020

Dissertation Committee

William Owings (Chair)

Steve Myran (Member)

Petros Katsioloudis (Member)

ABSTRACT

**THE RELATIONSHIP BETWEEN THE EARNING OF CAREER AND TECHNICAL
INDUSTRY CREDENTIALS AND THE VIRGINIA ECONOMY**

**Anjanette Hendricks
Old Dominion University, 2020
Chair: Dr. William Owings**

Nationally, the labor market is calling out for workers to fill the increasing number of job vacancies, but those qualified, skilled, and able to fill them are limited in supply or retiring in large numbers. As America's key industries offer high salaries in return for candidates with the necessary skills and credentials to fill their vacancies, the skills learned and third-party industry credentials earned in secondary Career and Technical Education (CTE) programs seem to make a perfect fit for the student, employer, and the economy. However, unlike the favored US educational model of the four-year degree, the continued outdated perception of CTE and low level of awareness of industry credentials held by the public, educators, and students, continue to perpetuate this skills crisis while undermining the economic potential for Virginia's high school students.

Using a non-experimental, quantitative study, employing ex post facto data, a Likert survey, and a closed-ended question survey, this research shows, in dollar terms, the economic value of CTE industry credentials for the students who earn them, the VDOE superintendent region in which they live, and for Virginia's Treasury in terms of potential income tax revenue for the next five years. The implications of this research are noteworthy for policymakers, school leaders, CTE advocates, for changing the perception of CTE and industry credentials, but most importantly, for the success of Virginia's high school graduates.

Copyright © 2020 by Anjanette Hendricks. All Rights Reserved

ACKNOWLEDGEMENTS

I could not write this acknowledgment without thanking my parents and family in England, and my mother-in-law and father-in-law in America. Their faith, confidence, love, and support have provided me the courage to push new boundaries and to take the next step, whatever that might be. It is with love that I thank them for all they have done for me.

I am immensely grateful for the continued support and eternal good humor of Dr. Owings, Dissertation Chair, human repository of all knowledge, and teller of bad jokes. Who knew education finance could be so fascinating? It has been a privilege and an honor to work with you. Thank you.

Thanks also to Dr. Myran and Dr. Katsioloudis for the guidance and advice throughout this dissertation process. I am indebted.

My sincere thanks go to each of the participants in this study; to the CTE experts who provided their valuable time and experience to share their level of agreement with the industry credential to occupational alignment, and to the representatives of Virginia's industries who provided their employment decision making processes. The requests made of you were no small measure. I am so grateful for your help to make this study possible.

Finally, and quite simply, I could not have taken a single step on this Ph.D. journey without the constant support, love, and cheerleading of my precious family. Words are insufficient to express the love and gratitude I have for my husband, Chris, and my daughters Ania and Hannah, who drive me in all I do, and to my puppy, who makes sure I stop to take her walkies or give her a tummy rub. I dedicate this work to them.

TABLE OF CONTENTS

LIST OF TABLES	x
LIST OF FIGURES	xiv
CHAPTER I: INTRODUCTION.....	1
Background and Context.....	1
Research Purpose and Questions	4
Significance of the Study	5
Theoretical Framework	12
Human Capital Theory	12
Methods.....	13
Overview of the Study	15
Delimitations	15
Definition of Terms.....	17
CHAPTER TWO: LITERATURE REVIEW	19
The Contradiction of CTE in Education	21
Industry Credentials	26
Absence of Data	30
Funding	38
Summary	42
CHAPTER THREE: METHODOLOGY	44
Research Design and Data Collection.....	44
Population of Participants	50
Instrumentation.....	50
Data Analysis	51
Instruments	52
Limitations	54
Data Analysis	54
CHAPTER FOUR: FINDINGS	66
Section One: Industry Credential to Occupational Alignment	68
Section Two: Research Findings by Virginia and Superintendent Regions	73
Commonwealth of Virginia.....	73
Research Question 1	73
Research Question 2	76

Research Question 3	96
Research Question 4	115
Region One: Central Virginia	117
Research Question 1	118
Research Question 2	119
Research Question 3	132
Research Question 4	143
Region Two: Tidewater	145
Research Question 1	146
Research Question 2	147
Research Question 3	159
Research Question 4	171
Region Three: Northern Neck	173
Research Question 1	174
Research Question 2	175
Research Question 3	184
Research Question 4	193
Region Four: Northern Virginia	195
Research Question 1	196
Research Question 2	197
Research Question 3	209
Research Question 4	221
Region Five: Valley	223
Research Question 1	224
Research Question 2	225
Research Question 3	236
Research Question 4	246
Region Six: Western Virginia	248
Research Question 1	249
Research Question 2	250
Research Question 3	260
Research Question 4	269
Region Seven: Southwest	271

Research Question 1	272
Research Question 2	273
Research Question 3	284
Research Question 4	294
Region Eight: Southside.....	296
Research Question 1	297
Research Question 2	298
Research Question 3	305
Research Question 4	311
CHAPTER 5: FINDINGS, SUMMARY, AND CONCLUSIONS	313
Summary of the Study.....	313
Overview of the problem.....	313
Purpose statement and research questions.....	314
Methodology.....	315
Major Findings	317
Annual Number of CTE Completer Students.....	317
The Trend in Completer Credentials	319
Potential earnings for students gaining industry credentials in Virginia’s labor market.....	320
The potential economic impact for the state if CTE students earning industry credentials were to increase by 10% annually	321
Conclusions.....	323
Implications for action	323
Recommendations for further research	325
Commonwealth of Virginia	326
Research Question 1	326
Research Question 2	328
Research Question 3	328
Research Question 4	329
Region One: Central Virginia	331
Research Question 1	331
Research Question 2	332
Research Question 3	332
Research Question 4	333

Region Two: Tidewater	335
Research Question 1	335
Research Question 2	336
Research Question 3	336
Research Question 4	337
Region Three: Northern Neck	339
Research Question 1	339
Research Question 2	340
Research Question 3	340
Research Question 4	341
Region Four: Northern Virginia	343
Research Question 1	343
Research Question 2	344
Research Question 3	344
Research Question 4	345
Region Five: Valley	347
Research Question 1	347
Research Question 2	348
Research Question 3	348
Research Question 4	349
Region Six: Western Virginia	351
Research Question 1:	351
Research Question 2	351
Research Question 3	352
Research Question 4	353
Region Seven: Southwest	355
Research Question 1	355
Research Question 2	356
Research Question 3	356
Research Question 4	357
Region Eight: Southside	359
Research Question 1	359
Research Question 2	360

Research Question 3	360
Research Question 4	361
Concluding remarks	362
REFERENCES	363
APPENDIX 1.1	383
APPENDIX 1.2	399
APPENDIX 1.2	401
APPENDIX 2	405
APPENDIX 3	407
Vita.....	40720

LIST OF TABLES

Table 1 Number of Assessments Passed: 2011-2017	6
Table 2 OECD Concentrator in CTE Pathways/Vocational Training	22
Table 3 OECD Estimated Percentage of Upper Secondary Vocational Programs	23
Table 4 Certification Request Rate in Select Occupation Families. 2015	27
Table 5 Projected Percent Change by Select Occupational Groups, 2016-2026	35
Table 6 Regional Labor Market Data by Local Workforce Investment Area, 2016-2026	37
Table 7 U.S. Education: Fiscal Years 2010 – 2020	39
Table 8 Virginia Education - Fiscal Years 2010 – 2020	40
Table 9 Percentage of Perkins funding to VA GDP	41
Table 10 Virginia Department of Education Superintendent's Regions	47
Table 11 Example of Occupational Projection and Worker Characteristics	53
Table 12 Example of Credential to Occupational Alignment	55
Table 13 Example of Credential to Occupational Alignment – 2012-2017	56
Table 14 Example of Virginia Statewide Selected Occupations, Median Wage, and Number of Industry Credentials Earned From 2012-2017.	56
Table 15 How Virginia Tax is Calculated	57
Table 16 CTE Experts Program Area and Number of Participants	61
Table 17 CTE Experts level of agreement with industry credential to occupational alignment, ranges 1-5	68
Table 18 CTE Experts level of agreement with industry credential to occupational alignment ..	69
Table 19 Virginia's Superintendent Regions, School Divisions, High Schools, and Technical Centers	73
Table 20 Middle School & High School CTE Program Enrollment	74
Table 21 Total Number of Completer Students by Superintendent Region	75
Table 22 Virginia: Industry Credentials Taken and Passed: 2014-2019- “Completers”	78
Table 23 “Other” industry credentials earned by Virginia’s CTE students, 2014-2019	89
Table 24 Soft skills/College & Career Readiness “industry credentials earned in Virginia: 2014- 2019	95
Table 25 Total Number of Industry Certifications Earned in Virginia: 2014-2019	96
Table 26 Virginia's Projected Employment Data: By Region	97
Table 27 Occupational Openings by Education Attainment Level – Virginia	97
Table 28 Occupational Openings by Education Attainment Level - Virginia - "Less than High School" and "Not Applicable" removed	98
Table 29 CTE Industry Credential to Occupational Alignment and Projections – All Virginia	100
Table 30 Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually	115
Table 31 Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually - AND Allows a 10% Increase in Beginning Salary	116
Table 32 VDOE Superintendent Region 1: Central Virginia	117
Table 33 Local Workforce Investment Areas (LWIAs) in Virginia by VDOE Superintendent Region	117
Table 34 Number of CTE Completers in Region One: 2014-2019	118

Table 35 Region One: Industry Credentials Taken and Passed: 2014-2019- “Completers”	121
Table 36 “Other” industry credentials earned by Region One CTE students, 2014-2019	126
Table 37 Soft skills/College & Career Readiness industry credentials earned in Region One: 2014-2019	130
Table 38: Total Number of Industry Certifications Earned in Region One: 2014-2019	130
Table 39 Occupational Openings by Education Attainment Level to 2026 – Region One	132
Table 40 Occupational Openings by Education Attainment Level – Region 1 - "Less than High School" and "Not Applicable" removed	133
Table 41 CTE Industry Credential to Occupational Alignment and Projections – Region One: Central Virginia and Capital Region Workforce Partnership LWIA IX and Crater Area LWIA XV	135
Table 42 Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually	143
Table 43 Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually - AND Allows a 10% Increase in Beginning Salary	144
Table 44 VDOE Superintendent Region 2: Tidewater	145
Table 45 Local Workforce Investment Areas (LWIAs) in Virginia by VDOE Superintendent Region	145
Table 46 Number of CTE Completers in Region Two: 2014-2019	146
Table 47 Region Two: Industry Credentials Taken and Passed: 2014-2019- “Completers”	148
Table 48 “Other” industry credentials earned by Region Two CTE students, 2014-2019	154
Table 49 Soft skills/College & Career Readiness industry credentials earned in Region Two: 2014-2019	158
Table 50 Total Number of Industry Certifications Earned in Region Two: 2014-2019	159
Table 51 Occupational Openings by Education Attainment Level to 2026 – Region Two	159
Table 52 Occupational Openings by Education Attainment Level – Region 2 - "Less than High School" and "Not Applicable" removed	160
Table 53 CTE Industry Credential to Occupational Alignment and Projections – Region Two: Tidewater; LWIA XIV: Greater Peninsula and LWIA XVI: Hampton Roads	162
Table 54 Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually	171
Table 55 Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually - AND Allows a 10% Increase in Beginning Salary	172
Table 56 VDOE Superintendent Region 3: Northern Neck	173
Table 57 Local Workforce Investment Areas (LWIAs) in Virginia by VDOE Superintendent Region	173
Table 58 Number of CTE Completers in Region Three: 2014-2019	174
Table 59 Region Three: Industry Credentials Taken and Passed: 2014-2019- “Completers” ...	177
Table 60 “Other” industry credentials earned by Region Three CTE students, 2014-2019	181
Table 61 Soft skills/College & Career Readiness industry credentials earned in Region Three: 2014-2019	183
Table 62 Total Number of Industry Certifications Earned in Region Three: 2014-2019	184
Table 63 Occupational Openings by Education Attainment Level to 2026 – Region Three	184

Table 64 Occupational Openings by Education Attainment Level – Region 3 - "Less than High School" and "Not Applicable" removed.....	185
Table 65 CTE Industry Credential to Occupational Alignment and Projections – Region Three: Northern Neck; LWIA XIII: Bay Consortium	188
Table 66 Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually	193
Table 67 Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually - AND Allows a 10% Increase in Beginning Salary	194
Table 68 VDOE Superintendent Region 4: Northern Virginia.....	195
Table 69 Local Workforce Investment Areas (LWIAs) in Virginia by VDOE Superintendent Region.....	195
Table 70 Number of CTE Completers in Region Four: 2014-2019	197
Table 71 Region Four: Industry Credentials Taken and Passed: 2014-2019- “Completers”	199
Table 72 “Other” industry credentials earned by Region Four CTE students, 2014-2019.....	204
Table 73 Soft skills/College & Career Readiness industry credentials earned in Region Four: 2014-2019	208
Table 74 Total Number of Industry Certifications Earned in Region Four: 2014-2019	208
Table 75 Occupational Openings by Education Attainment Level to 2026 – Region Four	209
Table 76 Occupational Openings by Education Attainment Level – Region 4 - "Less than High School" and "Not Applicable" removed.....	210
Table 77 CTE Industry Credential to Occupational Alignment and Projections – Region Four: LWIA IV, VI, XI AND XII.....	212
Table 78 Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually	221
Table 79 Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually - AND Allows a 10% Increase in Beginning Salary	222
Table 80 VDOE Superintendent Region 5: Valley.....	223
Table 81 Local Workforce Investment Areas (LWIAs) in Virginia by VDOE Superintendent Region.....	224
Table 82 Number of CTE Completers in Region Five: 2014-2019.....	225
Table 83 Region Five: Industry Credentials Taken and Passed: 2014-2019- “Completers”	227
Table 84 “Other” industry credentials earned by Region Five CTE students, 2014-2019	232
Table 85 Soft skills/College & Career Readiness industry credentials earned in Region Five: 2014-2019	235
Table 86 Total Number of Industry Certifications Earned in Region Five: 2014-2019	235
Table 87 Occupational Openings by Education Attainment Level to 2026 – Region Five.....	236
Table 88 Occupational Openings by Education Attainment Level – Region 5 - "Less than High School" and "Not Applicable" removed.....	237
Table 89 CTE Industry Credential to Occupational Alignment and Projections – Region Five: LWIA IV, VI, VII.....	239
Table 90 Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually	246
Table 91 Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually - AND Allows a 10% Increase in Beginning Salary	247

Table 92 VDOE Superintendent Region 6: Western Virginia.....	248
Table 93 Local Workforce Investment Areas (LWIAs) in Virginia by VDOE Superintendent Region.....	248
Table 94 Number of CTE Completers in Region Six: 2014-2019.....	249
Table 95 Region Six: Industry Credentials Taken and Passed: 2014-2019- “Completers”	252
Table 96 “Other” industry credentials earned by Region Six CTE students, 2014-2019	256
Table 97 Soft skills/College & Career Readiness industry credentials earned in Region Six: 2014-2019.....	259
Table 98 Total Number of Industry Certifications Earned in Region Six: 2014-2019.....	260
Table 99 Occupational Openings by Education Attainment Level to 2026 – Region Six	260
Table 100 Occupational Openings by Education Attainment Level – Region 6 - "Less than High School" and "Not Applicable" removed.....	261
Table 101 CTE Industry Credential to Occupational Alignment and Projections – Region Six: LWIA III, XVII	263
Table 102 Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually	269
Table 103 Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually - AND Allows a 10% Increase in Beginning Salary	270
Table 104 VDOE Superintendent Region 7: Southwest.....	271
Table 105 Local Workforce Investment Areas (LWIAs) in Virginia by VDOE Superintendent Region.....	271
Table 106 Number of CTE Completers in Region Seven: 2014-2019	273
Table 107 Region Seven: Industry Credentials Taken and Passed: 2014-2019- “Completers” .	275
Table 108 “Other” industry credentials earned by Region Seven CTE students, 2014-2019	280
Table 109 Soft skills/College & Career Readiness industry credentials earned in Region Seven: 2014-2019	283
Table 110 Total Number of Industry Certifications Earned in Region Seven: 2014-2019	284
Table 111 Occupational Openings by Education Attainment Level to 2026 – Region Seven ...	284
Table 112 Occupational Openings by Education Attainment Level – Region 7 - "Less than High School" and "Not Applicable" removed.....	285
Table 113 CTE Industry Credential to Occupational Alignment and Projections – Region Seven: LWIA I and II	287
Table 114 Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually	294
Table 115 Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually - AND Allows a 10% Increase in Beginning Salary	295
Table 116 VDOE Superintendent Region 8: Southside.....	296
Table 117 Local Workforce Investment Areas (LWIAs) in Virginia by VDOE Superintendent Region.....	296
Table 118 Number of CTE Completers in Region Eight: 2014-2019	297
Table 119 Region Eight: Industry Credentials Taken and Passed: 2014-2019- “Completers” ..	299
Table 120 “Other” industry credentials earned by Region Eight CTE students, 2014-2019	301
Table 121 Soft skills/College & Career Readiness industry credentials earned in Region Eight: 2014-2019	304

Table 122 Total Number of Industry Certifications Earned in Region Eight: 2014-2019	304
Table 123 Occupational Openings by Education Attainment Level to 2026 – Region Eight	305
Table 124 Occupational Openings by Education Attainment Level – Region 8 - "Less than High School" and "Not Applicable" removed.....	306
Table 125 CTE Industry Credential to Occupational Alignment and Projections – Region Eight: Southside and LWIA VIII: South Central	308
Table 126 Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually	311
Table 127 Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually - AND Allows a 10% Increase in Beginning Salary	312

LIST OF FIGURES

Figure 1 Share of Total K-12 Education Funding, 2015	11
Figure 2 Graphical representation of business candidate selection	70
Figure 3 Graphical representation of business candidate selection and salary	71
Figure 4 Graphical representation of the extent to which industry credentials influence starting salary.....	71
Figure 5 Graphical representation of the increased starting salary, by percentage, for applicants holding CTE industry credentials	72
Figure 6 CTE Completers: 2014-2019.....	75
Figure 7 Virginia CTE Completers: 2014-2019	76
Figure 8 CTE Career Clusters: 2014-2019	77
Figure 9 CTE Career Clusters in Region One: 2014-2019	120
Figure 10 CTE Career Clusters in Region Two: 2014-2019	148
Figure 11 CTE Career Clusters in Region Three: 2014-2019	176
Figure 12 CTE Career Clusters in Region Four: 2014-2019	198
Figure 13 CTE Career Clusters in Region Five: 2014-2019.....	226
Figure 14 CTE Career Clusters in Region Six: 2014-2019	251
Figure 15 CTE Career Clusters in Region Seven: 2014-2019.....	274
Figure 16 CTE Career Clusters in Region Seven: 2014-2019.....	299
Figure 17 Virginia CTE Program Enrollment and CTE Completers: 2012-2017	327
Figure 18 Virginia CTE Completers: 2014-2019	327
Figure 19 Region One CTE Completers: 2014-2019	331
Figure 20 Region Two CTE Completers: 2014-2019.....	335
Figure 21 Region Three CTE Completers: 2014-2019.....	339
Figure 22 Region Four CTE Completers: 2014-2019.....	343
Figure 23 Region Five CTE Completers: 2014-2019	347
Figure 24 Region Six CTE Completers: 2014-2019.....	351
Figure 25 Region Seven CTE Completers: 2014-2019	355
Figure 26 Region Eight CTE Completers: 2014-2019	359

CHAPTER I INTRODUCTION

Background and Context

Nationally, the labor market is calling out for workers to fill the increasing number of job vacancies, but those qualified, skilled, and able to fill them are limited in supply or retiring in large numbers (Bauer et al., 2019; Shanholtz, 2019, Shanholtz, 2019; Rothwell, 2013). In 2018, 14.61 million U.S. students enrolled in public colleges and 5.22 million in private colleges; by 2028, this number is projected to become 14.98 million students and 5.33 million students, respectively (Statista, 2019). Current Population Survey (CPS) data indicates that youth participation in the labor market is the lowest it has ever been (Crespin, 2019; Bauer et al., 2019), while, as the national population ages (Crespin, 2019), the largest generational group in U.S. history (aka “Baby Boomers) continues to retire at a rate of 10,000 a day (Chappelow, 2019). Taken together, these changes have created an increasingly “forgotten middle-skills” job market (National Skills Coalition, 2019; Rothwell, 2013). Constituting the most substantial part of America’s labor market, key industries are struggling to find sufficiently skilled workers, a struggle producing the subsequent “middle-skills gap.” Filling these high-need vacancies is leading many industries to offer high salaries in return for candidates with the necessary skills and credentials to undertake them; where jobs require education beyond high school, but less than a four-year degree (Carnevale et al., 2017; Burning Glass Technologies, 2017; Shanholtz, 2019, Rothwell, 2013). In the traditional U.S. educational model where the four-year degree has become the perceived golden pathway to economic success and mobility, too few high school students realize that opportunities exist at the sub-bachelor level to earn one of the “good jobs that pay without a B.A.” (Carnevale et al., 2017; Rothwell, 2013). This situation is a problem.

In today's knowledge-based economy, the increasing importance of education cannot be overstated, particularly in the skill mastery learned and developed in secondary Career and Technical Education (CTE) programs. As industry skills and competencies are learned and mastered, external validation of the new skills can be sought in the earning of industry-recognized credentials (Burning Glass Technologies, 2017; CCSSO, 2018). Approved by Virginia's Board of Education (VDOE, 2019), these credentials are considered to be the currency through which competencies and employability are recognized (CCSSO, 2018; Corporation for a Skilled Workforce, 2016; Bartlett et al., 2005) and the route through which a good salary can be earned. Whether these credentials serve as a "door opener" (Burningglass, 2017), or a "signal" (Bartlett, 2012), of talent to the employer, earning industry-recognized credentials serve as a stepping-stone to post-secondary education, to the workplace, or to a four-year college where credentials become the "elevator" and the "talent" (Bartlett, 2012). Further, for Shanholtz (2019, p. 3), the number of credentials awarded in a region is key to growing educational attainment and the building of its talent pool, contributing, therefore, to the quality of the workforce and its earning potential. As that earning potential increases, so does personal wellbeing and the local tax base, Shanholtz, (2019, p. 3).

That regional economic development and its education system go hand-in-hand have not been missed by Virginia's legislature. In recent years, CTE has risen to the top of the education policy agenda for governors and legislators (Zinth, 2013), as evident in 2002's General Assembly move to change the graduation requirements for all Virginia high school students taking a standard diploma (General Assembly of Virginia, 2006). The legislation now requires standard diploma students to earn an industry certification, state licensure examination, or national occupational competency assessment as a requirement for graduation (VDOE, 2016).

Demonstrating the state's value of CTE, the objective was/is to strengthen post-secondary education and workplace readiness opportunities for all students. In addition to being reported on Virginia's School Report Card, which provides information such as student achievement, accreditation, attendance, industry credentials, earn points for school division's Virginia Index of Performance (VIP). This index is intended to measure the extent to which students are progressing towards advanced levels in areas such as reading, mathematics, serving to encourage and recognize school accountability performance, and competence to excellence (VDOE, 2019).

The contribution of CTE to the workforce and regional economic development has been seen at the legislative level; however, a perception problem of CTE perpetuated by dominant values of the enforcing organization, e.g., state, school, and society continue to relegate CTE and industry credentials to a place of limited worth (Bartlett, Horwitz, Ipe, & Liu, 2005; Brand, 2008; Muller & Beatty, 2009; Quailey, 2012; Stone, 2014; Kandalec, 2016; Dougherty, 2016; Malkus, 2019; ACTE, 2019; General Assembly of Virginia, 2019). A significant gap in the literature reflects a critical economic incentive for the state, school, and student alike. By identifying the relationship of CTE and industry credentials with the filling of Virginia's labor market's "forgotten middle" jobs, one can estimate the potential earnings for those credentialed employees in the form of salary and to the state in terms of potentially taxable income, and hence the potential economic impact on Virginia's economy and regions. Further, if the number of completers in CTE programs was to increase by ten percent annually, the economic outcome to the state, school, and individual might go some way to changing the perception of CTE while contributing to the economic development of Virginia's educational regions.

Research Purpose and Questions

It is the purpose of this study to identify the relationship between the earning of CTE industry credentials at the high school level on Virginia's labor market and the State's economy with reference to each of the eight school superintendent regions.

Questions

1. What is the trend for high school participation in CTE programs in Virginia?
2. What is the trend for high school completer students earning industry certifications in Virginia?
3. What is the potential income for students earning industry credentials in Virginia's labor market?
4. What is the potential economic impact for the state if the number of CTE students earning industry credentials was to increase by 10% annually?

Virginia's eight superintendent regions (VDOE, 2020) are:

1. Superintendent Region One: Central Virginia
2. Superintendent Region Two: Tidewater
3. Superintendent Region Three: Northern Neck
4. Superintendent Region Four: Northern Virginia
5. Superintendent Region Five: Valley
6. Superintendent Region Six: Western Virginia
7. Superintendent Region Seven: Southwest
8. Superintendent Region Eight: Southside

The Commonwealth of Virginia of Virginia as a whole will be included in the findings of this study.

Significance of the Study

Research is clear that ‘a quality career and technical education system can play a major role in better utilizing all of America’s citizens’ (Lufkin et al., 2003; Johnston, 2019; Ornes, 2019). Offered in both middle and high school, CTE programs aim to provide all students the academic and technical skills necessary to succeed in future careers (ACTE, 2019). However, the literature surrounding CTE and industry credentials is limited (Brand B., 2008; Muller & Beatty, 2009; ESG, Advance CTE; CCSSO, 2018), helping to perpetuate the stigma often applied to CTE. While Federal and State governments have recently seen the value of CTE in meeting the needs of the labor market, and hence, state and national economic growth, there remains much to be done. In 2018, the *Strengthening Career and Technical Education for the 21st Century Act (Perkins V)* was passed requiring states and school divisions to meet a new program quality indicator by including at least one of the following indicators in their Perkins V accountability system: (a) the percentage of CTE concentrators who graduated from high school having attained a recognized postsecondary credential (b) the percentage of CTE concentrators who graduated from high school having attained postsecondary credits in the relevant CTE program of study earned through dual enrollment or concurrent enrollment or another credit transfer; or (c) the percentage of CTE concentrators who graduated from high school having participated in work-based learning (all4Ed.org, 2019, p. 4). While this plan does not take effect until 2021 and could be considered a good start, more information about the value both existentially and economically of CTE and industry credentials are needed at the school level. The significance of this study is to add to the literature surrounding the role of CTE in both the labor market and in individual progress replicated in lifelong learning. Data and research are needed if policymakers at the State and school level are to meet the needs of their students, community, city, state, and economy.

Data from the VDOE does show the soft skills credentials such as Workplace Readiness Skills for the Commonwealth Assessment and WISE Financial Literacy are increasing and continue to be the most significant number of any single credential earned (VDOE, 2019), for the past six years (VDOE, 2019), as seen in Table 1. However, their value as a ‘signal’ to the labor market when compared to technical credentials could be considered.

Table 1

Number of Assessments Passed: 2011-2017

Year	Workplace Readiness Skills for Commonwealth Assessment	Financial Literacy	Largest single number per technical certification
2016-2017	42,313	64,915	5,123 (CSP)
2015-2016	30,775	59,569	5,105 (MOS: Word)
2014-2015	33,665	55,817	3,552 (CSP)
2013-2014	28,349	39,313	4,648 (CS)
2012-2013	21,312	11,821	5,132 (CSP)
2011-2012	13,605	4,074	5,401 (CSP)

Note: Data retrieved from VDOE. (2019). *The path to industry certification: High school industry credentialing*. Retrieved from Virginia Department of Education: http://www.doe.virginia.gov/instruction/career_technical/path_industry_certification/index.shtml

While these certifications have been developed to signal to employers that a certified individual has the qualities and habits important to the success of the workplace, such as punctuality, self-discipline, effective communications and organizational skills (Muller & Beatty, 2009, p. 2), their service as a Virginia Board approved industry credential might be the Achilles heel when promoting “credentials of value,” e.g., technical credentials that demonstrate competence in skill areas such as A+ hardware and software technician assessment; Automotive Service Excellence (ASE) certifications; Licensed Practical Nursing (LPN), to name but three. If meeting the quality indicator of Perkins is achieved through the increased number of soft skill certifications rather than those needed by the labor market, to some, this is what “checking an accountability box” looks like. The purpose and significance of this study then are to contribute

to the research on CTE and industry credentials and their value to the student who earns them, in the eight educational regions of Virginia's economy.

Further, the significance of this study lies in the need to highlight the threat of maintaining the status quo in terms of CTE enrollee demographics. In her recently published Policy Brief *The Necessary Components of an Effective Career and Technical (CTE) Program* (2018), Passarella analyzed data from the U.S. Department of Education's Office of Career, Technical, and Adult Education. The findings show that male enrollment in CTE courses is almost ten percentage points higher than female enrollment (54.1%, compared to 45.9%, respectively), with White students representing a slight demographic majority at 51.2%. In contrast, Economically Disadvantaged students made up 46.1% (Passarella, 2018, p. 3). Additionally, of the 7.4 million students, only 41.1% are CTE 'concentrators', i.e., have earned three or more credits within a single CTE pathway, and again, gender differences are visible. While female enrollment is highest in Education and Training (75.5%), followed by Human Services (73.8%) and Health Services (73.9%), Architecture (85.1%), Distribution, and Logistics (91.3%) were the largest areas of male enrollment. These findings are significant in that they perpetuate the findings of studies undertaken over a decade ago.

In their study of enrollment in 12 states, the National Women's Law Center (NWLS, 2007), found that while females represented more than five out of six students enrolled in traditionally female courses, they represented just one of out every six in 'traditionally male' courses. Despite the acts passed to broaden gender equity in CTE – The Federal Vocational Education Act (1976); The Carl D. Perkins Vocational Education Act – 1984, 1990, 1998, 2006, to Title IX and the U.S. Department of Education Office for Civil Rights, gender segregation and disparity continue to reinforce the belief that CTE is a traditionally male area. To be sure, 2016

saw the U.S. Department of Education (2016), release a “Dear Colleague” letter reminding schools that “all students, regardless of sex or gender, must have equal access to the full range of career and technical education programs being offered.” Recognizing that persistent underrepresentation of females in CTE programs can hinder their earning power, decrease workforce, and global competitiveness, recipients, were reminded that when based on sex stereotypes, gender-related disparities can “contribute to disproportionate access to CTE programs that lead to high-skill, high-wage, and high-demand jobs” (U.S. Dept. of Education, 2016). Continuation of the status quo could serve only to reinforce and deepen inequalities of access and opportunities while undermining the educational, technical, skill, and financial potential for the underrepresented member of Virginia’s human capital.

The vital role that CTE plays in preparing students for success in the 21st century cannot be underestimated (Crespin, 2019; ACTE, 2019; IWPR, 2015; Rothwell, 2013). However, the gender divide in the preparation of females for high-skilled, high-wage jobs continues to prevail (Ornes, 2019; Lufkin et al., 2003; Kahn & Ginther, 2017; U.S. Dept.. of Education, 2016). Since Virginia’s high school students have access to a plethora of CTE programs, with many more industry credentials to avail of (Castellano, Stone, & Stringfield, 2005), the influence of the school environment, teachers and leaders cannot be understated. Therefore the findings of this study are aimed at informing those pivotal stakeholders.

In undertaking this research to be aimed at policymakers, educators, and CTE advocates, it is hoped that a contribution can be made to the improvement of practice and policy as described below:

How this study can inform practice

1. Schools working on the basis of building SOL scores and accreditation might see the long-term economic value of actual “Technical” and career education programs. Currently, the soft skills assessments of Workplace Readiness Skills for the Commonwealth Assessment and the Working in Support of Education: Financial Literacy are designated as CTE industry credentials. While these assessments measure the valuable knowledge and soft skills needed in the workplace, they work as a component of a stackable credential model, rather than as assessments that measure the earned technical skill to step into a job. In many schools, these assessments have become a safety-net – a means for every student to earn a CTE credential, enabling the student to ‘walk’ on graduation day, for the schools to meet their on-time graduation rate, and for school divisions to gain recognition of this feat (ESG, Advance CTE; CCSSO, 2018). With the economic value to the student, state, and ultimately the place in which the student lives, the dollar amount of an earned technical credential in a completer sequence might encourage an alternative perception of CTE.
2. Changing the perception of CTE in schools by valuing the authentic, work-ready skills embedded in a successful completer program and its aligned, earned industry credentials demonstrates to the school/division that CTE is a viable course for every student, regardless of whether they want to go to college or not. The purpose of CTE should not be ‘work or college.’ Changing the perception of CTE through recognition of the skills, industry credentials, employment potential, as well as entry into post-secondary education might help school policy recognize that CTE is for everyone – not just the

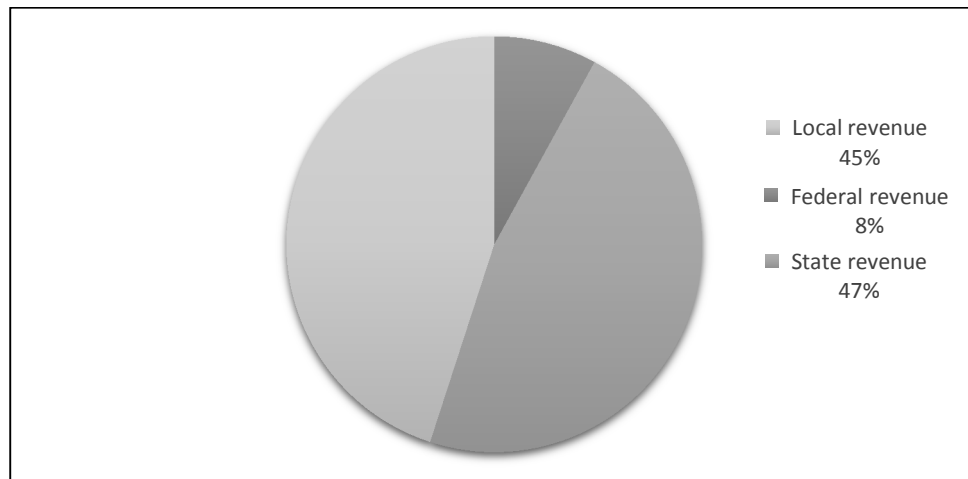
‘hard to teach, hard to reach’ student (ACTE, 2019; Bishop & Mane, 2003; Carnevale, Smith, & Strohl, 2010; Burningglass, 2017).

3. To increase SOL scores in core content areas such as English, social studies, and math, a more significant number of teaching faculty in these areas have been employed. These new full-time positions come at the cost of teachers in the ‘elective’ courses, of which CTE is one. The closing of CTE programs in schools undermines the value and importance of the program. When what matters get reflected in the system, the closing of CTE programs sends a clear message – that it is not essential. By demonstrating the economic potential of CTE and the earning of industry certifications, the evidence might help school administrators in the advancement of CTE rather than in its closure.

How this study can inform policy

1. Economic Policy - As a result of the great recession, many states and school divisions have still not returned to pre-recession levels of funding. Perkins funding goes only a certain amount of the way in supporting CTE. Additionally, as a result of Virginia’s funding formula, an equalized educational spending approach is needed across wealthy and poor school districts. Subsequently, higher and more equal levels of state funding are needed. Figure 1 shows the average share of total K-12 education funding (as of 2015).

Figure 1 Share of Total K-12 Education Funding, 2015



Source: Census Bureau, “Public Elementary-Secondary Education Finance Report, 2015 data.” June 2017, in Leachman, M., Masterson, K., & Figueroa, E. (2017). *A Punishing Decade for School Funding*. Washington DC: Center on Budget and Policy Priorities

2. While efforts are being made at the State level in Virginia’s Department of Education, through the Office of Career, Technical, and Adult Education, the Virginia State Chamber, and the Virginia Association for Career and Technical Education (VACTE), further legislative action is needed to increase funding in CTE. An abundance of literature reports the advantages of CTE and the need for more skilled workers; however, the funding necessary to make this happen is currently insufficient (see figure 1). Through the findings of this study, it is hoped that policymakers will see the return on investment. When the state invests in its students at high school and post-secondary level, the skills, industry certifications validating those skills, and career readiness create human capital that is prepared for the labor market, post-secondary education, or both. Failure to invest in our future is a failure, indeed.

Theoretical Framework

Human Capital Theory

Using the theoretical framework of Human Capital Theory (HCT), where “human behavior is based on economic self-interest of individuals operating within freely competitive markets” (Fitzsimons, 2017), and education is viewed to be an individual investment towards future returns (Bartlett, 2012, p. 3) this research will investigate the economic value of industry credentials to the students who earn them, and of the state in which that student will go onto work. Over the past five decades, the basic premise of HCT has been advanced, applied, and empirically supported in a wide range of education, training, and learning contexts (Bartlett, 2012, p. 3). This tenet explicates the theory that expenditures and investments in education and training are investments that produce capital in human beings in terms of knowledge and skills (Benjamin, Gunderson, & Riddell, 1998). It, therefore, augments natural abilities that are subsequently sold in labor markets (Bedard, 2001). Although HCT has its critics who claim that investing in human capital does not necessarily produce economic growth (Caselli, Eaqivel, & Lefort, 1996; Manikiw & Romer (1992), instead of perpetuating and solidifying ‘economic imperialism’ (Tan, 2014), whereby the individual is “no more than a thing that produces an instrument rather than a teleological end” (Dilts, 2011), this study takes the stance put forth by Becker (2012). For Becker, it is Human Capital Theory that highlights the underinvestment in humans, and further, it is the “poor and disadvantaged people who are most severely affected by this underinvestment” (Becker & Ewald, 2012). It is the perspective of this study, then to frame the HCT in a positive light. From the lens of HCT, the balance of power shifts from the employer to the owner of the much-needed skills and knowledge. Working together, the employer and employee create the capital goods to benefit themselves in terms of salary, the company in terms of competitiveness and bottom line, and the society in which those earnings

will ultimately be spent. By attaining the skills and knowledge that businesses and the economy need to succeed, students/workers own the capital goods demanded by the industry, “goods” that are validated by industry credentials. Further, as Mishel (2011) clearly states:

“Education and training is necessary to obtain the long-term growth we desire and to provide equal access to job opportunities for the entire population and workforce. This was the case 30 years ago and remains the case today. Individuals deciding whether to pursue more education and training would be wise to enhance their human capital, as it will place them in a better position as wage earners and as citizens” (Mishel, 2011).

Methods

The purpose of this study is to determine the economic value of industry credentials for the high school students earning them and the state and superintendent region in which the credentialed student can work. By calculating the potential earnings and possible income tax contributions these credentialed workers can make, this investigation aims to answer the question: what is the economic value of industry credential earnings to the state if the number of students earning them was to increase by ten percent annually? The research methodology used to answer this question is a non-experimental, quantitative study, utilizing both ex post facto data, a Likert survey, and a closed-ended question survey.

Ex post facto data was obtained from several sources. (a) *Industry Credential Assessment Data: 2012-2019*, obtained from the *Virginia Department of Education, Office of Education Information Management*, (2019). Data collected from this report was used to calculate the average number of students completing a CTE program of study over five years, enabling one to identify trends in the growth/decline of CTE participants. The information drawn from this series of statistics was applied to the identification of the average number of students earning an

industry credential over five years, specific to the credential type, which, therefore, helps in the mapping of credentials to the labor market and region. (c) The Bureau of Labor Statistics *Occupational Outlook Handbook* (BLS, 2018). Data collected from this source was employed to determine the mean salary by occupation as well as to identify occupational projections to 2026. (d) Labor market data through ‘*Trailblazers: Career and Technical Education in Virginia*’ (CTAE, 2018), was also used to identify the occupational data projections specific to Virginia and LWIA region. Through the utilization of this data, the research can show the credentials earned, their alignment with specific occupational fields, thereby allowing the calculating of potential salary earnings for the credential holders, and subsequently, the tax contributions potentially available to the state.

The population serving as the focus of this study are high school students enrolled in Career and Technical Education (CTE) programs, through which industry credentials are earned, particularly completer students. Because the Family Educational Rights and Privacy Act (FERPA) protects student data, the postsecondary route taken by Virginia’s students is not definitive; therefore, research findings cannot state the future of each student definitively, but rather the *minimal* earnings they and the state’s Treasury, have the potential to receive. Although ‘completer’ surveys are required to be completed annually by graduating high school students, which tracks students’ post-high school career, e.g., College, University, or Military, the results remain private and, therefore, inaccessible. With this limitation in mind, one can work on the basis that if these students were to enter the job market, a two year or four-year program of study, they carry with them the potential to earn a higher salary as a result of their credentials. This research will show the number of industry credentials earned over the past five years, and

using BLS data, will project the potential economic value of industry credentials to the student, the state, and the superintendent region in which they live.

Overview of the Study

Chapter 1 introduces the background and context to the study at hand: to identify the relationship between the earning of CTE industry credential at the high school on Virginia's labor market skills gap and the State's economy. Presenting justifications for the significance of the study, and the potential contributions to policy, practice, and the field of CTE, chapter one states the 'why' behind this study. Chapter 2 contains a review of the literature pertinent to the areas to be studied. By highlighting themes in the existing literature, a light is shone on the vacuum where gaps exist, demanding the need for study into such an area; this includes the potential economic impact of high school industry credential earners on the labor market and Virginia's economy. Chapter 3 presents the research methodologies at the heart of the study, centering on both the ex-post facto data and survey data collection methods, while Chapter 4 presents the study's findings and analysis of those findings. Chapter 5 addresses points for discussion, the implications for practice, and suggested areas for further research.

Delimitations

When investigating data related to the study of Career and Technical Education, high school industry credentials, and the power of perception afforded to its status in the education system, research is lacking. Recognized by the VDOE as a problem to address at the marketing and public level (General Assembly of Virginia, 2019), research into the perception of CTE, industry credentials, and their intrinsic and economic value at the high school level is rare, thus serving as a significant delimitation to this investigation. As a school division employee working directly with CTE and industry credentials, the author has seen first hand both the value of CTE

and industry credentials, and the resulting lack of interest or value afforded it by key stakeholders. Recognizing this experience brings one to this research with a bias for the assumption of the value of CTE; the matter is also underscored by the absence of research into the perception of these areas and the power of school leadership to direct the influence of the value of CTE to faculty and students. When what matters gets mirrored, the increasing number of core skills faculty compared with the small number of CTE faculty reflects the problem of CTE, industry credentials, and the absence of data. It is the delimitation of research in the area of CTE, which drives this study – to show the potential economic bottom line of the earning industry credentials through CTE, to both the student who earns them and the state in which they live and work.

When investigating the value, economic or otherwise, of high school industry credential attainment and the pathways taken after graduation, a recurring problem arises: the availability of research is lacking. While postsecondary research abounds, at the high school level, it is not so robust (Castellano, Stone, & Stringfield, 2005; Brand, Valent, & Browning, 2013). Reasons for this scarcity of data have been attributed to the difficulty of tracking student data, of Family Education Rights and Privacy Act (FERPA) regulations affecting how student data is transferred between entities, and of the relatively new demand for longitudinal postsecondary data. Consequently, obtaining a complete series of nationwide-disaggregated test data by school division is problematic. With this limitation in mind, the study will focus on Virginia, utilizing the annual industry credential test data from the VDOE. As part of the Perkins accountability measures associated with CTE funding, school divisions across Virginia are required to report to the state the total number of industry credentials taken, failed, and passed, as well as the name and third-party awarding body. For this study, data spanning the past five years, from 2014-2019,

were used to measure against data from the Bureau of Labor Statistics and the Virginia Employment Commission.

Definition of Terms

The purpose of this study is to investigate the potential economic impact of industry-recognized credentials on the Virginia high school student who earns them, and on the Commonwealth of Virginia in terms of taxable income. Because the Virginia Department of Education (VDOE) has specific definitions of industry credentials, as approved through the Board of Education, this study will use those definitions moving forward.

For the VDOE (2019), a credential is defined as:

- *State-issued Professional License*- required for entry into a specific occupation as determined by a Virginia state licensing agency (Licensed Practical Nurse (LPN), Cosmetology);
- *Full industry certification*- from a recognized industry, trade, or professional association validating essential skills of a particular occupation (A+ CompTIA, Microsoft Certified Professional (MCP);
- *Pathway Industry Certification*- which may consist of entry-level exams as a component of a suite of exams in an industry certification program leading toward full certification (Automotive Service Excellence, (ASE), Microsoft Office Specialist (MOS);
- *Occupational competency assessment*- a national standardized assessment of skills/knowledge in a specific career and/or technical area (NOCTI).
- *Completer*- A CTE completer is a student who has met the requirements for a CTE concentration (sequence) and all requirements for high school graduation, or an approved alternative education program (VDOE, 2019).

- *Concentration*- A concentration is a coherent sequence of state-approved courses as identified in the course listings within the web-based Administrative Planning Guide (APG).
- *Stackable Credentials*- Part of a sequence of credentials accumulated over time to build up an individual's qualification to help them move along a career pathway or up a career ladder to potentially different and higher-paying jobs (U.S. Department of Labor, 2010).

CHAPTER TWO

LITERATURE REVIEW

Central to this study is the relationship between the earning of CTE industry credentials at the high school level and Virginia's labor market and economy with reference to each of the eight school superintendent regions. This section will provide a review of the literature surrounding Career and Technical Education, industry credentials, and the common themes found in that research, ranging from perception and stigma to the labor market and funding. While the general expectation of a literature review is to keep the research presented as recent as possible, this review will include research that spans at least ten years in order to demonstrate that, in some instances, patterns continue to remain. Subsequent to this data are the gaps remaining unfilled, which therefore supports the focus of this study. It is the purpose of the study, therefore, to identify the relationship between the earning of CTE industry credentials at the high school level on Virginia's labor market and the State's economy as a whole and by the superintendent region.

Questions

1. What is the trend for high school participation in CTE programs in Virginia?
2. What is the trend for high school completer students earning industry certifications in Virginia?
3. What is the potential income for students earning industry credentials in Virginia's labor market?
4. What is the potential economic impact for the state if the number of CTE students earning industry credentials was to increase by 10% annually?

At a time when the U.S. economy is losing an increasing number of experienced professionals to retirement, automation, and globalization, the skills and experience they take with them are not easily replaced. Recognizing this, the Secretary's Commission on Achieving Necessary Skills (SCANS), and the Conference Board's 2006 report: *Are They Really Ready to Work* issued an urgent call to action: to ensure students are equipped to meet the needs of rapidly changing markets, and the challenges of global competition. For numerous years, the common assertion maintained that the education system was failing its students who graduate from high school lacking the skills necessary to enter the workforce or further education (Partnership for 21st Century Skills, 2007; Casner-Lotto & Barrington, 2006; Bae & Darling-Hammond, 2014; ACT, Inc., 2000). Since the 1991 publication of the Secretary's Commission on Achieving Necessary Skills (SCANS) report: *What Work Requires of Schools* (United States Department of Labor, 1991), demands of the changing workplace and the ability of young people in meeting them have been a constant cause for concern. A concern receiving added impetus following the release of the 2006 report *Are They Really Ready to Work* (Casner-Lotto & Barrington, 2006). While the SCANS report (1991), showed that work involved a relationship of five competencies (resources, interpersonal, information, systems, and technology) and three elements of foundation skills (basic skills, thinking skills, and personal qualities), Casner-Lotto & Barrington concluded that at the high school level, "well over one-half of new entrants are deficiently prepared in the most important skills – *Oral and Written Communication, Professionalism/Work Ethic, and Critical Thinking/Problem Solving* (p. 7, 2006). Central to both reports was the call to action for all stakeholders to consider methods of enhancing essential workplace skills. Chiefly, 75% of the 431 human resource professionals in Casner-Lotto & Barrington's report indicated that K12 schools should be responsible for developing the workplace readiness skills employers

want (2006). For *SCANS*, (1) all U.S. high school students must develop the competencies and foundation skills; (2) the high-performance qualities of the most competitive companies must become the standard for most companies; and (3) the nation's schools must become high-performance organizations if the U.S. is to remain economically competitive. The conclusion was reached that the nation's students must be equipped to meet the needs of rapidly changing markets and the challenges of global competition. For the Conference Board (2006), Partnership for 21st Century Skills (2007), and the Department of Labor (1991), the education system was to be the provider of these needs.

The Contradiction of CTE in Education

While calls have been made of the school system over the years, to ensure that all students are positioned for career success by preparing them for the changing needs of the labor market (Brand, 2008; Greenstone & Looney, 2011; Castellano, Stone, & Stringfield, 2005; ACTE, 2019;) at almost every turn in research literature into Career and Technical Education (CTE), industry credentials and the labor market, a common theme emerges – the contradiction of the value and purpose of CTE. The purpose and value of CTE in meeting the needs of the changing economy versus the declining number of students enrolled in CTE programs is one such example (Passarella, 2018). Placing students in CTE courses as a means to increase on-time graduation rates – i.e., the checking off of a box for school accountability measures in the face of financial sanctions (ESG, Advance CTE; CCSSO, 2018), rather than developing much-needed skills. The calls for high-quality CTE (ACTE, 2019), despite the limited funding provided to the nation's schools (Farrie, Kim, & Sciarra, 2019), with Virginia in particular restrictive in its per-pupil spending (Duncombe, Where money matters most in K-12, 2018). The myopic view of a four-year degree as the only path to success predominates over the much needed, skilled

workforce demanded by the labor market and economists – skills for which a good salary can be earned (Brand, 2008; Greenstone, Looney, Patashnik, & Yu, 2013). The rigor of skills assessed through the earning of industry credentials versus the credential confusion that abounds (Van Noy, McKay, & Michael, 2019; ESG, Advance CTE; CCSSO, 2018). Ultimately, the common thread throughout these elements appears to be the perception, image, and stigma undergirding the purpose of CTE, which continues to swing the education pendulum between the “persistent question of prestige and class” (Kandalec, 2016).

What is Career and Technical Education?

Following its collection, review, and analysis of the demographic changes, labor market needs, and student involvement in vocational educational training in 17 countries, the OECD presented its 2010 synthesis report: *Reviews of Vocational Education and Training (OECD, 2010)*. While providing advice to countries on how to make their vocational education and training systems more responsive to labor market needs, the report also concluded that the United States had virtually no students in vocational education and training (*Tucker, 2018*), as seen in Table 2.

Table 2

OECD Concentrator in CTE Pathways/Vocational Training

OECD Country	Percentage of high school students concentrating in CTE pathway / vocational training
United States	6%
United Kingdom	42%
Germany	59%
Switzerland	64%
Japan	25%

Note: Data retrieved from the U.S. Department of Education. (2013). *National Assessment of Career and Technical Education: Interim Report*. Retrieved from U.S. Department of Education, Office of Planning, Evaluation and Policy Development, Policy and Program Studies Service: <https://www2.ed.gov/rschstat/eval/sectech/nacte/career-technicaleducation/interim-report.pdf>

Although the U.S. sought to remind OECD officials that 20 percent of American students take a three-course sequence in career and technical education, and 75 percent take at least one course (Tucker, 2018), the OECD clarified their point with the example of Switzerland. Here, the “typical student spends three full eight-hour days, 40 weeks a year for three years in a highly-structured apprenticeship at a worksite, with at least one more day each week in a school learning the theory behind the work” (Tucker, 2018).

Table 3

OECD Estimated Percentage of Upper Secondary Vocational Programs

	Time spent in practical training as a ratio of the total program				
	75% or more	Between 50% and 75%	Between 25% and 50%	Less than 25%	Varied depending on institutions, programs, fields, etc
Australia					****
Austria	**	*	**	*	-
Belgium (Flanders)	*	*	-	-	****
Czech Republic	-	*	****	-	-
Denmark	-	****	-	-	-
Finland	****	-	-	-	-
France	*	****	-	-	-
Germany	-	****	*	-	-
Hungary	-	*	***	*	-
Netherlands	*	**	***	*	****
Norway	-	****	-	-	*
Sweden	-	-	***	-	-
Switzerland	*	****	-	-	*
Turkey	-	****	-	*	-
United States	-	-	****	-	-

Note: Estimated percentage of vocational upper secondary programs: - 0%; * 1-25%; ** 26-50%; *** 51-75%; **** 76-100. Source: OECD Synthesis report of the OECD reviews of vocational education and training: Learning for jobs, (2010, p. 62).

For Passarella (2018), the reasoning behind such differences lies in the more robust connections between education, industry, and government in those leading OECD nations. However, the undergirding difference between the U.S. and OECD appears to be the purpose and objective of the vocational education and training programs it provides. For the OECD, the seriousness of the vocational education program allows students to acquire meaningful

credentials with real value in the workplace; or as stated by Tucker, the aim of vocational education and training programs “is to enable the student to start work with a credential of enough value to future employers that those employers are willing to pay the student a good deal more than to a student who does not have the credential” (Tucker, 2018). On the basis this definition is used to understand the objectives of career and technical education, it is reasonable to see how the OECD reached its conclusion and further allows one to see that by this token, no more than three or four percent of the American junior and senior year high school students are in career and technical education.

The 2010 publishing date of the OECD report might garner criticism as a limitation in a literature review; however, the value of this report lies in its findings and timing. The diversity of definitions and purpose of career and technical education signaled the extent to which CTE and vocational education is valued, especially at a time where substantial labor market changes were projected. More significantly, this report was published four years after the implementation of the Carl. D. Perkins Career and Technical Education Act of 2006 (Perkins IV). As the United States’ principal source of federal funding in the improvement of secondary and postsecondary career and technical education programs, the purpose of Perkins IV was to “develop more fully the academic, career, and technical skills of secondary and post-secondary students who elect to enroll in career and technical education programs” (PCRN, 2019). Further, the Carl. D. Perkins Career and Technical Education Act of 2006 defined career and technical education as [the]

organized educational activities that offer a sequence of courses that “(i) provides individuals with coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in current or emerging professions; “(ii) provides technical skill

proficiency, an industry-recognized credential, a certificate, or an associate degree; and “(iii) may include prerequisite courses (other than a remedial course) that meet the requirements of this subparagraph; and “(B) include competency-based applied learning that contributes to the academic knowledge, higher-order reasoning, and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of an industry, including entrepreneurship, of an individual (S. 250, 109th Cong., 2006).

Though different in interpretation from the OECD’s objective of career and technical education, research is replete with the positive by-products of student involvement with CTE programs. As a means of motivating and engaging students CTE has been successful (Castellano, Stone, & Stringfield, 2005; Gentry & Rizza, 2005; National Research Council, 2004; Scherer, 2002). Supplementing, enhancing, and reinforcing academic content such as science and mathematics has provided a context for learning academic skills that demonstrate how theoretical and conceptual knowledge can be applied in real-world settings (Brand B., 2008). Through the integrated, applied curriculum and instruction, research by the University of Minnesota found that students in CTE courses where mathematics was embedded outperformed their peers in regular classes (Brand, 2008; Stone, Alfeld, Pearson, Lewis, & Jensen, 2006). Better attendance and increased graduation rates are also noticeable in the CTE research of Oakes, Selvin, Koroly, & Guiton (1992), Bishop & Mane, (2003), Dougherty & Lombardi (2016) Jacob, (2017), and Malkus, (2019). However, this has prompted some to wonder whether these measures serve as a means of keeping a student in school solely to meet the on-time graduation rate, rather than reinforcing any intrinsic value of the worth of CTE and industry credentials (ESG, Advance CTE; CCSO, 2018).

Industry Credentials

The awarding of industry credentials to high school students has numerous long-term educational benefits, including measuring preparedness for the ever-changing workplace. For the successful student completion of a CTE credential serves as an indicator of success (Castellano et al., 2005). Pursuing and achieving industry certifications enables students to acquire some of the most critical college and career-readiness skills, such as critical thinking, focusing, the ability to prioritize (Null, 2013). The credential can then be used as a signal that an individual has acquired the knowledge, skills, and abilities required in a particular occupation or industry. The student now has a proven skillset of value to the workforce or college. Although studies show that CTE students are more likely to enroll in a two-year college (Jonas, et al., 2014) than a four-year college, research also shows that the job-market between 2012 and 2022 “will require education or training beyond high school, but less than a four-year degree” (FCV, 2017; Rothwell, 2013). Not all students want to go to college, and with the U.S. economy changing from a goods-producing economy to a post-industrial one, demands are being made for workers with qualifications less than a four-year degree, but with postsecondary credentials and skills. Growth measures of fifty to sixty percent are projected in this middle-skill jobs market of *The Hidden STEM Economy*, where salaries “pay \$53,000 on average” (Rothwell, 2013). The value of an industry credential to high school students can, therefore, be seen in financial terms, for school divisions whose students work towards a stackable credential model, where previous skills and competencies are built upon through various stages of an individual’s education and training. Entering college or the workforce with a portfolio of stackable, portable credentials demonstrates the value of CTE and industry credentials not just to students, but to the economy, workforce and the status of the U.S. In their attempt to bring clarity to the market value of

industry credentials, Burningglass Technologies (2017), analyzing their database of more than 700 million past job postings to do so, were able to track how often employers explicitly ask for certifications, and in what context. Findings show that (a) the certifications most in demand were comprised exclusively of measures of technical skills, e.g., welding, computer networking or accounting, and (b) certifications served as either a door opener or career escalator. In the ‘door opener’ capacity, a significant number of the postings noted were available, e.g., Auto Repair, I.T. Help Desk, and welding, (c) Almost 3 out of every ten entry-level auto repair job posting request Automotive Service Excellence (ASE); (d) In entry-level jobs on I.T. Help Desks, almost 1 out of every 5 require a certification, and (e) Employers value these in-demand certifications so much they are willing to pay a higher salary for them, e.g., 21% net premium for ASE certified candidates translates to more than an extra \$9,587 per year (Burningglass, 2017, p. 8).

Table 4

Certification Request Rate in Select Occupation Families. 2015

Occupational Family	Number of Job Postings	Sub-BA Jobs	BA Jobs	All Jobs
All jobs	17,177,962	6%	11%	9%
Management	2,431,936	8%	14%	14%
Business and Financial Operations	1,753,102	11%	18%	18%
Computer and Mathematical	2,850,137	17%	13%	13%
Architecture and Engineering	634,773	6%	10%	10%
Life, Physical, and Social Science	214,815	9%	8%	8%
Community and Social Service	204,431	11%	13%	13%
Education, Training, and Library	379,850	6%	10%	9%
Arts, Design, Entertainment, Sports, and Media	484,243	2%	3%	2%
Protective Service	214,163	8%	12%	8%
Food Preparation and Serving Related	520,079	4%	5%	4%
Building and Grounds Cleaning and Maintenance	162,702	4%	17%	4%
Personal Care and Service	179,061,	11%	3%	11%
Sales and Related	2,638,945	2%	3%	2%
Office and Administrative Support	2,343,410	3%	16%	3%
Construction and Extraction	170,198	9%	12%	9%

Installation, Maintenance, and Repair	554,750	14%	8%	14%
Production	398,258	7%	5%	5%
Transportation and Material Moving	1,033,109	6%	NA	6%

Note: Data retrieved from ACTE. (2019). *ACTE strategic direction and vision statement*. Retrieved from Association for Career and Technical Education: <https://www.acteonline.org/about/acte-mission-standard>

The second stream of research prevalent in industry credential research is the continued confusion surrounding the notion of just what an industry credential is (Muller & Beatty, 2009; Bartlett, 2012; Burningglass, 2017; ESG, Advance CTE; CCSSO, 2018; Van Noy, McKay, & Michael, 2019; Goger, 2019). Used interchangeably to mean licensure, certification, digital badge, accreditation, and micro-credential, the term ‘*industry credential*’ is taken to refer to a certification issued by a third-party occupational or industry group to signal completion of appropriate training, culminating in the passing of an exam, validating the ownership of that technical skill or knowledge. Research is also clear that the plethora of credentials available from state to state, offered by as many vendors, is just as confusing as the many definitions of industry credentials, particularly for schools and businesses when determining the value of a credential (Muller & Beatty, 2009; Bartlett, 2012; Burningglass, 2017; Van Noy, McKay, & Michael, 2019). Due to the varying requirements in place whereby a credential can be obtained, the value or ‘currency’ of some credentials are called into question. In their research, however, ESG, Advance CTE; CCSSO (2018) recognized this need for (a) a deeper and more transparent understanding of what industry credentials are, (b) how they can be earned, and (c) their role in the ability to meet current and projected workforce demands. Creating a guide whereby states can identify and promote credentials of value, *Currency Credential* (ESG, Advance CTE; CCSSO, 2018) addressed identified and addressed the three substantial challenges meeting numerous states:

1. How can states reliably identify industry-recognized credentials that are valued by employers in industries aligned to their economy?
2. What will incentives for students, schools, and districts likely accelerate and grow credential attainment rates?
3. How can states overcome a lack of access to source data on credentialing exam results to measure and report student attainment of those credentials reliably?

In partnership with state leaders, businesses and industry associations, and policy and research organizations, the recommendations from the *Credential Currency* report identified robust strategies based on current and emerging best practices from around the country to identify and help states adopt and modify the information needed to help students earn valuable credentials that will prepare them for continuing education and good jobs (p. 12). Building on this need to clarify the confusion surrounding industry credentials, research by the Rutgers Education and Employment Research Center (2019) likewise offered a broad definition of non-degree quality. This definition included four key elements: credential design, demonstrated competencies, market processes, and outcomes of value (p. 2). Creating a guide which policymakers could use as a diagnostic tool to identify weaknesses in credentials, the need to reduce confusion and increase awareness was paramount. The subsequent recommendations were made:

1. Create awareness of non-degree credential quality and how to measure it.
2. Collect better information on non-degree credential quality and outcomes.
3. Develop and promote systems to assess the non-degree credential quality
4. Promote and understand the use of data on non-degree credential quality (ESG, Advance CTE; CCSSO, 2018, p. 5).

While the limited amount of credentialing data have prevailed as a limitation to credentialing research over the years (Castellano, Stone, & Stringfield, 2005; Brand, 2008; Muller & Beatty, 2009; ESG, Advance CTE; CCSSO, 2018), two common themes that do appear in existing literature are:

(a) The purpose of industry credentialing to the employer and potential employee, as a signal that skills, education, and training in a predetermined level of proficiency have been reached a particular area of validation, (Stone, 2017; Stone, 2014; Bartlett, 2012).

(b) That credentials of currency, serve to place students on a robust and sustainable pathway to a financially rewarding career (Van Noy, McKay, & Michael, 2019; ESG, Advance CTE; CCSSO, 2018; Tucker, 2018; Burningglass, 2017).

Throughout many years industry credentials have served to indicate the attainment of a predetermined benchmark in a specific technical area, connoting workplace readiness and readiness for a path of financial success. Limiting that research, however, is the variety of credentials available and the value or currency applicable to that credential. Although the research referred to in this review exceeds the required five years for a literature review, the research itself is valuable in that it shows the continuum of time through which the issues identified ten years ago remain. Central to the identification of these issues is the common theme in CTE and industry credentialing data – the absence of data.

Absence of Data

While research abounds at the postsecondary level, of the value of industry credentials in the four-year colleges, community colleges, and the workplace, research surrounding industry-credentials at the high school level is not so robust (Castellano et al., 2005; AIR, 2013; Bielick, et al., 2013; Jacob, 2017; ESG, Advance CTE; CCSSO, 2018;). Reasons for this scarcity of data

have been attributed to the difficulty of tracking student data, of privacy laws such as Family Education Rights and Privacy Act (FERPA) regulations impacting how student data are transferred between entities, and of the relatively new demand for longitudinal postsecondary data (Brand B., 2008). Concerning industry credentials, the external agent that provides the certification does not report students' performance on industry assessments to schools. A transparent, thoroughly coordinated administration of assessments via proctors could alleviate this tracking; however, in some instances, the external agents refuse to divulge any student-related data to the school (National Retail Federation). In Jacob's (2017) study, *What we know about Career and Technical Education in High School*, an analysis of the What Works Clearinghouse, found that in relation to educational research, there were currently, 83 programs with experimental or quasi-experimental evidence in the area of early childhood education; 39 programs for drop-out prevention; 32 programs for English learners, and in the area of secondary CTE, there is only one (Jacob, 2017). Research into the technical skills and capacities developed by high school students in CTE classes subsequently remains minimal. While Perkins IV and V, have established funding to support the requirement of earning credentials, with the recording of credentialing data as a financial accountability measure, specific research into the practices through which student knowledge and performance assessment are measured, and the subsequent return on investment of the financial value of industry credentials, remains sparse. The paucity of data and rigorous research has led the Institute for Education Sciences (IES) to initiate several data collection and research grants; however, the evidence is clear – a great deal of robust, longitudinal data and research into CTE and industry credentials is needed. Nevertheless, in the absence of longitudinal data systems that can help track labor participation of students following graduation, incorporating industry credentials into its database, the omissions of data help

contribute to the misunderstanding of the value of CTE and industry credentials at the secondary level (Brand B., 2008; Muller & Beatty, 2009; ESG, Advance CTE; CCSO, 2018).

Perception

A major theme running through research literature into CTE and industry credentials is the continued low level of awareness and outdated perception held by the public, educators, and students, while being “chronically neglected” by policymakers (Bartlett, Horwitz, Ipe, & Liu, 2005; Brand, 2008; Muller & Beatty, 2009; Quailey, 2012; Stone, 2014; Kandalec, 2016; Dougherty, 2016; Malkus, 2019; ACTE, 2019; General Assembly of Virginia, 2019). The prevailing perception has many holding to the stereotype that career and technical education lacks academic rigor, leads to antiquated, undesirable, or low-paying jobs, limits access to college, and serves only low performing students (Brand B., 2008). The history of CTE does little to dispel the myth of an egalitarian process with the tracking of low-income students and students of color into low-income occupations based on “ability” rather than allowing students to choose, (Goger, 2019; Malkus, 2019). While CTE provides students with skills demanded by the labor market while preparing them for post-secondary education (Jacob, 2017, p. 1), Tucker (2018, p. 2) captures the acuity of CTE:

On the street, career and technical education is widely thought of as the place where the struggling students go. The reality is that our career and technical education system is more often than not where we send the students who we think are not very good at academics to get an education that, more often than not, is not even intended to confer the skills they need to make a decent living. Because of CTE's low-status students with stronger academic skills who might have preferred a more applied form of education avoid it.

On March 29, 2018, the General Assembly of Virginia enacted House Bill 1530. Acknowledging the prevalence of negative stigma surrounding CTE, the bill required the Virginia Department of Education to make recommendations relating to (a) Strategies for eliminating any stigma associated with high school career and technical education. (b) The consolidation of the standard and advanced studies diplomas into a single diploma (General Assembly of Virginia, 2019). Convening a working group of representatives which included the Virginia Manufacturing Association, Virginia Chamber of Commerce, Virginia Career and Technical Association, State Council of Higher Education in Virginia, Virginia Association of Superintendents, Virginia School Board Association, Virginia Community College System, school division superintendents, Career and Technical education administrators, school counselors, teachers and students, the working group sought to respond to and discuss HB1530. While the group failed to reach consensus on various aspects of the bill, the working group did make the recommendation to “change perceptions and raise awareness” of career and technical education through sustained promotional awareness campaigns. While providing recommendations for “work-based learning,” “inspiring innovation,” and “providing an incentive for comprehensive high school CTE programs,” the undergirding current setting the “vocational” apart from the “academic” inspired no such recommendation. The increased pressure on state academic assessments (e.g., end-of-course exams or high stakes tests) and emphasis of college as the end goal, has, according to the Youth Forum “signaled that disciplinary knowledge is the only type of knowledge with learning, and devalues the attainment of other types of knowledge” (Brand, 2008, p. 6).

Further, this increased accountability mounting the pressure on core academics has led many schools to incorporate remedial courses or tutoring to improve their state scores. As far

back as 2002, Phelps, and more recently, Jacob, (2017), recognized that the higher the number of required courses, the more significant the reduction of CTE enrollment due directly to the lack of time in a student's schedule. As Fletcher so succinctly put it in 2006, "we are already seeing increased academic courses for graduation, therefore reducing the time available to students to take career technical courses...this insight reinforces the assumption that CTE courses may be squeezed out of the curricula with students and administration believing that CTE courses are a waste of time" (Fletcher, 2006, p. 165). Findings supported by the research of Bartick and Hollenbeck (2006) further cautioned that more course requirements would increase drop-out rates and decrease enrollment in CTE (Quailey, 2012). In their findings, ESG, Advance CTE, CCSSO, (2018) elaborated on the time constraint of CTE versus core subjects in the curricula. Because of continued perception that CTE is the less rigorous option, a decreased rate of CTE completers is bound to ensue. The reasoning behind this statement lies in the fact that industry credentials "are generally the culmination of a three-or-more-course career pathway," therefore if CTE courses are being squeezed out of the curriculum, students are being barred from the opportunity to earn a credential with workforce currency (ESG, Advance CTE; CCSSO, 2018, p. 23).

The perception of the unmotivated, uninterested, hard-to-teach, hard-to-reach CTE student has also been countered by (Cheng & Hitt, 2018). Drawing on data from the longitudinal educational study undertaken by the US Department of Education in 2002, which surveyed more than 15,000 American 10th-grade students from 2002 to 2012, findings revealed that the student self-reports of self-efficacy in academics, teacher reports of student behavior, and observed levels of behavior, student conscientiousness and self-control were no higher than those otherwise similar students. Moreover, "CTE students are just as attentive as their peers, just as

likely to complete their homework, and much less likely to be absent from class” (Cheng & Hitt, 2018, p. 1).

Labor Market

According to the Bureau of Labor Statistics (Bureau of Labor Statistics, 2017), employment is projected to increase by 11.5 million over the 2016-2026 decade, representing a growth of 0.7% annually. Accounting for this increase is the aging population, who will not only leave their job behind but will drive the occupational changes in a large share of the new jobs projected to 2026, e.g., healthcare services. Data show that employment in the healthcare and social assistance sector is projected to add almost 4.0 million jobs by 2026, and an estimated one-third of all new jobs, accounting for 13 of the 30 fastest growing new jobs (Bureau of Labor Statistics, 2017, p. 4).

Table 5

Projected Percent Change by Select Occupational Groups, 2016-2026

Occupational Group	Projected percent change, by select occupational groups, 2016-26
Healthcare support occupations	23.60%
Personal care and service occupations	19.10%
Healthcare practitioners and technical occupations	15.30%
Community and social service occupations	14.50%
Computer and mathematical occupations	13.70%
Construction and extraction occupations	11%
Total, all occupations	7.40%

Note: Bureau of Labor Statistics (2017). *Employment projections: 2016-2026*. Washington DC: U.S. Department of Labor

If the labor force participation rate is a crucial measure of economic health (Bauer, Moss, Nunn, & Shambaugh, 2019), the evidence will point to the skills-gap and labor participation of young and old, as an ailment. The research undertaken by the Hamilton Project (Bauer, Moss, Nunn, & Shambaugh, 2019, p. 3) found that:

- (a) The downward trend in youth labor force participation is occurring against a backdrop of increasing school enrollment (Dennett & Modestino, 2013),
- (b) More students are graduating from high school and enrolling in post-secondary institutions, (US Department of Education, 2016a)
- (c) School dropout rates have declined over 40 years, falling from 9.7% in 2006 to 5.4% in 2017, (US Department of Education, 2016b)
- (d) In October 2018, 69.1% of the high school class of 2018 was enrolled in college (Bureau of Labor Statistics, 2019)

With more of the young population continuing into postsecondary education, the availability of workers with the skills needed to fill the skills-gap of new technologies, globalization, and vacancies left behind by retirees, a subsequent ‘middle-skills’ gap has emerged. Research abounds of the labor market changes, demanding increased efforts into skill-building and preparing our students for such changes (Greenstone & Looney, 2011; ESG, Advance CTE; CCSSO, 2018; VACTEA, 2018; Bureau of Labor Statistics, 2017). Further, claims by Virginia’s Association of Career and Technical Education Administrators, to state policymakers make clear that “Virginia’s future workforce must be retooled and reskilled to respond to new growth opportunities in high-tech, high-growth, potential industries” (VACTEA, 2018, p. 3). Such calls are echoed in the extant CTE research that credentials and postsecondary credentials matter more today than any time previously in history (ESG, Advance CTE; CCSSO, 2018, p. 13). While the same research maintains that by the end of the decade, more than two-thirds of all jobs will require a postsecondary certificate or degree (Carnevale, Smith, & Strohl, Help wanted: Projections of jobs and education requirements through 2018, 2010), it also makes

clear that not all students must earn a bachelor's degree. Further, not only are there 30 million "good jobs" nationwide held by people with less than a BA, data presented by Georgetown University finds that 28 percent of associates holders, and many workers with one-year certificates, earn more than the average BA holder (Carnevale & Cheah, 2018).

Employment projections in Virginia, as stated by Trailblazers labor market data, will be over 4 million job openings between 2014-2024. It is projected that half a million new jobs will be created in Virginia. Approximately 45 percent of Virginia's current labor market is comprised of jobs requiring less than a baccalaureate degree but more than a high school diploma (Virginia Board of Workforce Development). Evidence of regional changes and projections can be seen in Table 5 as a synthesis of the findings of the Virginia Department of Education, the Weldon Cooper Center for Public Policy, and the Virginia Employment Commission (Trailblazers CTAE, 2019). The projected employment figures from 2016 to 2026 are set to increase significantly.

Table 6

Regional Labor Market Data by Local Workforce Investment Area, 2016-2026

Workforce Investment Area	Number of Jobs	
	2016 Estimated Employment	2026 Projected Employment
Southwestern VA (I)	58,133	62,533
New River/Mt. Rogers (II)	146,832	158,439
Western VA (III)	167,609	181,165
Shenandoah Valley (IV)	227,123	247,722
Piedmont (VI)	174,618	194,135
Central VA (VII)	103,490	111,760
South Central (IX)	57,329	62,313
Capital Region (IX)	588,548	648,035
Northern Virginia (XI_XII)	1,296,174	1,467,605
Bay Consortium (XIII)	171,735	192,474
Greater Peninsula (XIV)	237,905	257,130
Crater Area (XV)	72,100	78,390
Hampton Roads (XVI)	537,701	589,331

West Piedmont (XVII)

71,906

77,894

Note: Data retrieved from CTAE. (2019). *Labor market data*. Retrieved from Trailblazers Career and Technical Education in Virginia: <http://ctetrailblazers.org/labor-market-data/>

By 2040 the nation's population is projected to age and projected to become more female. It is estimated that Virginia will see the female population stand at an estimated 50.9% compared to males at 49.1%. (Crespin, 2019), and by 2073 close its gender wage gap (Institute for Women's Policy Research, 2015). Further, the shift in recent decades to a more service-based economy in the US has changed the requirements and demands it makes on the American workforce and education. Key findings of the Cyberstates 2016 (CompTIA, 2016) report show that by state, Virginia ranks third in its computer systems design and related services sector, fifth in its engineering service industry, and second nationally in its concentration of tech workers. Taken together, these societal changes make clear the call for action: all students, regardless of gender, color or background should be provided the education and skills to prepare them for the “high levels of educational attainment and competencies which have become closely associated with labor market success” (Fogg, Harrington, & Khatiwada, 2018). Indeed, “those individuals who lack advanced knowledge or skills to satisfy the increasingly technical demands of the new labor market may find themselves in less stable employment or trapped in long term unemployment.” (World Economic Forum, 2014). Preparing students for the demands of a 21st-century labor market is imperative not only as a means to ensure a healthy economy and with individuals earning a healthy income, but as a means of social justice and equity, an egalitarian path to success should be prepared by and embraced by all for the benefit of all.

Funding

Findings into the relationship between spending and achievement have long been a contentious issue in educational, economic research. One side of the debate Hedges &

Greenwald (1996), Flanigan, Marion, & Richardson (1996), Vertsegen & King (1998), Opkala (2002), and Lou, et al., (2018) assert the positive relationship between spending and achievement, while opposing this view, Coleman et al., (1966), Hanushek (1986), and LeFevre & Hederman (2001), maintain that no such evidence of a link between spending and achievement exists. However, consensus does emerge in the frequent analysis of states' fiscal policy decisions – that “none of the states measure up on even rough measures of adequacy and equity in school funding” (Simms, 2004; Salmon, 2010; Leachman & Mai, 2014; Duncombe, 2018; Farrier, Rober, & Sciarra, 2019). As a nation, one can see that as a percentage measure of the GDP, the total amount of funding assigned to education has continually decreased, and is projected to do so further. Figure 6 shows the respective declines in fiscal years 2010 to 2020.

Table 7

U.S. Education: Fiscal Years 2010 - 2020

Year	GDP – U.S. \$ billion nominal	Population – U.S. million	Education – Total % GDP
2010	14992.1	309.326	6.14
2011	15542.6	311.58	5.81
2012	16197	313.874	5.67
2013	16784.9	316.058	5.45
2014	17521.7	318.386	5.5
2015	18219.3	320.743	5.63
2016	18707.2	323.071	5.57
2017	19485.4	325.147	5.76
2018	20494.1	327.167	5.48
2019	21288.9	329.523	5.65
2020	22409.7	331.896	5.5

Source: https://www.usgovernmentspending.com/spending_chart_2010_2020USp_21s2li111mcn_20t

When disaggregated by state, the pattern of education funding by percentage of GDP in Virginia fluctuates between 1.86% at its highest point in (2012), and 1.75% at its lowest projected point in 2020. Data in Table 8 make clear that regardless of the GDP, Virginia's investment in education is much less than 2% of its GDP.

Table 8

Virginia Education - Fiscal Years 2010 - 2020

Year	GDP-VA \$ billion nominal	Population-VA Million	Education Total % GDP	Education – VA % GDP
2010	422.902	8.024	5.42	1.78
2011	432.393	8.1	5.31	1.82
2012	444.95	8.185	5.35	1.86
2013	455.07	8.253	5.37	1.85
2014	463.782	8.312	5.33	1.78
2015	484.628	8.363	5.24	1.79
2016	493.866	8.411	5.15	1.78
2017	510.425	8.465	5.35	1.79
2018	534.449	8.518	5.4	1.77
2019	553.694	8.57	5.49	1.77
2020	581.913	8.624	5.48	1.75

Source: https://www.usgovernmentspending.com/spending_chart_2010_2020VAp_21s2li11mcn_20t20s#copypaste

In its research on pre and post-recession spending on education, the Center on Budget and Policy Priorities (2014), found that at least 30 states are providing less funding per student in 2014-2015 than they did before the recession, with Virginia reducing its spending by 11%, at the cost of \$679 per student (Leachman & Mai, 2014, p. 2). Consequences of such cut-backs not only undermine educational reform, but they also do so in a way that makes recruiting and retaining quality teachers, and teachers of critical shortage areas such a CTE extremely difficult (all4Ed.org, 2019; U.S. Department of Education, 2017). When quality teachers are essential to improving student achievement and teaching them the skills needed to be successful in postsecondary opportunities, such a reduction in education spending is harmful to the student, the state and economy (Flanigan, Marion, & Richardson, 1996; Simms, 2004; Leachman & Mai, 2014; Farrie, Kim, & Sciarra, 2019).

While it is true that CTE programs receive federal funding through the Carl D. Perkins IV Act, and Perkins V, to be used for the following purposes:

1. Provide financial incentives and additional supports for individuals with industry or educational backgrounds to become certified as CTE teachers, particularly in STEM-related fields.
2. Create or expand recruitment and retention efforts through Professional development, curricular and pedagogical support, peer mentoring, and externships with businesses.
3. Provide training for teachers and counselors to increase their understanding and ability to communicate current CTE career opportunities and employment trends to students.
4. Incentivize CTE teachers to earn industry- or sector-specific certifications and credentials, such as in the STEM fields or other in-demand industry sectors or occupations.
5. Improve and diversify the pipeline of educators into the CTE teaching profession by underwriting preparation for individuals from both industry and academic backgrounds, particularly in subject-area shortage fields (all4Ed.org, 2019).

Lobbyists, advocates, and organizations created to educate policymakers indicate that funds are still insufficient for such purposes and should be increased (ACTE, 2019). America's workforce and student demographics are changing, creating a skills-gap for employers and a crisis for the economy. For students graduating high school or postsecondary education, with skills validated by a third-party industry-based body, the opportunity to earn a 'good' wage, requires a more meaningful consideration of fiscal policy. Data in Table 9 indicates the percentage of Perkins funding compared to Virginia's GDP.

Table 9

Percentage of Perkins funding to VA GDP

Year	U.S. % Per GDP	VA % Per GDP	Perkins % Per VA GDP
2011	5.31	1.82	0.004
2012	5.35	1.86	0.039
2013	5.37	1.85	0.038
2014	5.33	1.78	0.004
2015	5.24	1.79	0.004
2016	5.15	1.78	0.004
2017	5.35	1.79	0.005
2018	5.4	1.77	0.005
2019	5.49	1.77	0.005
2020	5.48	1.75	0.005

Source: VDOE. (2018). *Superintendent's Memo #108-18*. Retrieved from Commonwealth of Virginia Department of Education: http://www.doe.virginia.gov/administrators/superintendents_memos/2017/178-17a.pdf and https://www.usgovernmentspending.com/spending_chart_2010_2020VAp_21s2li111mcn_20t20s#copypaste

Summary

Upon examination of the literature surrounding Career and Technical Education, and industry certifications, the emerging themes are consistent in their confusion. The value of CTE in general and the importance of skills developed in CTE programs are highly regarded by the labor market and is much needed. The earning of industry certifications in those skill areas provides currency in value, as well as a door-opener, signaling to potential employers they have the skills necessary to begin a career. However, the undergirding problem with CTE is the stigma it has carried through time, both as a distinction between the academically inclined, and those destined for nothing beyond high school; the distinction between the classics, and blue-collar work. With the increasing emphasis on college as the most successful route for the earning of a sustainable living wage, anything other than the myopic focus on the four-year degree is derided as inferior, resulting in the reduced enrollment figures. The demographic chasms that have appeared due to the aging and retiring workforce and the absence of young people in the labor market has led to millions of jobs that cannot be filled because no one has the skills to fill them. This middle-skill labor market is such that those with the skills can command a very good salary

in meaningful occupations. However, the problem of perception is also accompanied by the problem of funding. When both national and state funding reflect a minimal investment in its schools and students, the issue arises – how much more can be done with less? The funding of education speaks loudly as to a state's priorities. Policymakers recognize the importance of CTE and the need to fill the skills gap. However, absent in their literature is the financial difference that CTE and the earning of industry credentials can make to an individual, and to the state's revenue. When everything boils down to the bottom line – the financial line, the data gap in the dollar value of industry credentials to a state is significant.

CHAPTER THREE

METHODOLOGY

Research Design and Data Collection

Using a non-experimental, quantitative methodological approach to this research, with data collected through the use of ex post facto data, and two surveys, one a Likert survey, the other a closed question survey, the purpose of this research is to identify the relationship between the earning of CTE industry credentials at the high school level on Virginia's labor market and the State's economy. The industry credentials referred to in this study are those approved by Virginia's Board of Education (VDOE, 2020), and defined as a:

- State-Issued Professional License, required for entry into a specific occupation as determined by a Virginia state licensing agency (Licensed Practical Nurse (LPN), Cosmetology).
- Full Industry Certification, from a recognized industry, trade, or professional association validating essential skills of a particular occupation (A+ CompTIA, Microsoft Certified Professional (MCP).
- Pathway Industry Certification, which may consist of entry-level exams as a component of a suite of exams in an industry certification program leading toward full certification (Automotive Service Excellence, (ASE), Microsoft Office Specialist (MOS); or
- Occupational competency assessment, a national standardized assessment of skills/knowledge in a specific career and/or technical area (NOCTI).

Ex Post Facto Data

Ex post facto industry credential assessment data provided by the *Virginia Department of Education, Office of Education Information Management (2019)*, are used to determine the

number of test-takers by both credential area (from years 2014-2019) and Superintendent Region.

Data from the Bureau of Labor Statistics are utilized to determine the projected occupational openings in Virginia to 2026 and is applied in conjunction with data provided by TrailBlazers: Career and Technical Education in Virginia (CTAE, 2018). Ultimately, the data collected from the described datasets are employed to show the current participation trend of Virginia's high school students in CTE programs and their earning of industry credentials.

Survey Data

Two further datasets are utilized to calculate the potential income of completer students earning CTE industry credentials in Virginia's labor market:

1. Likert survey: Central to this study is the alignment of CTE industry credentials earned in the last five years, with possible occupations reasonably open to that candidate when seeking employment. To ensure the validity of the results and elimination of any potential for researcher bias in this alignment, a five-point Likert survey was sent to ten CTE experts, 5 in Virginia and 5 in Texas. Using a five-point Likert scale survey, the CTE experts were asked to indicate their level of agreement with the alignment, "one" indicating a low level of agreement, and a "five" representing a high level of agreement. Feedback from this survey was used to ensure the alignments were in agreement with the CTE expert (see Appendix 1.3).
2. A five-question closed answered survey was provided to representatives of Virginia's business representatives. To understand the extent to which industry credentials are valued in the workplace, the five questions asked the respondents to make employment

and salary decisions based on the applicant holding CTE industry credentials. This survey can be seen in Appendix 2.

By determining and calculating the potential earnings and possible income tax contributions credentialed workers can make, this study aims to answer the following questions:

1. What is the trend for high school participation in CTE programs in Virginia?
2. What is the trend for high school completer students earning industry certifications in Virginia?
3. What is the potential earning for students earning industry credentials in Virginia's labor market?
4. What is the potential economic impact for the state if the number of CTE students earning industry credentials was to increase by 10% annually?

Ex Post Facto Participants

Participants in this study are Virginia high school students in grades 9-12 who have or are currently undertaking a CTE completer program of study at the high school level, or in one of Virginia's technical centers. A "completer" is a student who has undertaken at least two consecutive years of a CTE program. Using the *Industry Credential Assessment Data: 2012-2019*, obtained from the *Virginia Department of Education, Office of Education Information Management, (2019)*. The population size of the CTE school participants in **984,284**. Each of the 17 national CTE Cluster areas will be represented in the data:

1. Agriculture, Food & Natural Resources
2. Architecture & Construction
3. Arts, A/V Technology & Communications
4. Business Management & Administration
5. Education & Training

6. Finance
7. Government & Public Administration
8. Health Science
9. Hospitality & Tourism
10. Human Services
11. Information Technology
12. Law, Public Safety, Corrections & Security
13. Manufacturing
14. Marketing
15. Science, Technology, Engineering & Mathematics (STEM)
16. Transportation, Distribution & Logistics
17. Energy

Student participation in CTE industry credentialing makes them and their data eligible for this study. Students represent the following Virginia Department of Education Superintendent's Regions:

Table 10

Virginia Department of Education Superintendent's Regions

Virginia Region	Name
Region 1	Central Virginia
Region 2	Tidewater
Region 3	Northern Neck
Region 4	Northern Virginia
Region 5	Valley
Region 6	Western Virginia
Region 7	Southwest
Region 8	Southside

Notes: VDOE. (2019). *Superintendent's Regions*. Retrieved from Commonwealth of Virginia Department of Education: http://www.doe.virginia.gov/directories/va_region_map.pdf

The population serving as the focus of this study are high school students enrolled in Career and Technical Education (CTE) programs, through which industry credentials are earned. Because FERPA limits us, we cannot state definitively that these students will go on to postsecondary education. Although ‘completer’ surveys are required to be completed annually by graduating high school students, which tracks students’ post-high school career, e.g., College, University, or Military, the results remain private and, therefore, inaccessible. With this limitation in mind, one can work on the basis that if these students were to enter the job market, a two year or 4-year program of study, they carry with them the potential to earn a higher salary as a result of their credentials. This study aims to identify the relationship between earning CTE industry credentials at the high school level on Virginia’s labor market and state economy. By investigating the number of industry credentials earned by high school students over the past five years, and aligning them with occupational and salary data, the objective of the study is to determine a dollar amount that both student and state can potentially yield. The data sources used to determine this dollar figure are as follows.

Virginia Department of Education: Industry Credential Assessment Data: 2012-2019

Available to the public upon request, is the *Industry Credential Assessment Data: 2012-2019*, obtained from the *Virginia Department of Education, Office of Education Information Management, (2019)*. Data presented in this report are a culmination of annual CTE data. Serving as an accountability measure for the VDOE, and as a requirement for both state and federal funding, the information collected by the VDOE and presented in this dataset serves to help the VDOE (a) plan budgets, (b) determine the Standards of Quality (SOQ) funding for career and technical education programs, (c) determine the disbursements of federal funds for the

administration of CTE programs, and (d) report CTE accountability data to federal, state, and local agencies or individuals in response to request for specific information (VDOE, 2019).

The *Industry Credential Assessment Data: 2012-2019* is appropriate to the study since the source of the data is a federal and state-mandated, recording process. Further, the security and validity of this data should be considered sound since the data collected from these reports are used to inform the Annual Performance Report (APR) for each school division – primarily, the division-wide report card (VDOE, 2019), and is also the same data that the Commonwealth of Virginia will be using in its following year’s funding plan (VDOE, 2019, p. 1).

Specific data entry procedures for the uploading of CTE data by school divisions are explicitly stated in the VDOE’s CTERS Manual (VDOE, 2019), e.g., school division administrator responsible for reporting the data; timelines and reporting deadlines. Ensuring a uniformed and standardized approach to the data entered, each of the 131 school divisions in the eight educational superintendent regions of Virginia, are required to submit information pertinent to the following:

1. Secondary enrollment demographics
2. CTE financial report for the school year
3. CTE follow-up survey of program completers
4. Secondary student career clusters enrollment report
5. Completer demographics completion
6. CTE credential collection

For this study, data from the academic year 2014 to 2019 were used. This time frame was intended to assist in determining the number of completers, and the number of industry

credentials earned by CTE students in Virginia. Once this figure had been identified, a cross-reference to the occupational areas and respective average salary was tentatively made.

Population of Participants

Because this study uses a five-year time frame, the data available in this report shows the number of participants as:

1. The number of students enrolled in one or more CTE courses (*n* **984,284**).
2. The number of CTE completers – students who have completed at CTE concentration.

This is an unduplicated count (*n* 205,825).

Instrumentation

Designed by the VDOE and accessible to qualified and specified administrative division personnel through the SSWS platform, the *CTE Program Enrollment Form* data are collected using the Secondary Enrollment Demographics Form (SEDF) instrument twice a year -January and September. Recording enrollment numbers that are verified as of October 1st, for all CTE state-approved 6-, 9-, 12-, 18-week and yearlong (36 weeks) classes, the CTE administrator submits the division's data through SSWS via the Fall Master Schedule Collection (MSC) reporting procedure – a report serving to satisfy federal assurances, while also reporting the number of non-traditional students in designated Career and Technical Education classes (VDOE, 2019). The validity of the data available in this report is strengthened through the mandatory nature by which it is requested, the secured process through which data is collected, and through the financial implications to the school division entering incorrect data. Since the critical data collected by the VDOE is used to plan the following year's budget, the need to enter the correct information into the VDOE system is paramount. The reliability of the content is evidenced in the unified use of standardized reporting. For each data set requested, the questions

used to elicit the data are standardized with the same question, and in the same format requested of each school division.

Data Analysis

Data pulled from *Industry Credential Assessment Data: 2012-2019* were used to calculate the average number of students participating in CTE courses and the number of students completing a CTE concentration of courses in those five years. By calculating the average number of students in each category over this timeframe, the goal is to identify a trend in the growth/decline of CTE participants, which can then be used to inform the subsequent data analyses from alternative data sets.

Limitations

The limitation with the data presented in the *Industry Credential Assessment Data: 2012-2019* report, is that it provides a breakout of the number of completers by region, and by year, which is extraordinarily helpful to this study, however, in its list of industry credentials, there is no indication of which assessments have been taken as a completer series. Students who have completed an Advanced level assessment can be seen to have completed a completer sequence, as can the student who has earned a MOS Master. However, the data does not show whether a student has taken one individual MOS credential or a series of them. For this study, this limitation could be regarded as a significant limitation; however, in this instance, it serves as an amplifier instead of a limitation. Because one is unable to state with any certainty that the student who earned one MOS certification (as an example) did or did not earn another, the data was disaggregated by known completer credentials. For example, students who have earned a MOS Master are included in the final calculation since this series of credentials takes place over two years. For the completer credential to have value, a significant amount of time (seat time or

otherwise), is needed. Earning one single certification does not mean that it carries the same value as a series of earned credentials. With this in mind, the data is disaggregated into three categories: (a) Technical – completer assessments, (b) Other – students on the CTE completer pathway, e.g., are at level one of a two-year program, and (c) Soft skills / College and Career Ready.

The number of completers under this new disaggregation is **133,721**. With this in mind, the results of this study show the potential economic impact that 133,721 completers *could* make on Virginia’s economy. The findings in this study serve as a minimal starting point – calculating the floor rather than the ceiling of potential.

Bureau of Labor Statistics: Occupational Projections and Worker Characteristics

Readily available to the public through the Bureau of Labor Statistics is the detailed *Occupational Projections and Worker Characteristics* dataset (BLS, 2019). As a reference point for this study, the BLS data presents a substantial matrix of occupational data, ranging from current employment levels to that projected to 2026, along with estimated employment changes, occupational openings, median annual wage, and typical education needed for entry into that occupational area.

Instruments

To support this study, data gathered from this dataset includes: (a) Fastest growing occupations, (b) Occupations with the largest projected job growth, (c) Fastest declining occupations. These datasets are appropriate to this study because if one is to determine the best path for our high school graduates, it helps to know what is at the end of that path.

As a component of the U.S. Department of Labor, the Bureau of Labor Statistics is the principal federal agency responsible for measuring labor, market activity, working conditions,

with its mission to “collect, analyze and disseminate essential economic information to support public and private decision making” (BLS, 2019). A lengthy *Handbook of Methods* (BLS, 2019) into the design and method of BLS research is also available. Information from Chapter 3 of this book details the background, industrial scope and stratification, concepts, sampling procedures, response and nonresponse, estimation methodology, variance estimation, reliability of estimates, confidentiality, and data presentation of the data collected to identify and present occupational employment statistics. To the degree that the data presented serves public and private decision-makers, from business leaders and economists to public policymakers and researchers, the validity and reliability of the data presented can be taken with some degree of confidence.

Data Analysis

The data pulled from this website highlights the areas of occupational growth and decline. By analyzing the projected occupational changes from 2018 to 2026, a table of results is produced, displaying (a) occupational areas where more people are needed, (b) declining occupations, which will lead us to question why that phenomenon is occurring. These data are used in comparison with Virginia’s data projections to provide the calculation at the heart of this study. This calculation determines an answer to the following question: What is the dollar amount a CTE student with industry credentials can earn in Virginia, and what tax revenue could the State’s Treasury department expect to collect if the amount were to increase by 10% annually?

Table 11

Occupation	Mean Annual Wage	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Accountants and Auditors	\$85,640	48,072	6,042	4,525	1,330
Animal Care and Service Workers	\$27,720	11,405	2,420	1,718	676
Architects, Except Landscape and Naval	\$85,380	3,198	144	234	80

Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	69,741	7,202	7,147	2,647
Automotive Body and Related Repairers	\$53,060	4,797	467	477	158

Note: To be adapted from *Occupational Projections and Worker Characteristics* (2019)—Bureau of Labor Statistics.

Limitations

At its core are the statistics requiring one to estimate a projection of a potential outcome. Since nothing is guaranteed, with independent variables influencing other variables, one cannot work with specifics. However, using the data to make a projection serves as a starting point. With the reliability of data emanating from the BLS, the reliability of the data could be considered sound.

Trailblazers: Career and Technical Education in Virginia

Created as a collaborative project between the Virginia Department of Education Office of Career, Technical, and Adult Education, and the Weldon Cooper Center for Public Service at the University of Virginia, Trailblazers (CTAE, 2018) is a resource for both demographic and labor market specific to Virginia. Information, data, and statistics collected from Trailblazers, will be cross-referenced with the occupational projections for Virginia's labor market data, as presented by the Bureau of Labor Statistics. By combining both datasets, the aim is to determine the most significant occupational growth and subsequent needs of Virginia's labor market, and hence, the opportunities available for students with the skills and credentials to fill them. In this instance, data will be analyzed to identify the following Virginia data.

Data Analysis

While vast amounts of data are available in the *State of Virginia Employment Projections* report –this study analyzes the data by occupational projection and mean salary. Serving as a reference point for occupations and average salaries, this report is used in conjunction with the industry credentialing data found in the *Industry Credential Assessment Data: 2012-2019 report*.

Each of the industry credential areas is aligned with the corresponding occupational area, and subsequently, the average salary listed. Because the aim is to present a realistic version of the types of occupations available to a high school graduate who chooses to enter the workforce straight out of school, or elects to undertake postsecondary education, the occupations selected for alignment are at the lower end of the pay scale. This action is not to devalue credential or opportunity; instead, it adds to the emphasis of this study to show the minimal potential available – to create a finding that is a floor rather than a ceiling. The findings in this study show the very least industry credentials can make on Virginia’s economy.

Table 12

Example of Credential to Occupational Alignment

Assessment	Occupation	Mean Annual Wage
AAFCS: Culinary Arts Examination	Food Preparation and Serving Related Occupations	\$24,280
AAFCS: Early Childhood Education Examination	Preschool Teachers, Except Special Education	\$37,880
AAFCS: Education Fundamentals Examination	Teacher Assistants	\$28,000
AAFCS: Family and Community Services Examination	Childcare Workers	\$24,620

Note: Adapted from *Credential Assessment Data: 2012-2019* Virginia Department of Education, (2019), the *2018 Occupational Projections and Worker Characteristics* (2019). Bureau of Labor Statistics and the *2016-2026 State of Virginia Employment Projections* (2019), Trailblazers, CTEA.

To determine the average number of credentials earned in the selected occupation, the *Industry Credential Assessment Data: 2012-2019* was used to locate the number of credentials earned over five years. Table 13 provides an example of the data found.

Table 13

Example of Credential to Occupational Alignment – 2014-2019

Assessment	Taken 5 Yr. Avg.	Passed 5 Yr. Avg.	Occupation	Mean Annual Wage
AAFCS: Early Childhood Education Examination	186	127	Preschool Teachers, Except Special Education	\$37,880
AAFCS: Education Fundamentals Examination	359	307	Teacher Assistants	\$28,000
AAFCS: Interior Design Fundamentals Examination	8	5	Interior Designers	\$52,670

Note: Adapted from *Credential Assessment Data: 2012-2019* Virginia Department of Education, (2019), the *2018 Occupational Projections and Worker Characteristics* (2019). Bureau of Labor Statistics and the *2016-2026 State of Virginia Employment Projections* (2019), Trailblazers, CTEA.

With the average number of credentials obtained and aligned with selected occupation and estimated mean salary, the next step is to calculate the projected income tax, as seen in the example in table 14.

Table 14

Example of Virginia Statewide Selected Occupations, Mean Wage, and Number of Industry Credentials Earned From 2014-2019.

Test	Taken 5 Yr. Avg.	Passed 5 Yr. Avg.	Occupation	Mean Annual Wage	Minus \$17,000	Income Tax Due	Income Tax Due per 5 Yr Avg
AAFCS: Early Childhood Education Examination	186	127	Preschool Teachers, Except Special Education	\$37,880	\$24,668	\$ 2,138.41	\$ 10,692.05
AAFCS: Education Fundamentals Examination	359	307	Teacher Assistants	\$28,000	\$13,800	\$ 1,513.50	\$ 7,567.50
AAFCS: Interior Design Fundamentals Examination	8	5	Interior Designers	\$52,670	\$40,937	\$ 3,073.88	\$15,369.39

Note: Adapted from *Credential Assessment Data: 2012-2019* Virginia Department of Education, (2019), the *2018 Occupational Projections and Worker Characteristics* (2019). Bureau of Labor Statistics and the *2016-2026 State of Virginia Employment Projections* (2019), Trailblazers, CTEA.

Income tax is calculated using the formula below, as indicated in Virginia's Tax Rate

Table (Table 15) available through Virginia.gov (2020).

Table 15

How Virginia Tax is Calculated

Virginia Taxable Income	Tax Calculation
0 - \$3,000	2%
\$3,001 - \$5,000	\$60 + 3% of excess over \$3,000
\$5,001 - \$17,000	\$120 + 5% of excess over \$5,000
\$17,001 -	\$720 + 5.575 of excess over \$17,000

Example:

If your taxable income is \$54,000, your tax is \$720 + 5.75% of the amount over \$17,000.

This equal: $\$720 + (.0575 \times \$37,000) = \$720 + \$2,127.50 = \$2,847.50$ which should be rounded to \$2,848.

Data Analysis

In this section, a demonstration of the formula used to reach the final calculation of the number of industry credentials earned by completers, how they align with occupational fields and estimated salaries, is presented. Finally, the formula shows how the revenue available to students and the state is calculated.

Average Total Earnings

Industry credentials earned by credential	/	2014-2019 5 years	=	Average number of credentials earned by
Industry credentials earned by <i>credential</i>	x	Projected salary for that occupation	=	Salary by credential area
Salary by credential area	Sum	Adds together salary by each credential area	=	Total projected salary (annual) of cumulative credentials

Average Total Earnings by Completer

Total projected salary (annual) of cumulative credentials	/	Total credentials earned by completers	=	Average annual salary per completer
---	---	---	---	--

Rate of Return on Credential

Average annual salary per completer	/	Total credentials earned	=	Rate of Return on Credential
--	---	--------------------------	---	---------------------------------

Tax Rate per Credential

Tax rate x	*	Total credentials earned	=	Tax rate per credential
------------	---	--------------------------	---	-------------------------

Tax Rate per Salary

Tax rate for Average annual salary per completer	*	Number of completers	=	Tax rate per salary
--	---	----------------------	---	---------------------

Calculations reflecting the potential state income tax contributions if the number of completer students increased by ten percent annually.

Additional 10% of students

Number of completers in VA	/	100*10	=	Additional 10% of students
-------------------------------	---	--------	---	-------------------------------

Additional Students divided by number of schools

Additional 10% of students	/	361 Virginia high schools	=	Total number of completers by school
-------------------------------	---	------------------------------	---	---

Estimated tax projections with a 10% increase by credential

Tax rate per credential	*	Additional 10% of students	=	Estimated tax projections with 10% increase by <i>credential</i>
-------------------------	---	----------------------------	---	--

Survey Data (1)

Industry Credential to Occupational Alignment Survey: CTE Experts

To avoid researcher bias, while enhancing objectivity in the alignment of the credentials to occupational areas, a validation study was undertaken. A Likert survey of aligned industry credentials and occupations was sent to a panel of ten experts in the field of Career and Technical Education. The purpose of the survey was for each CTE expert to indicate, on a level from one to five, their level of agreement with the industry credential to occupational alignments. “One” indicated a low level of agreement, while “five” indicated a high level of agreement. A comments section was also provided to allow the expert to enter an alternative occupational area they thought was more appropriate. All feedback provided by the CTE experts was applied to the alignments to ensure the level of agreement was at 100% (See Appendix 1).

Participants

The inclusion criteria necessary for CTE experts to participate in this validation study involved the following characteristics:

1. Participant currently serves as a Career and Technical Education Administrator/Director at the high school level or division-wide level
2. The CTE Administrator role may be as a Principal/Assistant Principal
3. The CTE Administrator role may be as Director of Career and Technical Education
4. The CTE Administrator role may be as a division-wide Program Coordinator for any of the 17 career cluster areas, including the following CTE program areas:

- a. Business and Information Technology
 - b. Family and Consumer Sciences
 - c. Marketing Education
 - d. Technology & Engineering
 - e. Trade and Industry
5. As a CTE Administrator, each participant will have experience as a teacher, and as coordinator, where the course best suited to meet the positive educational and economic potential for students is aligned with program, career, and industry credential.
6. Participants will be knowledgeable regarding the State's educational requirements and CTE program offerings
7. Participants will be knowledgeable regarding the needs of the local economy and business
8. Participants will be knowledgeable regarding the Department of Education's industry credentials and pathways
9. Participants will have been in their administrative position for a minimum of three years.
10. Participants may be recommended by CTE Director, CTE Program Coordinator, or other CTE expert as meeting the knowledge requirements stated in points 6, 7, 8, and 9, and therefore eligible to participate in this validation study.
11. The researcher will have no supervisory position over any of the participants.

Five CTE experts were from Virginia, and five were from Texas. Because industry credentials are nationally recognized, receiving feedback from experts in two different states helps to reinforce the value and recognition of CTE industry credentials, and reiterates that industry credentials are not a local certificate. Although there are 17 Career Clusters in CTE nationally,

there is a great deal of cross over between program areas, where the coordinator of one area is responsible for the coordination and direction of another career cluster. The program areas in Table 16 represent CTE experts who lead that program but are involved in the coordination and direction of other clusters.

Table 16

CTE Experts Program Area and Number of Participants

Program Area	Number of Participants Texas	Number of Participants Virginia
Business and Information Technology (BIT)	n = 1	n = 1
Family and Consumer Sciences (FACS)	n = 1	n = 1
Marketing Education (ME)	n = 1	n = 1
Technology & Engineering (TE)	n = 1	n = 1
Trade and Industry (TI)	n = 1	n = 1
Total	N = 5	N = 5

Before undertaking the survey, the respondents in Texas were identified by their Director as potential participants in this study. The researcher contacted via email each potential respondent, explaining to them the purpose of the study and their participation in it. A consent form was sent to each participant, with the understanding that if they wanted to participate, they would submit a signed consent form to the researcher. Upon receipt of this form, a link to the Likert survey was e-mailed to the participant, along with the instructions necessary to undertake the survey. A similar selection process for Virginia's CTE expert participants was also used; however, permission was sought from the school division's Office of Planning, Innovation, and Accountability. Once permission was received, the participants who are known to the researcher

were contacted via email, and the same process and the Texas selection began. While it could be considered a limitation that the Virginia respondents are known to the researcher, the researcher has no supervisory role or influence over any of the respondents. Had there been a conflict of interest in the use of these candidates, approval for the study would have been blocked by the Office of Planning Innovation and Accountability.

Instrument

Five individual Likert surveys were created using the web-based application *Survey Monkey* (see Appendix 1). Employing this delivery method allowed for ease of access to the survey via PC, tablet, or cell phone, the intention being to increase the response rate. Five surveys were created - one for each of the CTE program areas Business and Information Technology (BIT), Family and Consumer Sciences (FACS), Marketing Education (ME), Technology & Engineering (TE), and Trade and Industry (TI). The responses of each survey were anonymous, with results from both states being included in the same count. In this way, the Virginia responses would be combined with the Texas responses, thus increasing the anonymity of the Virginia respondents, and hence the validity of the results.

Data Analysis

The data received were measured against the existing alignment, and the “agree” (4) and “strongly agree” (5) were held in place. Where feedback provided an alternative occupation, which was founded in the “low” level of agreement range, the change was made in the alignment. In this way, the credential to occupational alignment strongly represented the agreement of the ten CTE experts.

Survey Data (2)

Virginia Business Representatives

As a means of obtaining input from Virginia's business community regarding the value-added in the earning of industry credentials, and to determine whether owning industry credentials influences business employment decisions, a five-question, closed answered survey was created (see Appendix 2). Prior to distribution, the survey was piloted, and any discrepancies in the format and interpretation of the questions were amended.

Participants

The participants in this survey are representatives from Virginia's local industries; however, as part of the data collection process, the anonymity of respondents and locations was confirmed. Surveys were emailed to forty potential participants, with 18 of them responding. While the 45% response rate might appear low, the respondents represent large businesses that currently employ a significant number of those in Virginia.

Participant selection was made possible through information provided by a critical stakeholder in CTE and education. As contacts on the various committees on which this stakeholder sits, they were convenient and best suited to survey. Following the distribution of an introductory email explaining the nature of the survey, acceptance of participation was made through receipt of a signed letter of consent. Once the researcher had received the letter of consent, a survey link was emailed to the participant.

Instrument

The instrument in this research was a five-question, closed answered survey which required respondents to select one of two answers pertinent to their (a) hiring decisions, (b) starting salary allocation, and (c) the impact that holding CTE industry credentials has on their employment making decisions. One question was open-ended, inviting the respondent to enter a

figure relevant to that question. Using the online platform of *Survey Monkey*, the survey link was emailed to each participant, allowing them to access the survey on a desktop, laptop, tablet, or phone. The reasoning behind this method of distribution was that the ease of access might increase the response rate. As part of the anonymity process, no identifying data was collected. The survey did not permit duplicate responses – each survey could be completed once. Upon completion, data was sent to the researcher's account in Survey Monkey, where data analysis could begin.

Data Analysis

Analyzing the data for this section involved calculating the percentage of respondents to each of the five questions, thereby determining the majority response for each question. The findings of this survey are particularly crucial to this research, as it shows the extent to which CTE industry credentials are recognized in industry. Further, it provided a figure that could be applied to the calculations in this research, the value-added figure that could be determined through the earning of industry credentials.

Limitations

The small size of the respondents could be considered a limitation, along with the selection process. Although the selection was not random in that the population was known to the key stakeholder who was likeminded, the participants were unknown to the researcher, and so too were the responses. In this instance, although the sample was small and partially random, the responses were validated because of participant anonymity.

Summary

Using a non-experimental, quantitative research methodology to determine the relationship between the earning of CTE industry credentials at the high school level and

Virginia's economy, the data collected was through both ex post facto data; Likert survey data, and through a closed answered survey.

The population size of participants in each methodology are:

- Ex post facto data:
 - a. The number of students enrolled in one or more CTE courses (***n* 984,284**).
 - b. The number of CTE students who have completed at CTE concentration. (***n* 205,825**)
- Likert Survey:
 - a. The number of CTE Experts (***n* 10**)
- Closed answered survey:
 - a. The number of Virginia Business representatives (***n* 18**)

The findings of each data set presented in this research methodology are now presented in the following chapter.

CHAPTER FOUR

FINDINGS

In Chapter 4, the findings of the research are presented in table and chart format, as well as narrative. The results presented are extrapolated from the ex post facto data of Virginia's Department of Education, the Bureau of Labor Statistic's State Occupational Employment and Wage Estimates, and Virginia's Tax schedule. Further, quantitative data are presented from the CTE experts who stated their agreements with the occupation to credential alignment. Finally, data from the representatives of Virginia's economy and industry provide an estimated financial account of the value added to those students earning industry certifications upon entering the workforce.

Due to the robust nature of this study, the results are presented into two sections:

- **Section One** presents quantitative data of the two surveys distributed in this study. (a) Likert survey results from CTE experts regarding the alignment of industry credentials to the occupational field; (b) Closed answer survey results from representatives of Virginia's economy on the value added to the earning of industry credentials when entering the workforce.
- **Section Two** is divided into nine subcategories, with each subcategory formatted and presented in the same manner:
 1. Commonwealth of Virginia
 2. Superintendent Region One: Central Virginia
 3. Superintendent Region Two: Tidewater
 4. Superintendent Region Three: Northern Neck
 5. Superintendent Region Four: Northern Virginia

6. Superintendent Region Five: Valley
7. Superintendent Region Six: Western Virginia
8. Superintendent Region Seven: Southwest
9. Superintendent Region Eight: Southside

The purpose of this study was to identify the relationship between the earning of CTE industry credentials at the high school level on Virginia's labor market and the State's economy.

The research questions driving this study are:

1. What is the trend for high school participation in CTE programs in Virginia, over the past five years?
2. What is the trend for high school completer students earning industry certifications in Virginia over the past five years?
3. What are the potential earnings for students gaining industry credentials in Virginia's labor market?
4. What is the potential economic impact for the state if the number of CTE students earning industry credentials were to increase by 10% annually?

Section One: Industry Credential to Occupational Alignment

Research Question 3: What are the potential earnings for students gaining industry credentials in Virginia's labor market?

One of the objectives when investigating the potential earnings for students gaining industry credentials in Virginia's labor market, and determining the economic impact on the state, is to identify what those industry credentials are, and to which occupation they align. The Virginia Department of Education provides industry credential test data for years 2014-2019. Occupational data and projections are derived from the Bureau of Labor Statistics, the Virginia Employment Commission, and the Weldon Cooper Center for Public Service.

Following the analysis and alignment of industry credential to occupation by the researcher, CTE experts were surveyed to determine their level of agreement. CTE experts from Virginia (N = 5) and Texas (N = 5) were asked the extent to which they agree or disagree with the alignments made on a five-point Likert scale, ranging from 1 to 5. "1" was "strongly disagree," "2" was "disagree," "3" was "neutral," "4" was "agree" and "5" was "strongly agree." The results are presented in Table 17.

Table 17

CTE Experts level of agreement with industry credential to occupational alignment ranges 1-5

CTE Program Area	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Business & IT	5%	0%	4%	17%	73%
Engineering Technology	0%	3%	19%	38%	40%
Family & Consumer Science	0%	1%	7%	30%	62%
Marketing Education	7%	0%	3%	20%	70%
Trade & Industry	1%	0%	13%	45%	41%

When collated in terms of disagreement, neutral, and strongly agree, the results for the industry credential to occupational alignments are presented in Table 18.

Table 18

CTE Experts level of agreement with industry credential to occupational alignment

CTE Program Area	Disagree	Neutral	Agree
Business & IT	5%	4%	90%
Engineering Technology	3%	19%	78%
Family & Consumer Science	1%	7%	92%
Marketing Education	7%	3%	90%
Trade & Industry	1%	13%	86%

Further to the Likert scale, respondents were able to leave a comment or generate their own credential to occupational alignment using the Occupational Projections List (see Appendix 1.3). While the agreement categories were in high agreement, the alignments in the disagree category were changed to reflect the feedback and suggestion of the respondent, thereby increasing the level of agreement to a higher level (see Appendix 1.3).

A second objective when investigating the potential earnings for students gaining industry credentials in Virginia's labor market, and determining the economic impact on the state, is to identify the economic value those in the workforce place on the earning of industry credentials. To answer this question, forty closed-answered surveys were distributed to representatives of Virginia's industries. Eighteen respondents completed their survey generating a 45% response rate. Respondents were asked:

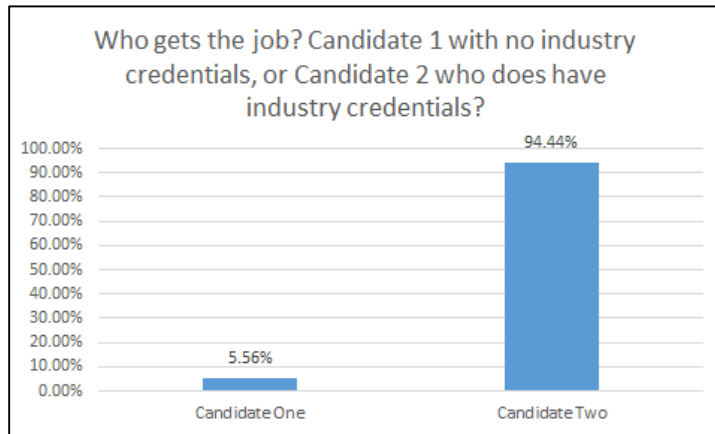
Question 1: Scenario: Your Company has ONE job opening for a high school graduate. Two candidates have applied for the position.

- a. Candidate One is a high school graduate who does not have any industry credentials but is eager to learn.
- b. Candidate Two is a high school graduate who has completed at least two years of a Career and Technical Education program relevant to your company's business area. The

candidate has successfully earned a series of third-party industry credentials that validate the knowledge and skills to be used in your company's business area.

Question: Which candidate would you/your company employ?

Figure 2 Graphical representation of business candidate selection

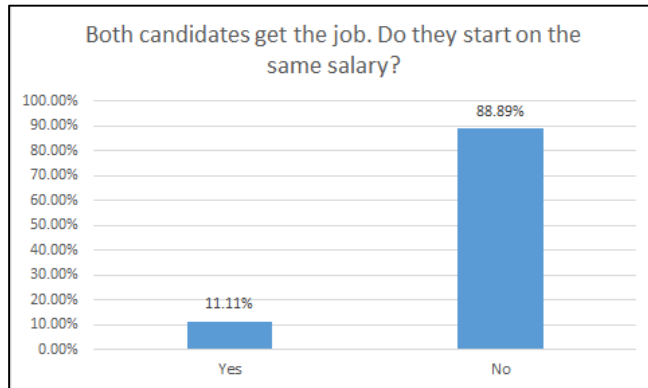


Question 3: Scenario: Your Company has TWO job openings for high school graduates. Two candidates have applied for the position.

- a. Candidate One is a high school graduate who does not have any industry credentials but is eager to learn.
- b. Candidate Two is a high school graduate who has completed at least two years of a Career and Technical Education program relevant to your company's business area. The candidate has successfully earned a series of third-party industry credentials that validate the knowledge and skills to be used in your company's business area.

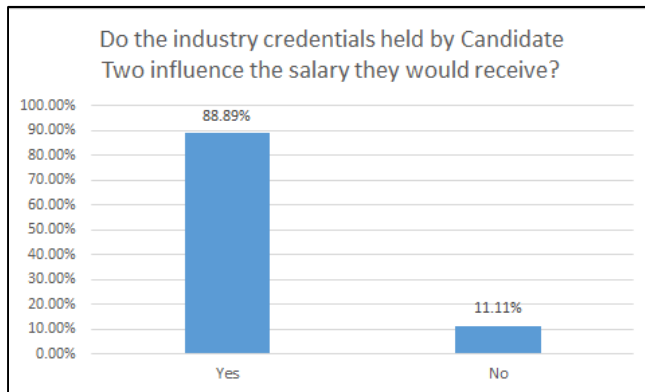
Question 4: Assuming you/your company employed both candidates, would they receive the same starting salary?

Figure 3 Graphical representation of business candidate selection and salary



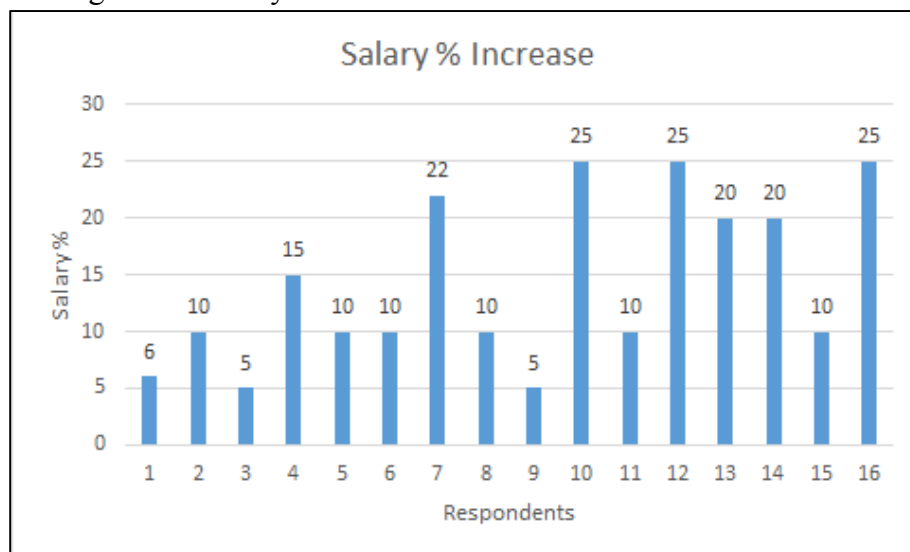
Question 4: Would the industry credentials held by Candidate Two influence the starting salary they would receive?

Figure 4 Graphical representation of the extent to which industry credentials influence starting salary



Question 5: If you/your company decided to give Candidate Two a higher starting salary to reflect the industry credentials they have, what percent increase would this look like?

Figure 5 Graphical representation of the increased starting salary, by percentage, for applicants holding CTE industry credentials



Section Two: Research Findings by Virginia and Superintendent Regions

Commonwealth of Virginia

Before drawing conclusions on the relationship between the earning of industry credentials at the high school level on Virginia's labor market and the State's economy, it is necessary to identify the Superintendent Regions that constitute Virginia's educational system. Identifying the number of regions and high schools in each region will contribute to both the bigger picture of CTE and industry credentials in Virginia, and to the disaggregated picture where economic impact can be measured. Data in Table 19 shows that the Commonwealth of Virginia consists of 131 school divisions, comprising 361 high schools (VDOE, 2020).

Table 19

Virginia's Superintendent Regions, School Divisions, High Schools, and Technical Centers

VDOE Superintendent Region	Divisions in Region	High Schools/Tech Centers in Region
Region 1: Central Virginia	15	38
Region 2: Tidewater	14	63
Region 3: Northern Neck	17	29
Region 4: Northern Virginia	19	98
Region 5: Valley	20	37
Region 6: Western Virginia	15	38
Region 7: Southwest	19	43
Region 8: Southside	12	15
Virginia	131	361

Source: School Report Card Data: Year 2016-2017

http://www.doe.virginia.gov/instruction/career_technical/path_industry_certification/index.shtml

Research Question 1: What is the trend for high school participation in CTE programs in Virginia, over the past five years?

In order to determine a trend in the enrollment for high school participation in CTE programs in Virginia, data pulled from the VDOE Middle School and High School CTE Program Enrollment Report (VDOE, 2019), is available in Table 20. While this study focuses on years

2014-2019, enrollment and completer data is only available via the VDOE website for years up to and including 2016-2017. More recent completer data is available upon request from the VDOE. Further, while the data in Table 20 includes enrollment data for both middle and high schools, the focus of this study is high school, completer students.

Table 20

Middle School & High School CTE Program Enrollment

Years	CTE Enrollment	CTE Completers
2016-2017	642,165	40,496
2015-2016	631,373	42,417
2014-2015	586,836	39,291
2013-2014	575,426	41,916
2012-2013	576,454	40,753

Source: CTE Program Enrollment Report, VDOE, 2019,
http://www.doe.virginia.gov/instruction/career_technical/statistics_reports/enrollment.shtml

When disaggregated by Superintendent Region, Table 21 indicates the number of Virginia's completer students from years 2014-2019, by region, and when calculated over a five-year range to determine the average number of students completing a CTE concentration. The data is clear that a significant difference is evident in the number of completer students between regions, with Northern Virginia providing the largest number of completer students, and Southside, the smallest number. However, despite the differences in the total number of completers, the data provided is essential to determine the relationship between the earning of industry credentials at the high school level on Virginia's labor market and the State's economy.

Table 21

Total Number of Completer Students by Superintendent Region

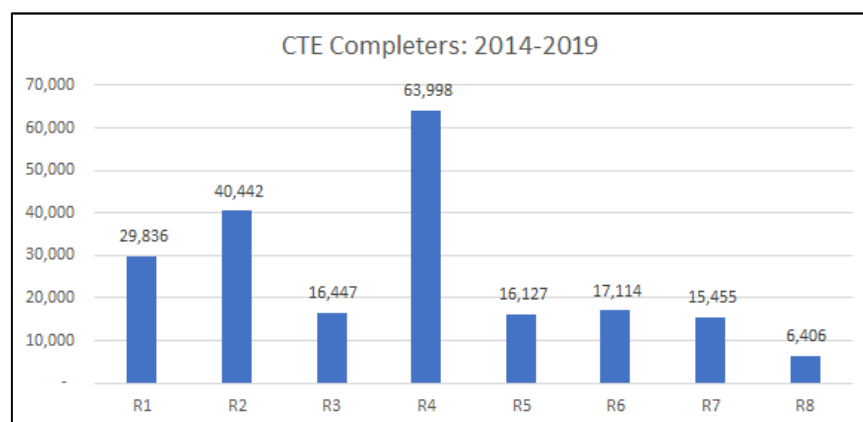
VDOE Superintendent Region	Total Completers	5 Year Avg Completers
Region 1: Central Virginia	29,836	5,967
Region 2: Tidewater	40,442	8,088
Region 3: Northern Neck	16,447	3,289
Region 4: Northern Virginia	63,998	12,800
Region 5: Valley	16,127	3,225
Region 6: Western Virginia	17,114	3,423
Region 7: Southwest	15,455	3,091
Region 8: Southside	6,406	1,281
Virginia	205,825	41,164

Source: Virginia Public School Listing - By Region

(http://www.doe.virginia.gov/instruction/career_technical/path_industry_certification/index.shtml)

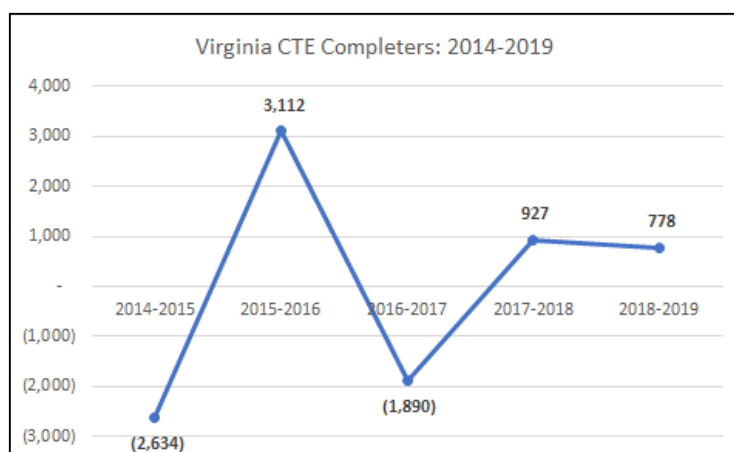
Completer data by region retrieved from Virginia Department of Education, Office of Education Information Management, (2019).

Graphical representation of the number of completers by region is shown in Figure 6, whereas the noticeable trend of completers by Virginia's students are collectively presented in Figure 7.

Figure 6 CTE Completers: 2014-2019

Source: Virginia Department of Education, List of Credentials and Completers: 2019

Figure 7 Virginia CTE Completers: 2014-2019



Source: Virginia Department of Education, List of Credentials and Completers: 2019

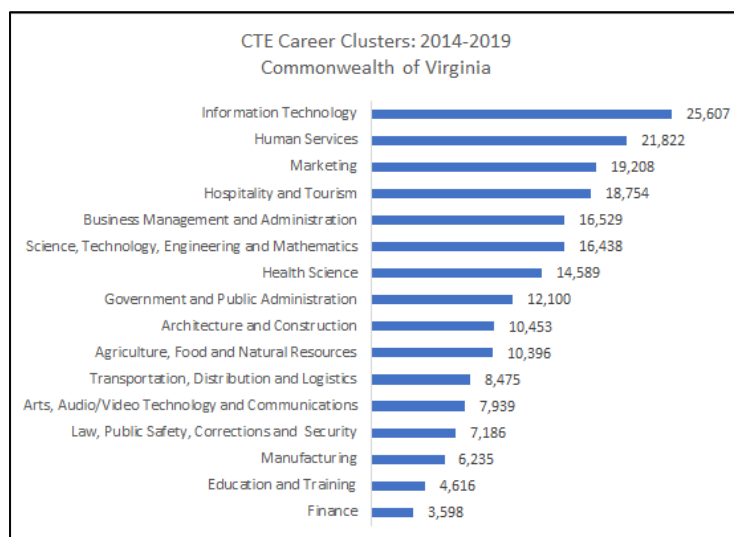
Research Question 2: What is the trend for high school completer students earning industry certifications in Virginia over the past five years?

Enabling school administration to organize curriculum design, and career counselors to provide the necessary guidance to students, the Virginia Department of Education groups CTE programs and courses in a “Career Cluster.” According to VDOE (2020), these career clusters help to:

- Organize academic and technical knowledge and skills into a coherent sequence
- Identify pathways from secondary to postsecondary education
- Provide a framework for seamless education
- Provide institutional support of rigorous academic teaching and learning
- Provide alignment of academic and technical skills with workplace readiness skills
- Provide opportunities to involve parents, business and industry, and the school community
- Provide the development of effective plans of study that are based on career assessments

Using data drawn from the Weldon-Cooper Center for Public Service: CTE Completer Data: 2014-2019, over five years, Virginia’s CTE completer students are seen to favor the Information Technology cluster (25,607), with the least numerous cluster of Finance reflecting 3,598 completer students.

Figure 8 CTE Career Clusters: 2014-2019



Source: *Weldon-Cooper Center for Public Service: CTE Completer Data: 2014-2019*

Using industry credential test data provided by the *Virginia Department of Education, Office of Education Information Management, (2019)*, data were disaggregated using SPSS. Disaggregation was used to determine the credential type earned, the number of students taking and earning the credential, and what this looks like over a five-year average. Further, because the focus of this study is on CTE completers, the data was analyzed to determine which of the credentials earned would be the final steps in the completer process. The disaggregated data demonstrating the “completer industry credentials earned by Virginia’s CTE students: 2014-2019” is presented in Table 22.

Table 22

Virginia: Industry Credentials Taken and Passed: 2014-2019- “Completers”

Industry Credential Assessment & Assessment Provider	Region	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
AAFCS: Culinary Arts Examination	1,2,5,6,7,8	1,023	456	205	91
AAFCS: Early Childhood Education Examination	1,2,3,4,5,6,7,8	929	635	186	127
AAFCS: Education Fundamentals Examination	1,2,3,4,5,6,8	1,794	1,537	359	307
AAFCS: Family and Community Services Examination	5	71	47	14	9
AAFCS: Fashion, Textiles, and Apparel Examination	1,2	55	45	11	9
AAFCS: Food Science Fundamentals Examination	2,4	72	11	14	2
AAFCS: Interior Design Fundamentals Examination	2,5	40	23	8	5
AAFCS: Housing and Furnishings Examination	4	1	1	0	0
AAFCS: Nutrition, Food and Wellness Examination	2,5,6,8	467	164	93	33
ACCESS Examination: American Culinary Federation, Inc. (ACF)	1,3	74	62	15	12
Accounting (Basic) Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,3,4,5,6,7,8	2,657	1,633	531	327
Accounting--Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,4,6	96	78	19	16
ACF Culinary Arts Certification Assessment: American Culinary Federation, Inc. (Assessment is administered by NOCTI)	1,4,5	20	14	4	3
Administrative Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	1,6,7,8	192	141	38	28
Administrative Services Assessment: National Occupational Competency Testing Institute (NOCTI)	1	117	99	23	20
Adobe Certified Associate: Animate CC 2015/Certiport	4	22	6	4	1
Adobe Certified Associate: Dreamweaver CS5, CS6, Cloud 2015, 2018 Examination/Certiport	1,2,4,6	1,029	435	206	87
Adobe Certified Associate: Photoshop CS3, CS4, CS5, CS6, Cloud 2013, 2015, 2018 Examination/Certiport	1,2,3,4,5,6,7,8	2,552	1,198	510	240
Adobe Certified Associate: Flash, CC2013, CS6 Examination/Certiport	1,2,4	268	132	54	26
Adobe Certified Associate: Illustration 2018 Examination/Certiport	1,4	123	18	25	4
Adobe Certified Associate: Illustrator Cloud, 2015, CS6 Examination/Certiport	1,2,4,6,7	1,142	482	228	96
Adobe Certified Associate: InDesign CS6, Cloud 2015, 2018 Examination/Certiport	1,2,4,6	615	327	123	65
Adobe Certified Associate: Premier Pro CS5, CS6, CC2015, 2018 Examination/Certiport	1,2,3,4,7	249	102	50	20
Advanced Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	1,2,3,4,5,6,7	2,793	1,496	559	299
Advertising and Design Assessment: National Occupational Competency Testing Institute (NOCTI)	2,4,6,7	421	227	84	45
Agriculture Mechanics Assessment: National Occupational Competency Testing Institute (NOCTI)	4,7,8	320	153	64	31

AHLA Certified Hospitality and Tourism Management Professional Examination (Must pass Level 1 and Level 2 exams): American Hotel and Lodging Association	1,2	41	24	8	5
American Medical Certification Association Examinations: AMCA	1,4	115	60	23	12
Architectural Apprentice Drafter Examination: American Design Drafting Association (ADDA)	1,7	3	3	1	1
Architectural Certified Drafter Examination: American Design Drafting Association (ADDA)	3,6,7	41	28	8	6
Architectural Drafting Assessment: National Occupational Competency Testing Institute (NOCTI)	2,4,5	603	332	121	66
Architectural Drafting Examination: American Design Drafting Association (ADDA)	3	26	8	5	2
ASE Auto Maintenance and Light Repair Examination (G1): National Institute for Automotive Service Excellence	1,2,3,4,5,6,7	1,223	726	245	145
ASE Automotive & Light Truck Certification Test-Automatic Transmission/Transaxle (A2): National Institute for Automotive Service Excellence	2,3,4,5,6,7	202	113	40	23
ASE Automotive & Light Truck Certification Test-Brakes (A5): National Institute for Automotive Service Excellence	1,2,3,4,5,6,7	1,278	651	256	130
ASE Automotive & Light Truck Certification Test-Electrical/Electronic Systems (A6): National Institute for Automotive Service Excellence	1,2,3,4,5,6,7	696	432	139	86
ASE Automotive & Light Truck Certification Test-Engine Performance (A8): National Institute for Automotive Service Excellence	1,2,3,4,5,6,7	492	244	98	49
ASE Automotive & Light Truck Certification Test-Engine Repair (A1): National Institute for Automotive Service Excellence	1,2,3,4,5,6,7	601	376	120	75
ASE Automotive & Light Truck Certification Test-Heating and Air Conditioning (A7): National Institute for Automotive Service Excellence	1,2,3,4,5,6,7	261	187	52	37
ASE Automotive & Light Truck Certification Test-Light Vehicle Diesel Engines (A9): National Institute for Automotive Service Excellence	1,5	21	17	4	3
ASE Automotive & Light Truck Certification Test-Manual Drive Train and Axles (A3): National Institute for Automotive Service Excellence	1,2,3,4,5,6,7	258	159	52	32
ASE Automotive & Light Truck Certification Test-Suspension & Steering (A4): National Institute for Automotive Service Excellence	1,2,3,4,5,6,7	865	440	173	88
ASE Collision Repair & Refinish Certification Test - Mechanical & Electrical Components (B5): National Institute for Automotive Service Excellence	2,7	27	6	5	1
ASE Collision Repair & Refinish Certification Test - Structural Analysis & Damage Repair: National Institute for Automotive Service Excellence	1.5.6.7	246	160	49	32
ASE Collision Repair and Refinish Certification Test - NonStructural Analysis & Damage Repair (B3): National Institute for Automotive Service Excellence	1,3,4,5,6,7	79	36	16	7
ASE Collision Repair and Refinish Certification Test - Painting & Refinishing (B2): National Institute for Automotive Service Excellence	1,2,3,4,5,6,7	257	134	51	27

ASE Medium-Heavy Truck Certification Test - Brakes (T4): National Institute for Automotive Service Excellence	7	34	6	7	1
ASE Medium-Heavy Truck Certification Test - Diesel Engines (T2): National Institute for Automotive Service Excellence	7	15	1	3	0
ASE Medium-Heavy Truck Certification Test - Suspension & Steering (T5): National Institute for Automotive Service Excellence	7	15	2	3	0
ASE Student Certification Automotive: Electrical/Electronic Systems: National Institute for Automotive Service Excellence	1,2,3,4,5,6,7,8	2,007	1,167	401	233
ASE Student Certification Automotive: Engine Performance: National Institute for Automotive Service Excellence	1,2,3,4,5,6,7,8	1,536	860	307	172
ASE Student Certification Automotive: Engine Repair: National Institute for Automotive Service Excellence	1,2,3,4,5,6,7,8	1,778	1,077	356	215
ASE Student Certification Automotive: Heating and Air Conditioning: National Institute for Automotive Service Excellence	1,2,3,4,5,6,7	1,110	697	222	139
ASE Student Certification Automotive: Maintenance and Light Repair: National Institute for Automotive Service Excellence	1,2,3,4,5,6,7,8	3,143	1,960	629	392
ASE Student Certification Automotive: Manual Drive Train and Axles: National Institute for Automotive Service Excellence	1,2,3,4,5,6,7	802	428	160	86
ASE Student Certification Automotive: Automatic Transmission/Transaxle: National Institute for Automotive Service Excellence	1,2,3,4,5,6,7	732	375	146	75
ASE Student Certification Automotive: Automotive Service Technology National Institute for Automotive Service Excellence	1,2,3,4,5,6,7	995	571	199	114
ASE Student Certification Automotive: Brakes: National Institute for Automotive Service Excellence	1,2,3,4,5,6,7,8	3,045	1,692	609	338
ASE Student Certification Automotive: Suspension and Steering: National Institute for Automotive Service Excellence	1,2,3,4,5,6,7,8	2,200	1,216	440	243
ASE Student Certification Collision Repair & Refinish: Mechanical and Electrical: National Institute for Automotive Service Excellence	1,2,3,4,5,6,,	593	262	119	52
ASE Student Certification Collision Repair & Refinish: Non-structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	1,2,3,4,5,6,7,8	1,154	640	231	128
ASE Student Certification Collision Repair & Refinish: Painting and Refinishing: National Institute for Automotive Service Excellence	1,2,3,4,5,6,7,8	1,390	665	278	133
ASE Student Certification Collision Repair & Refinish: Structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	1,2,3,4,5,6,7	683	342	137	68
ASE Student Certification M/H Truck: Brakes: National Institute for Automotive Service Excellence	5,7	65	12	13	2
ASE Student Certification M/H Truck: Diesel Engines: National Institute for Automotive Service Excellence	5,7	58	31	12	6

ASE Student Certification M/H Truck: Electrical/Electronic: National Institute for Automotive Service Excellence	5,7	63	19	13	4
ASE Student Certification M/H Truck: Steering & Suspension: National Institute for Automotive Service Excellence	5,7	74	39	15	8
ASK Concepts of Entrepreneurship and Management Assessment: ASK Business Institute	1,4,8	195	63	39	13
ASK Fundamental Business Concepts Assessment: ASK Business Institute	4	129	59	26	12
ASK Fundamental Marketing Concepts Assessment: ASK Business Institute	4,6,7	109	34	22	7
Autodesk 3DS Max Certified User Examination: Autodesk	1,2,4	154	19	31	4
Autodesk AutoCAD Certified Professional Examination: Autodesk	2,4,7	28	28	6	6
Autodesk Certification Program	1,2,4	184	96	37	19
Autodesk Fusion 360 Certified User Examination: Autodesk	1	1	1	0	0
Autodesk Inventor Certified Professional Examination: Autodesk	1,2,4,6,7	469	293	94	59
Autodesk Inventor Certified User: Autodesk	1,2,3,4,5,6,7	4,005	2,169	801	434
Autodesk Revit Architecture Certified User Examination: Autodesk	2,4,5,7	216	63	43	13
Autodesk Revit Certified Professional Examination: Autodesk	1,2,4,5,6,7	1,287	666	257	133
Autodesk: AutoCAD Certified User	1,2,3,4,5,6,7,8	6,861	2,923	1,372	585
Automotive Technician Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	7	1	1	0	0
Automotive Technician Core Assessment: National Occupational Competency Testing Institute (NOCTI)	5,6,7	30	23	6	5
Barbers Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	1,2,4,5,8	76	24	15	5
Basic Refrigeration & Charging Procedures Employment Ready Examination: HVAC Excellence	1,2,5	25	24	5	5
Beef Quality Assurance Certification	1,3,4,5,6,7,8	2,383	2,011	477	402
BrainBench Desktop Publishing Software Examinations	1,2,3,5	272	235	54	47
BrainBench Network Administration Examinations	2,4	368	114	74	23
BrainBench Software Development Examinations	1,3,4	169	88	34	18
BrainBench Systems Administration Examinations:	3	45	45	9	9
BrainBench Technical Support Examinations	1,3,4,5	191	108	38	22
BrainBench Web Administration Examinations	3	1	1	0	0
BrainBench Web Design and Development Examinations	5,6	96	85	19	17
Building Construction Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	5,7	92	54	18	11
Building Trades Maintenance Assessment: National Occupational Competency Testing Institute (NOCTI)	5,7	47	39	9	8
Cabinetmaking Assessment: National Occupational Competency Testing Institute (NOCTI)	5,7	101	33	20	7

CAD Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,5,6,7,8	607	373	121	75
CAD/CAM Assessment: National Occupational Competency Testing Institute (NOCTI)	4,5	57	33	11	7
Carpentry Assessment: National Occupational Competency Testing Institute (NOCTI)	2,3,4,5,6,7	335	167	67	33
Certification of Pharmacy Technicians (ExCPT) Examination: Virginia Board of Pharmacy	1,2,3,4,5,7,8	907	748	181	150
Certified Clinical Medical Assistant (CCMA) Examination: National Healthcareer Association (NHA)	2,3,4,7	739	391	148	78
Certified Dental Assistant and National Entry Level Assistant: Infection Control (ICE) Examination: Dental Assisting National Board	2,5,6	23	21	5	4
Certified Dental Assistant and National Entry Level Assistant: Radiation Health & Safety (RHS) Examination: Dental Assisting National Board	1,2,3,4,5,6	429	278	86	56
Certified Emergency Telecommunicator Examination: International Academies of Emergency Dispatch (IAED)	2,4,5	152	151	30	30
Certified Inpatient Coder (CIC) Examination: American Academy of Professional Coders (AAPC)	6	1	1	0	0
Certified Medical Administrative Assistant (CMAA) Examination: National Healthcareer Association (NHA)	1,2,3,4	210	132	42	26
Certified Patient Care Technician (CPCT) Examination: American Allied Health (AAH)	4	16	11	3	2
Certified Patient Care Technician (CPCT/A) Examination: National Healthcareer Association (NHA)	4	3	3	1	1
Certified Pharmacy Technician (CPhT) Examination: American Allied Health (AAH)	4	13	10	3	2
Certified Pharmacy Technician (ExCPT) Examination: National Healthcareer Association (NHA)	2,4	141	84	28	17
Certified Phlebotomy Technician (CPT) Examination: National Healthcareer Association (NHA)	8	5	5	1	1
Certified Physical Therapy Aide (CPTA) Examination: American Allied Health (AAH)	1,2	287	239	57	48
Certified Satellite Installer (CSI) Examination: Electronics Technicians Association (ETA), International	2	9	9	2	2
Certified SOLIDWORKS Associate (CSWA) Examination: SOLIDWORKS Corporation	1,2,5,6	537	197	107	39
Certified Veterinary Assistant Examination: American Allied Health (AAH)	5,7	40	31	8	6
Certified Veterinary Assistant Examination: Texas Veterinary Medical Association	4,6,7	57	36	11	7
Child Development Associate Certification: CDA Council	1	11	11	2	2
Cisco Certified Entry Network Technician (CCENT) Examination: Cisco Systems, Inc.	1,2,4,7	209	72	42	14
Cisco Certified Networking Associate (CCNA) Routing and Switching Examination: Cisco Systems, Inc.	1,2,3,4,7	660	610	132	122
Cisco Certified Networking Associate (CCNA) Security Examination: Cisco Systems, Inc.	4	3	3	1	1
Cisco Composite Exam for CCNA (640-802): Cisco Systems	1,4	16	6	3	1

Cisco Interconnecting Cisco Networking Devices Part 2 (640-816)	1,2,4,7	39	17	8	3
Cisco IT Essentials, PC Hardware, and Software End-of-Course Examination: Cisco Systems	3,5,7	101	92	20	18
CIW (Certified Internet Webmaster) Professional Examinations: Certification Partners, LLC	1,2,4,5	96	95	19	19
CIW Internet Business Associate Examination: Certification Partners, LLC	2,4	195	185	39	37
CIW Network Technology Associate Examination: Certification Partners, LLC	1,2,4	45	13	9	3
CIW Site Development Associate Examination: Certification Partners, LLC	1,2,4,5	331	267	66	53
Clinical Medical Assistant Certification (CMAC) Examination: American Medical Certification Association (AMCA)	7	1	1	0	0
Collision Repair and Refinishing Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	2,3,5,7	148	79	30	16
Collision Repair Assessment: National Occupational Competency Testing Institute (NOCTI)	4,5,7	19	8	4	2
Commercial Foods Assessment: National Occupational Competency Testing Institute (NOCTI)	3,5,7	73	38	15	8
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	1,2,3,4,5,6,7,8	778	584	156	117
CompTIA IT Fundamentals Certification Examination: CompTIA	1,2,3,4,5,6,7,8	798	562	160	112
CompTIA A+ Certification Examination (must pass both exams): CompTIA	1,2,3,4,5,6,7,8	1,252	714	250	143
CompTIA Linux+ Examination Program--Powered by Linux Professional Institute (must pass both exams): CompTIA	2	1	1	0	0
CompTIA Network+ Examination: CompTIA	1,2,4,5,6,7,8	377	147	75	29
CompTIA Security + Examination: CompTIA	1,2,4,5,7,8	222	112	44	22
CompTIA Server+ Examination: CompTIA	4,5	2	2	0	0
Computer Networking Fundamentals Assessment: National Occupational Competency Testing Institute (NOCTI)	2,4,5,7,	389	252	78	50
Computer Programming Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,3,4,5,6	590	444	118	89
Computer Repair Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	2,3,4,5,6,7	438	259	88	52
Computer Service Technician (CST) Examination : Electronics Technicians Association (ETA), International	1	26	14	5	3
Computer Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	2,7	165	87	33	17
CompTIA A+ 901 Examination	1,2,3,4,5,6,7,8	689	424	138	85
Conservation Assessment: National Occupational Competency Testing Institute (NOCTI)	7	32	25	6	5
Construction Masonry-Block Assessment: National Occupational Competency Testing Institute (NOCTI)	4,5	5	5	1	1

Construction Masonry-Brick Assessment: National Occupational Competency Testing Institute (NOCTI)	2,4,5,6,7,8	154	102	31	20
Cosmetology Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,3,4,5,6,7	1,214	929	243	186
Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	1,2,3,4,5,6,7,8,	3,796	2,778	759	556
Criminal Justice Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2	19	11	4	2
Criminal Justice Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,3,4,5,6,7,8,	1,590	1,191	318	238
Culinary Arts Prep Cook-Level 1 Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,3,4,5,6,7,8	1,000	688	200	138
Culinary Arts Prep Cook-Level 2 Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,3,4,5,6,7	361	258	72	52
Data Cabling Installer (DCI) Certification Examination: Electronics Technicians Association (ETA), International	2,7	42	35	8	7
Dental Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	2,3,5,7,	420	261	84	52
Diesel Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	1,3,5,7	98	67	20	13
Early Childhood Development and Services Assessment: National Occupational Competency Testing Institute (NOCTI)	6,8	6	6	1	1
Early Childhood Education and Care, Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	1,7,8	54	33	11	7
Early Childhood Education and Care, Basic Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,3,4,5,6,7,8	1,688	1,402	338	280
Electric Power and Distribution Assessment: National Occupational Competency Testing Institute (NOCTI)	2	4	4	1	1
Electrical Construction Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,3,4,5,6,7	175	98	35	20
Electrical Employment Ready Examination: HVAC Excellence	7	12	10	2	2
Electrical Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,3,4,5,7,	188	93	38	19
Electronic Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	2,4	186	36	37	7
Electronics Assessment: National Occupational Competency Testing Institute (NOCTI)	2,3,4,6	510	179	102	36
Emergency Medical First Responder Certification: Department of Health, Office of EMS	1,2,3,4,5	32	18	6	4
Emergency Medical Technician Examination: Department of Health, Office of Emergency Medical Services	1,2,3,4,5,6,7	595	389	119	78
EPA Universal Examination (pass all three types): Environmental Protection Agency (EPA)	1,2,3,4,5,6,7	611	554	122	111
Equine Science Examination – New York State Department of Education (Cornell University)	4,6,7,8	126	105	25	21
Fiber Optics Installer (FOI) Certification: Electronics Technicians Association (ETA), International	2	45	41	9	8

Firefighter II Certification Examination: Virginia Department of Fire Programs	1,2,3,4,5	145	127	29	25
Floriculture Assessment: National Occupational Competency Testing Institute (NOCTI)	6,7	125	96	25	19
Floriculture-Greenhouse Assessment: National Occupational Competency Testing Institute (NOCTI)	1,4,5	60	31	12	6
Food Safety & Science Certification Examination: American Meat Science Association (Exam is administered by iCEV)	7	10	4	2	1
Forestry Products & Processing Assessment: National Occupational Competency Testing Institute (NOCTI)	8	3	3	1	1
Fundamentals of Animal Science Certification Examination: Elanco (Exam is administered by iCEV)	4,5,7,8	167	77	33	15
Fundamentals of Construction Assessment: National Occupational Competency Testing Institute (NOCTI)	2	624	265	125	53
Gas Heat Employment Ready Examination: HVAC Excellence	7	8	8	2	2
Graphic Production Technology Assessment: National Occupational Competency Testing Institute	6	20	20	4	4
Greenhouse Operators Certification Examination: Southeast Greenhouse Growers Association/Virginia Flower Growers Association	1,2,3,4,5,6,7	540	237	108	47
HBI/NAHB Building Construction Technology Advanced Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	2,8	2	2	0	0
HBI/NAHB Carpentry Advanced Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	5	3	3	1	1
Health Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,3,4,5,6,7	596	335	119	67
Heating, Electrical, Air Conditioning Technology Examination (HEAT): HVAC Excellence	7	11	11	2	2
Heating, Ventilation, Air Conditioning & Refrigeration (HVAC/R) Assessment: National Occupational Competency Testing Institute (NOCTI)	1,3,5	55	28	11	6
Horticulture Landscaping Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,4,5,6,7	258	131	52	26
Hospitality Management Food and Beverage Option Assessment: National Occupational Competency Testing Institute (NOCTI)	2	134	121	27	24
Hospitality Management Lodging Option Assessment: National Occupational Competency Testing Institute (NOCTI)	2,7	107	45	21	9
HTML 5 CSS 3 Specialist Examination: Certification Partners, LLC	4,7	14	14	3	3
HVAC (EPA) Technician Examinations (Levels: Core, I, II, or III): Environmental Protection Agency	1,2,3,4,6	247	220	49	44
HVAC Excellence Certification Program: HVAC Excellence	2,3,7	147	114	29	23
IC3 Global Standard 5, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	1,2,3,4,5,6,7,8	1,286	828	257	166

IC3 Global Standard 4 Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	1,2,3,4,7,8	1,057	730	211	146
International Code Council Certificates of Achievement Examinations: International Code Council (ICC)	1,3,4,5,7	479	416	96	83
Internet and Computing Core Certification Examinations/Windows 7--Office 2010: Certiport (student has passed all three examinations)	1,2,4,7,8	510	416	102	83
Intuit QuickBooks Certified User Certification Test: Certiport	2,4,5	56	21	11	4
Licensed Practical Nurse Examination: Virginia Board of Nursing (VBN)	2,7	18	18	4	4
Logistics Technology/Distribution Center Services Assessment: National Competency Testing Institute (NOCTI)	1	26	18	5	4
Manufacturing Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	4,5	50	21	10	4
MCP - MCSA: Cloud Platform (pass any two exams): Microsoft	5	2	2	0	0
MCP - MCSA: Machine Learning (must pass both exams): Microsoft	5	2	2	0	0
MCP - MCSA: Microsoft Dynamics 365 for Operations (must pass two required exams): Microsoft	6	1	1	0	0
MCP - MCSA: SQL 2016 BI Development (must pass two required exams): Microsoft	2,4,7	12	12	2	2
MCP - MCSA: SQL 2016 Database Administration (must pass two required exams): Microsoft	2,5	2	2	0	0
Mechanical Apprentice Drafter Examination: American Design Drafting Association (ADDA)	7,8	2	2	0	0
Mechanical Certified Drafter Examination: American Design Drafting Association (ADDA)	3,6,7	138	87	28	17
Mechanical Drafting and Design Assessment: National Competency Testing Institute (NOCTI)	2,4,5,7	247	133	49	27
Mechatronics-Level 1 Assessment: National Competency Testing Institute (NOCTI)	1,2,3	236	156	47	31
Medical Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,3,4,5,7	603	465	121	93
MOS 2013, 2016 Master/Certiport (must pass four exams)	1,2,3,4,6,7,8	59	59	12	12
MOS Examinations (Advanced level): Microsoft Office Specialist/Certiport (Pass any one exam at this level)	2,3,4,5,6,7,8	232	232	46	46
MOS Excel Expert Level: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	1,2,3,4,5,6,7,8	367	163	73	33
MOS Microsoft Office Expert 2013/Certiport (must pass both Word & Excel at expert levels)	1,2,4,5,6,7,8	25	25	5	5
MOS Word Expert Level Examination: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	1,2,3,4,5,6,7,8	1,579	941	316	188
MTA Examination: .NET Fundamentals (98-372)	2,6	125	67	25	13
MTA Examination: Database Administration Fundamentals (98-364)	1,2,4,5,6,7	273	144	55	29
MTA Examination: Gaming Development Fundamentals	1,2	11	4	2	1
MTA Examination: HTML5 Application Development Fundamentals (98-375)	1,2,3,4,5,6	106	51	21	10

MTA Examination: Mobility and Device Fundamentals (98-368)	1,4,6,8	47	11	9	2
MTA Examination: Networking Fundamentals (98-366)	1,2,3,4,5,6,7,8	869	375	174	75
MTA Examination: Security Fundamentals (98-367)	1,2,3,4,5,6,7,8	1,775	648	355	130
MTA Examination: Software Development Fundamentals (98-361)	1,2,3,4,6	428	121	86	24
MTA Examination: Windows OS Fundamentals (98-349)	1,2,3,4,5,6,7,8	627	352	125	70
MTA Examination: Windows Server Administration Fundamentals (98-365)	2,3,4,5,8	75	52	15	10
MTA Examination: Introduction to Programming using HTML & CSS (98-383)	1,2,4,5,6	174	78	35	16
MTA Examination: Introduction to Programming using Java (98-388)	2,3,4,6	190	98	38	20
MTA Examination: Introduction to Programming using JavaScript (98-382)	2,4,6	40	33	8	7
MTA Examination: Introduction to Programming using Python (98-381)	1,2,4,6	680	198	136	40
MTA Examination: Introduction to Programming with Block-Based Languages (98-380)	2,4,6	115	46	23	9
Nail Technician Examination: Virginia Board for Barbers and Cosmetology	1,2,4,7	196	129	39	26
National Certified Patient Care Technician (NCPCT) Examination: National Center for Competency Testing (NCCT)	1	7	7	1	1
National Nurse Aide Assessment Program (NNAAP) Examination: Virginia Board of Nursing	1,2,3,4,5,6,7,8,	5,284	4,340	1,057	868
Nationally Registered Certified Dental Assistant (NRCDA) Examination: National Association of Health Professionals (NAHP)	1,2	295	129	59	26
Nationally Registered Certified Medical Assistant (NRCMA) Examination: National Association of Health Professionals (NAHP)	1,5	26	26	5	5
Nationally Registered Certified Pharmacy Technician (NRCPhT) Examination: National Association for Health Professionals (NAHP)	1,3,7	40	33	8	7
Network Cabling Specialist Certification Examination: C-Tech Associates	4	123	120	25	24
Network Pro Certification Examination: Test Out Corporation (TOC)	3,4,6,7	119	75	24	15
NHA: Certified Medical Laboratory Assistant (CMLA)	1	1	1	0	0
Nursing Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,3,4,5,6,7,8	675	494	135	99
Oracle Certification Program Examination: PL SQL	4,7	21	5	4	1
Oracle Certification Program Examinations (Pass any one exam from this certification program): Oracle Corporation	1,4,7	98	20	20	4
ParaPro: Educational Testing Service (ETS)	1,2,3,4,5,6,7,8	1,817	1,637	363	327
PC Pro Certification Examination: Test Out Corporation (TOC)	4,6,7,8	329	247	66	49
Phlebotomy Technical Certification (PTC) Examination: American Medical Certification Association (AMCA)	4	23	21	5	4

Plant Science Certification Examination: Bayer Crop Science (exam is adm. by iCEV)	1,5,7	81	41	16	8
Pork Quality Assurance Certification	4,5	101	95	20	19
Practical Nursing Assessment: National Occupational Competency Testing Institute	7	144	93	29	19
Praxis Core Academic Skills for Educators Tests: Educational Testing Service (must pass all three tests)	4,6,7	6	6	1	1
Precision Machining Assessment: National Occupational Competency Testing Institute (NOCTI)	1,5,6,7	66	48	13	10
Pre-Engineering/Engineering Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,3,4,5,6	2,358	1,376	472	275
Principles of Floral Design Certification Examination: Benz School of Floral Design (exam is adm. by iCEV)	5,7	13	4	3	1
Principles of Livestock Selection and Evaluation Certification Examination: National Collegiate Livestock Coaches Association (exam is adm. by iCEV)	2,7	63	27	13	5
Private Applicator Certification Examination: VA Dept. of Agriculture and Consumer Services	1,2,3,4,5,6,7,8	2,765	1,928	553	386
Production Agriculture Assessment: National Occupational Competency Testing Institute (NOCTI)	4,5,6,7,	115	72	23	14
ProStart Program End-of-Course Examination (Level 2): Education Foundation of the National Restaurant Association	1,2,3,4,5,6,7,8	600	437	120	87
Real Estate Salesperson Examination: Virginia Real Estate Board	1	25	24	5	5
Registered Technician Certification Examination: VA Dept. of Agriculture and Consumer Services	2,4	29	16	6	3
Restaurant, Food and Beverage Services Assessment: National Occupational Competency Testing Institute (NOCTI)	1,3	290	203	58	41
Retail Commercial Baking Assessment: National Occupational Competency Testing Institute (NOCTI)	2	149	92	30	18
Retail Management Certification Assessment: National Retail Federation (NRF) Foundation	1,2,4,6,7,8	68	64	14	13
Retail Merchandising Assessment: National Occupational Competency Testing Institute (NOCTI)	5,6,8	123	60	25	12
Security Pro Certification Examination: Test Out Corporation (TOC)	3,4,6,7	115	73	23	15
ServSafe Manager Certification Examination: National Restaurant Association	1,2,3,4,5,6,7,8,	6,877	4,348	1,375	870
Small Animal Care Examination New York Dept. of Education (Cornell Univ.)	1,4,5,6,7,8	674	582	135	116
Small Animal Science and Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,3,4,5,6,7,	1,545	1,032	309	206
Small Engine Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,4,5,6,7,8	1,546	629	309	126
Technical Drafting Assessment: National Occupational Competency Testing Institute	2,4,5,7	335	241	67	48
Television Production Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,3,4,5,6	781	547	156	109

Therapeutic Services Assessment: National Occupational Competency Testing Institute (NOCTI)	3	12	12	2	2
Veterinary Medical Applications Certification Examination: Elanco (exam is adm. by iCEV)	1,6,7	176	104	35	21
Virginia Motor Vehicle Safety Inspection Program Examination: Virginia State Police	1,4,5,8	28	28	6	6
Visual Communications and Multimedia Design Assessment: National Occupational Competency Testing Institute (NOCTI)	4,5	176	112	35	22
Web Design Assessment: National Occupational Competency Testing Institute (NOCTI)	1,3,4	254	199	51	40
Welding Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,3,4,5,6,7,8	643	360	129	72
TOTAL		133,721	81,413	26,744	16,283

Because a full picture of the industry credentialing test data is needed to determine trends in the earning of industry certifications in Virginia, one must be aware of the data for those currently on their CTE pathway, as seen in Table 23. Students earning credentials in this table are currently on a CTE program, as seen in the “Certification,” “Pre-apprentice,” or “other” pathway certifications, and non-CTE specific certification. Although the data from this table is not included in the final calculation to determine economic impact, this does not negate their value or economic potential. This study focuses on completer students.

Table 23

Other” industry credentials earned by Virginia’s CTE students, 2014-2019

“Other” Industry Credential Assessments & Assessment Provider	Region	Taken	Passed	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
AAFCS: Broad Field Family and Consumer Sciences Examination	1,2,3,4,5,6,7,8	2,148	1,415	430	283
AAFCS: Leadership Fundamentals Assessment	1,2,5	102	76	20	15
Advanced Placement (AP) Computer Science Principles Examination: The College Board	2,4	450	450	90	90
Advanced Placement Computer Science A Examination: The College Board	1,4	3,054	3,054	611	611
Agribusiness Examination: New York State Department of Education	1,2,6	67	60	13	12
Agricultural Biotechnology Assessment: National Occupational Competency Testing Institute (NOCTI)	1,5	117	101	23	20
AHLA (START) Certification Examination: American Hotel and Lodging Association	4,5	70	65	14	13

AHLA: Certified Restaurant Server Examination: American Hotel and Lodging Association	4	11	11	2	2
Animal Systems Assessment: National Occupational Competency Testing Institute (NOCTI)	5,6,7	243	107	49	21
Autodesk 2010 AutoCAD Associate Examination: Autodesk	4,7	5	5	1	1
BrainBench: AutoCAD 2000, 2004, 2012 Certification Examination	1,2,3,4,5	282	217	56	43
Briggs & Stratton Master Service Technician Program Examination	1,2,3,5,6	175	124	35	25
Broadcasting and Journalism Assessment: National Occupational Competency Testing Institute (NOCTI)	1	77	71	15	14
Business Financial Management Assessment: National Occupational Competency Testing Institute (NOCTI)	2,8	228	166	46	33
Canine Care & Training - Level 1 Certification Examination: Continental Kennel Club, Inc.	4,5,7	88	66	18	13
Carpenter Level One - Entry Level Assessment: National Center for Construction Education & Research (NCCER)	1,3,5	121	101	24	20
College Level Examination Program (CLEP): Financial Accounting: The College Board	2,3,4	10	2	2	0
College Level Examination Program (CLEP): Introductory Business Law: The College Board	2,3,4,8	81	5	16	1
College Level Examination Program (CLEP): Principles of Marketing: The College Board	1,3,4	106	49	21	10
Construction Technologist - Entry Level Assessment: National Center for Construction Education & Research (NCCER)	3	7	7	1	1
Core: Introductory Craft Skills Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	1,3,4,5,6,7,8	1,482	1,280	296	256
Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	1,2,3,4,5,6,7,8	25,728	22,053	5,146	4,411
Design and Preconstruction Assessment: National Occupational Competency Testing Institute (NOCTI)	5	58	44	12	9
Diagnostic Services Assessment	4	62	60	12	12
Education and Training Assessment: National Occupational Competency Testing Institute (NOCTI)	4,5,6	134	103	27	21
EETC Four Stroke Engine Certification Test: Equipment and Engine Training Council (EETC)	1,2,3,7	20	20	4	4
EETC Two Stroke Engine Certification Test: Equipment and Engine Training Council (EETC)	1,7	12	3	2	1
Electronics Module: DC (EM1): Electronics Technicians Association (ETA), International	1,2,5	197	102	39	20
Emergency and Fire Management Services Assessment: National Occupational Competency Testing Institute (NOCTI)	2,3	48	38	10	8
Emergency Medical Services Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2,3,5,7	155	132	31	26
Energy Industry Fundamentals Certificate Assessment: Center for Energy Workforce Development	3	4	4	1	1
EPA Technician Examination (Core): Environmental Protection Agency (EPA)	1,2,3,4,5,6	842	617	168	123

EPA Technician Examination (Type I): Environmental Protection Agency (EPA)	1,2,3,4,5,6,7,8	879	552	176	110
EPA Technician Examination (Type II): Environmental Protection Agency (EPA)	1,2,3,4,5,6,7,8	972	497	194	99
EPA Technician Examination (Type III): Environmental Protection Agency (EPA)	1,2,3,4,5,6	936	423	187	85
Firefighter I Certification Examination: Virginia Department of Fire Programs	1,2,3,4,5,7,8	255	200	51	40
General Management Assessment: National Occupational Competency Testing Institute (NOCTI)	1,4,6,8	549	385	110	77
HBI/NAHB Basic Principles of Construction Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	2,4,8	25	17	5	3
HBI/NAHB Carpentry Basic Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	2,5,6,7	31	11	6	2
HBI/NAHB House Wiring Basic Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	1,2,7	12	1	2	0
HBI/NAHB HVAC Basic Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	1,2	13	5	3	1
HBI/NAHB Plumbing Basic Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	1,2,3,4	55	55	11	11
Health Informatics Assessment: National Occupational Competency Testing Institute (NOCTI)	2	61	56	12	11
Heavy Equipment Operator Level One Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	2	27	13	5	3
Human Resources Management Assessment: National Occupational Competency Testing Institute (NOCTI)	5	4	4	1	1
HVAC Level One Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	1	103	55	21	11
IC3 Spark, Internet and Computing Core Certification Examinations: Certipoint (student has passed all three examinations)	1,2,4,5,6,7	593	401	119	80
Installer (or Service) Core Certification Examination: North American Technician Excellence, Inc. (NATE)	1	4	4	1	1
International Baccalaureate Computer Science (Higher Level) Examination: The International Baccalaureate Organization	4	29	29	6	6
International Baccalaureate Computer Science (Standard Level) Examination: The International Baccalaureate Organization	2,4	137	137	27	27
International Baccalaureate Design Technology (Standard Level) Examination: The International Baccalaureate Organization	4,5	372	362	74	72
International Baccalaureate for Business & Management (Standard Level) Examination: The International Baccalaureate Organization	1,2,4	3,043	2,977	609	595
Landscape Management Certification Examination: Green Industry Web Portal	1,3,4	46	9	9	2

Lodging Assessment: National Competency Testing Institute (NOCTI)	1	26	25	5	5
Manufacturing Specialist Certification: Manufacturing Skills Institute	2,5,6	111	73	22	15
Manufacturing Technician Level 1 Certification Examination: Manufacturing Skills Institute	2,5,6	81	64	16	13
Masonry Level One Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	7,8	9	9	2	2
MOS Access Examination: Microsoft Office 2007, 2010, 2013, 2016/Certiport	1,2,3,4,5,6,7,8	3,091	1,955	618	391
MOS Excel Examination: Microsoft Office 2007, 2010, 2013, 2016/Certiport	1,2,3,4,5,6,7,8	16,028	9,893	3,206	1,979
MOS Excel Expert Examination: Microsoft Office 2010/Certiport I	1,2,3,4,5,6,7,8	1,044	482	209	96
MOS One Note Examination: Microsoft Office 2013, 2016/Certiport	1,2,4,6,7	333	195	67	39
MOS Outlook Examination: Microsoft Office 2007, 2010, 2013, 2016/Certiport	1,2,3,4,5,6,7,8	1,413	968	283	194
MOS PowerPoint Examination: Microsoft Office 2007, 2010, 2013, 2016, Specialist/Certiport	1,2,3,4,5,6,7,8	38,725	29,688	7,745	5,938
MOS SharePoint Examination: Microsoft Office 2010, 2013/Certiport	2,4,6	35	12	7	2
MOS Word Examination: Microsoft Office 2007, 2010, 2013, 2016/Certiport	1,2,3,4,5,6,7,8	40,553	29,662	8,111	5,932
MOS Word Expert Examination: Microsoft Office 2007, 2010, 2016/Certiport	1,2,3,4,5,6,7,8	2,406	1,487	481	297
National Health Science Assessment: National Consortium for Health Science Education (Administered by Precision Exams)	2,4,6,7	314	252	63	50
Natural Resource Systems Assessment: National Occupational Competency Testing Institute (NOCTI)	4,5,6,7	444	369	89	74
NCCT (HVAC), National Construction Career Test: National Center for Construction Education & Research (NCCER)	6	11	11	2	2
NCCT Carpentry Level One, National Construction Career Test: National Center for Construction Education and Research (NCCER)	1,3,5,6,7	85	49	17	10
NCCT Core: Introductory Craft Skills, National Construction Career Test: National Center for Construction Education & Research (NCCER)	1,2,3,4,5,6,7	1,183	988	237	198
NCCT Electrical Examination, National Construction Career Test: National Center for Construction Education & Research (NCCER)	1,5,6,8	55	47	11	9
NCCT Heavy Equipment Operations Level One: National Center for Construction Education & Research (NCCER)	2	43	34	9	7
NCCT Welding Examination, National Construction Career Test: National Center for Construction Education & Research (NCCER)	1,5,6	88	82	18	16
NIMS Machining - Level I - CNC Lathe - Programming Setup & Operations: National Institute for Metalworking Skills, Inc.	1	1	1	0	0
NIMS Machining - Level I - CNC Lathe Operations: National Institute for Metalworking Skills, Inc.	6	17	17	3	3

NIMS Machining - Level I - Milling I: National Institute for Metalworking Skills, Inc.	6,7	21	21	4	4
NIMS Machining - Level I - Turning I Between Centers: National Institute for Metalworking Skills, Inc.	1,6,7	61	49	12	10
NIMS Machining - Level I - Job Planning, Benchwork, & Layout Skills: National Institute for Metalworking Skills, Inc.	1,6,8	19	16	4	3
NIMS Machining - Level I - Measurement, Materials, & Safety Skills: National Institute for Metalworking Skills, Inc.	1,6,7,8	219	194	44	39
Non-Structural Technician – Pro Level 1 Certification Test: ICAR	2,4	89	89	18	18
Pet Sitters Certification: National Association of Professional Pet Sitters	1,4	129	113	26	23
PLTW Examination: Aerospace Engineering: Project Lead the Way (PLTW)	2,3,4,5	250	198	50	40
PLTW Examination: Civil Engineering and Architecture: Project Lead the Way (PLTW)	1,2,3,4	824	506	165	101
PLTW Examination: Computer Integrated Manufacturing: Project Lead the Way (PLTW)	2,3,4,5	180	117	36	23
PLTW Examination: Digital Electronics: Project Lead the Way (PLTW)	1,2,3,4,7	1,261	669	252	134
PLTW Examination: Engineering Design and Development: Project Lead the Way (PLTW)	1,4,5	267	198	53	40
PLTW Examination: Human Body Systems: Project Lead the Way (PLTW)	2,3,4	595	358	119	72
PLTW Examination: Introduction to Engineering Design: Project Lead the Way (PLTW)	1,2,3,4,6,7	5,488	3,315	1,098	663
PLTW Examination: Medical Interventions: Project Lead the Way (PLTW)	2,3,4	252	145	50	29
PLTW Examination: Principles of Biomedical Sciences: Project Lead the Way (PLTW)	2,3,4	1,653	1,075	331	215
PLTW Examination: Principles of Engineering: Project Lead the Way (PLTW)	1,2,3,4,5,6,7	2,307	1,549	461	310
PLTW Examination: Computer Science Essentials: Project Lead the Way (PLTW)	2	40	39	8	8
PLTW Examination: Computer Science Principles: Project Lead the Way (PLTW)	1,2,4	123	113	25	23
Plumbing Level One Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	1	3	3	1	1
Pre-Engineering Industry Certification Examination: Robotics Education Competition Foundation (RECF)	1,2,6,7	79	33	16	7
Private Pilot Written Test: Federal Aviation Administration (FAA)	4	10	2	2	0
Professional Communications Certification Examination: Southwest Airlines (exam is adm. by iCEV)	1,7	46	21	9	4
ProStart Program End-of-Course Examination (Level 1): Education Foundation of the National Restaurant Association	1,2,3,4,5,6,7,8	1,240	965	248	193
Recreation, Amusements, and Attractions Assessment: National Occupational Competency Testing Institute (NOCTI)	1,3,6	473	316	95	63

Refinish Technician – Pro Level 1 Certification Test: ICAR	4	33	33	7	7
Safety Examination: Manufacturing Skill Standards Council (MSSC)	1,7	31	20	6	4
SENSE Training Program Certification Examination: American Welding Society (AWS)	1,2,3,4,5,6,7,8	723	687	145	137
SkillsUSA: 3D Visualization & Animation Examination	1,3,5	102	83	20	17
SkillsUSA: Architectural Drafting Examination	1,3,7	112	39	22	8
SkillsUSA: Audio-Radio Production Examination	1,7	25	24	5	5
SkillsUSA: Automated Manufacturing Technology Examination:	1	49	21	10	4
SkillsUSA: Cabinetmaking Examination	4,5,7	17	14	3	3
SkillsUSA: Carpentry Examination	1,2,3,4,5,6,7,8	592	405	118	81
SkillsUSA: CNC Milling and Turning Technology Examination	7	1	1	0	0
SkillsUSA: Computer Maintenance Technology Examination	2,7	16	16	3	3
SkillsUSA: Cosmetology Examination	1,2,5,7,8	297	207	59	41
SkillsUSA: Criminal Justice and CSI Examination	1,2,4,5,7,8	307	241	61	48
SkillsUSA: Culinary Arts Examination	1,3,4,5,7,8	77	17	15	3
SkillsUSA: Customer Service Examination	1,2,3,4,5,6,7,8	1,585	1,288	317	258
SkillsUSA: Digital File Preparation/Digital File Output (PrintED co-brand)	4	5	5	1	1
SkillsUSA: Electrical Construction (Residential) Wiring Examination	1,2,3,4,7	208	104	42	21
SkillsUSA: Electronics Application/Technology Examination	1,7,8	1	1	0	0
SkillsUSA: Engineering Technology Examination	1,2,3,5,7	101	75	20	15
SkillsUSA: Internetworking Examination	2,7	1	1	0	0
SkillsUSA: Masonry Examination	1,2,3,5,8	21	12	4	2
SkillsUSA: Nail Care Examination	7	11	11	2	2
SkillsUSA: Nurse Assisting Examination	1,4,7,8	40	26	8	5
SkillsUSA: Photography Examination	1,4,5,6	392	151	78	30
SkillsUSA: Plumbing Examination	2	13	2	3	0
SkillsUSA: Robotics and Automation Technology Assessment	1,2,3,7	101	39	20	8
SkillsUSA: Screen Printing Examination (PrintED co-brand)	1	13	2	3	0
SkillsUSA: Technical Drafting Examination	1,2,3,5,7,8	348	274	70	55
SkillsUSA: Television Video Production Examination	1,3	122	83	24	17
SkillsUSA: Welding Examination	2,3,6,7,8	292	224	58	45
SkillsUSA: Graphic Design Examination (PrintED co-brand)	3	13	6	3	1
SkillsUSA: Introduction to Graphic Communications Examination (PrintED co-brand)	1,3,4,6	147	93	29	19
Student Electronics Technician (SET) Certification Examination: Electronics Technicians Association (ETA), International	2,4	106	1	21	0

Virtual Enterprises Assessment: National Occupational Competency Testing Institute (NOCTI)	1,2	471	442	94	88
Welding Level One Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	1,5,6	89	87	18	17
TOTAL		172,517	128,003	34,503	25,601

As a final measure to determine the trend for the earning of CTE industry credentials at the high school level in Virginia, Table 24 presents the data specific to “Soft skills/College & Career Readiness” certifications. Because these certifications are included in the VDOE approved list of industry certifications, they are included in the industry credential test data provided by the Virginia Department of Education, Office of Education Information Management (VDOE, 2019). The value of this data lies in its relationship to the overall earning of industry credentials by high school students in Virginia, and the bigger picture when determining any trend.

Table 24

Soft skills/College & Career Readiness “industry credentials earned in Virginia: 2014-2019

“Soft skills/College & Career Readiness” Assessments & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
Armed Services Vocational Aptitude Battery Examination: United States Military Entrance Processing Command	11,246	7,792	2,249	2,249
Avid Certified User for Media Composer Certification Examination: Avid	21	8	4	4
College and Work Readiness Assessment (CWRA+): Council for Aid to Education	9,210	5,364	1,842	1,842
National Career Readiness Certificate (ACT)	9,477	8,496	1,895	1,895
W!SE Financial Literacy Certification: Working in Support of Education (W!SE)	386,431	307,004	77,286	77,286
Workplace Readiness Skills for the Commonwealth Examination	261,661	201,412	52,332	52,332
TOTAL	678,046	530,076	135,609	135,609

To determine the trend for high school completer students earning industry credentials in Virginia over the past five years, a finalized set of summarized data can be seen in Table 25.

These data present the number of students who have earned a CTE industry credential approved by Virginia's Board of Education. The three categories of assessment type are represented in Table 25 and present the five year total, and five-year average number of earned (a) "technical" credentials (sufficient for a student to successfully end their completer program); (b) "other" assessments taken where students are on the CTE path, working towards certifications; and (c), the "Soft skills/College & Career Readiness" certifications.

Table 25

Total Number of Industry Certifications Earned in Virginia: 2014-2019

Industry Credential Assessment & Type	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
"Technical" Completer Certifications	133,721	81,413	26,744	16,283
"Other" CTE certifications - pathway/level one/PLTW/Skills USA	172,517	128,003	21,565	34,503
"Soft skills/College & Career Readiness" certifications.	678,046	530,076	84,756	106,015
TOTAL	984,284	739,492	133,065	156,801

Research Question 3: What are the potential earnings for students gaining industry credentials in Virginia's labor market?

To determine the potential earning for students gaining industry credentials in Virginia's labor market, it is crucial to see the employment levels, numeric change, annual openings, and annual exits projected by the Bureau of Labor Statistics (Bureau of Labor Statistics, 2020) and the Virginia Employment Commission to 2026. Data in Table 26 indicate the projected employment levels for each region in Virginia.

Table 26

Virginia's Projected Employment Data: By Region

Area	Region	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Southwestern Virginia (LWIA I)	7	62,533	4,400	7,007	2,853
New River/Mt. Rogers (LWIA II)	7	158,439	11,607	18,212	7,395
Western Virginia (LWIA III)	6	181,165	13,556	20,393	8,147
Shenandoah Valley (LWIA IV)	4, 5	247,722	20,599	28,846	11,559
Piedmont Workforce Network (LWIA VI)	4, 5	194,135	19,517	21,932	8,734
Region 2000/Central VA (LWIA VII)	5	111,760	8,270	12,765	5,167
South Central (LWIA VIII)	8	62,313	4,984	7,117	2,924
Capital Region Workforce Partnership (LWIA IX)	1	648,035	59,487	72,302	28,167
Combined Projections Area (LWIA XI and LWIA XII)	4	1,467,605	171,431	160,170	59,856
Bay Consortium (LWIA XIII)	3	192,474	20,739	22,252	8,772
Greater Peninsula (LWIA XIV)	2	257,130	19,225	29,404	11,799
Crater Area (LWIA XV)	1	78,390	6,290	8,978	3,628
Hampton Roads (LWIA XVI)	2	589,331	51,630	66,935	26,557
West Piedmont (LWIA XVII)	6	77,894	5,988	9,103	3,733

In furtherance of determining the potential earnings for students with industry credentials, understanding the labor market's occupational openings by educational attainment level is important. Through the review of these data, one can examine the extent to which Virginia's students are entering a labor market saturated with similarly qualified candidates, or into the market with high-demand, high-salary openings. Data in Table 27, as extracted from the Bureau of Labor Statistics and the Virginia Employment Commission projection to 2026, show the probable occupational openings by education level attainment for Virginia as a whole.

Table 27

Occupational Openings by Education Attainment Level - Virginia

Virginia	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Associate's Degree	130,765	14,977	11,532	3,432
Bachelor's Degree	716,959	94,827	62,035	17,983
Doctoral or Professional Degree	100,489	14,240	6,800	2,458

High School Diploma or equivalent	1,463,614	88,914	159,662	63,670
Less than High School	1,070,844	111,915	162,742	69,531
Master's Degree	66,556	11,555	6,026	1,937
Not Applicable	8,850,863	865,729	985,038	383,759
Postsecondary non-degree award	125,239	13,469	11,974	4,737
Some College, No Degree	5,490	838	680	279
TOTAL	12,530,819	1,216,464	1,406,489	547,786

Source: Bureau of Labor Statistics: May 2018 State Occupational Employment and Wage Estimates,
https://www.bls.gov/oes/current/oes_va.htm#00-0000

While data in Table 27 specify occupations in the “Not Applicable” category as the largest group to access to occupational openings, a precise definition of the education included in that category is not available. The second-largest estimated category in labor market openings is found in the “High School Diploma or Equivalent” category. However, when the “Not Applicable” category is removed from the data, along with “Less than High School” as in Table 28, numbers show that the two categories of education with greater access to projected employment are those with “High School Diploma or Equivalent” and “Bachelor’s Degree.”

Table 28

Occupational Openings by Education Attainment Level - Virginia - "Less than High School" and "Not Applicable" removed

Virginia	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Associate's Degree	130,765	14,977	11,532	3,432
Bachelor's Degree	716,959	94,827	62,035	17,983
Doctoral or Professional Degree	100,489	14,240	6,800	2,458
High School Diploma or equivalent	1,463,614	88,914	159,662	63,670
Master's Degree	66,556	11,555	6,026	1,937
Postsecondary non-degree award	125,239	13,469	11,974	4,737
Some College, No Degree	5,490	838	680	279
TOTAL	2,609,112	238,820	258,709	94,496

Source: Bureau of Labor Statistics: May 2018 State Occupational Employment and Wage Estimates, https://www.bls.gov/oes/current/oes_va.htm#00-0000

Data presented in Table 29 show the occupations available to Virginia’s CTE completer students who have earned a series of industry credentials. These data present the estimated mean salary expected, the projected occupational openings to 2026 of that occupation, the number of annual openings, and annual exits. Data included in this table show completer data specifically and does not include those who are currently enrolled in a CTE pathway, or who have completed credentials with a career readiness focus. The data in Table 29 brings together data points from:

- a) *Virginia: Industry Credentials Taken and Passed: 2014-2019 – Completers* (see Table 22). Data from this source is seen in the columns “Assessment,” “Taken 5 Yr. Avg.” and “Pass 5 Yr. Avg”.
- b) Bureau of Labor Statistics *May 2019 State Occupational Employment and Wage Estimates: Virginia* (Bureau of Labor Statistics, 2020). Data from this source is seen in columns “Occupation,” “Mean Annual Salary,” “Projected Employment,” “Numeric Change,” “Annual Openings,” and “Annual Exits.

Table 29

CTE Industry Credential to Occupational Alignment and Projections – All Virginia

Assessment	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.	Occupation	Mean Annual Wage	Projected Employment	Numeric Change	Annual Openings	Annual Exits
AAFCS: Culinary Arts Examination	205	91	Food Preparation and Serving Related Occupations	\$24,280	372,377	42,614	64,086	26,620
AAFCS: Early Childhood Education Examination	186	127	Preschool Teachers, Except Special Education	\$37,880	9,747	731	977	403
AAFCS: Education Fundamentals Examination	359	307	Teacher Assistants	\$28,000	32,596	3,221	3,438	1,702
AAFCS: Family and Community Services Examination	14	9	Childcare Workers	\$24,620	22,726	1,464	3,304	1,793
AAFCS: Fashion, Textiles, and Apparel Examination	11	9	Personal Appearance Workers	\$31,700	27,125	2,749	3,193	1,639
AAFCS: Food Science Fundamentals Examination	14	2	Dietetic Technicians	\$32,430	284	27	24	9
AAFCS: Interior Design Fundamentals Examination	8	5	Interior Designers	\$52,670	1,111	59	102	37
AAFCS: Housing and Furnishings Examination	0.2	0.2	Textile, Apparel, and Furnishings Workers	\$34,460	15,967	(1,314)	1,887	1,042
AAFCS: Nutrition, Food and Wellness Examination	93	33	Dietetic Technicians	\$32,430	284	27	24	9
ACCESS Examination: American Culinary Federation, Inc. (ACF)	15	12	Chefs and Head Cooks	\$54,760	3,534	416	451	106
Accounting (Basic) Assessment: National Occupational Competency Testing Institute (NOCTI)	531	327	Financial Clerks	\$40,410	78,680	2,168	8,566	4,149
Accounting--Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	19	16	Accountants and Auditors	\$85,640	48,072	6,042	4,525	1,330
ACF Culinary Arts Certification Assessment: American Culinary Federation, Inc. (Assessment is administered by NOCTI)	4	3	Chefs and Head Cooks	\$54,760	3,534	416	451	106
Administrative Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	38	28	Office and Administrative Support Occupations	\$39,030	558,426	22,904	63,576	28,097
Administrative Services Assessment: National Occupational Competency Testing Institute (NOCTI)	23	20	Office and Administrative Support Occupations	\$39,030	558,426	22,904	63,576	28,097
Adobe Certified Associate: Animate CC 2015/Certiport	4	1	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	69,741	7,202	7,147	2,647

Adobe Certified Associate: Dreamweaver CS5, CS6, Cloud 2015, 2018 Examination/Certiport	206	87	Web Developers	\$88,850	4,545	667	361	80
Adobe Certified Associate: Photoshop CS3, CS4, CS5, CS6, Cloud 2013, 2015, 2018 Examination/Certiport	510	240	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	69,741	7,202	7,147	2,647
Adobe Certified Associate: Flash, CC2013, CS6 Examination/Certiport	54	26	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	69,741	7,202	7,147	2,647
Adobe Certified Associate: Illustration 2018 Examination/Certiport	25	4	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	69,741	7,202	7,147	2,647
Adobe Certified Associate: Illustrator Cloud, 2015, CS6 Examination/Certiport	228	96	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	69,741	7,202	7,147	2,647
Adobe Certified Associate: InDesign CS6, Cloud 2015, 2018 Examination/Certiport	123	65	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	69,741	7,202	7,147	2,647
Adobe Certified Associate: Premier Pro CS5, CS6, CC2015, 2018 Examination/Certiport	50	20	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	69,741	7,202	7,147	2,647
Advanced Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	559	299	Sales and Related Occupations	\$41,140	437,498	17,499	60,690	25,941
Advertising and Design Assessment: National Occupational Competency Testing Institute (NOCTI)	84	45	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	69,741	7,202	7,147	2,647
Agriculture Mechanics Assessment: National Occupational Competency Testing Institute (NOCTI)	64	31	Transportation and Material Moving Occupations	\$38,200	249,662	18,839	30,305	11,856
AHLA Certified Hospitality and Tourism Management Professional Examination (Must pass Level 1 and Level 2 exams): American Hotel and Lodging Association	8	5	Hotel, Motel, and Resort Desk Clerks	\$22,300	7,270	291	1,127	394
American Medical Certification Association Examinations: AMCA	23	12	Medical Assistants	\$35,010	16,716	4,301	1,963	640
Architectural Apprentice Drafter Examination: American Design Drafting Association (ADDA)	1	1	Mechanical Drafters	\$59,000	753	55	64	21
Architectural Certified Drafter Examination: American Design Drafting Association (ADDA)	8	6	Mechanical Drafters	\$59,000	753	55	64	21
Architectural Drafting Assessment: National Occupational Competency Testing Institute (NOCTI)	121	66	Mechanical Drafters	\$59,000	753	55	64	21

Architectural Drafting Examination: American Design Drafting Association (ADDA)	5	2	Mechanical Drafters	\$59,000	753	55	64	21
ASE Auto Maintenance and Light Repair Examination (G1): National Institute for Automotive Service Excellence	245	145	Automotive Service Technicians and Mechanics	\$47,730	24,370	1,348	2,312	748
ASE Automotive & Light Truck Certification Test-Engine Repair (A1); Automatic Transmission/Transaxle (A2); Manual Drive Train and Axles (A3); Suspension & Steering (A4); Brakes (A5); Electrical/Electronic Systems (A6); Heating and Air Conditioning (A7); Engine Performance (A8); Light Vehicle Diesel Engines (A9): National Institute for Automotive Service Excellence	519	291	Automotive Service Technicians and Mechanics	\$47,730	24,370	1,348	2,312	748
ASE Collision Repair and Refinish Certification Test - Painting & Refinishing (B2); Nonstructural Analysis & Damage Repair (B3); Mechanical & Electrical Components (B5); Structural Analysis & Damage Repair: National Institute for Automotive Service Excellence	152	84	Automotive Body and Related Repairers	\$53,060	4,797	467	477	158
ASE Medium-Heavy Truck Certification Test - Diesel Engines (T2); Brakes (T4); Suspension & Steering (T5): National Institute for Automotive Service Excellence	21	3	Automotive Service Technicians and Mechanics	\$47,730	24,370	1,348	2,312	748
ASE Student Certification Automotive: Electrical/Electronic Systems; Engine Performance; Engine Repair; Heating and Air Conditioning; Maintenance and Light Repair; Manual Drive Train and Axles; Automatic Transmission/Transaxle; Automotive Service Technology; Brakes; Suspension and Steering: National Institute for Automotive Service Excellence	1,735	1,004	Automotive Service Technicians and Mechanics	\$47,730	24,370	1,348	2,312	748
ASE Student Certification Collision Repair & Refinish: Mechanical and Electrical; Non-structural Analysis and Damage Repair; Painting and Refinishing; Structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	955	477	Automotive Service Technicians and Mechanics	\$47,730	24,370	1,348	2,312	748
ASE Student Certification M/H Truck: Brakes; Diesel Engines; Electrical/Electronics; Steering & Suspension: National Institute for Automotive Service Excellence	65	25	Bus and Truck Mechanics and Diesel Engine Specialists	\$48,470	7,310	758	683	212
ASK Concepts of Entrepreneurship and Management Assessment: ASK Business Institute	39	13	Sales and Related Occupations	\$41,140	437,498	17,499	60,690	25,941
ASK Fundamental Business Concepts Assessment: ASK Business Institute	26	12	Sales and Related Occupations	\$41,140	437,498	17,499	60,690	25,941

ASK Fundamental Marketing Concepts Assessment: ASK Business Institute	22	7	Sales and Related Occupations	\$41,140	437,498	17,499	60,690	25,941
Autodesk 3ds Max Certified User Examination: Autodesk	31	4	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	69,741	7,202	7,147	2,647
Autodesk AutoCAD Certified Professional Examination: Autodesk	6	6	Mechanical Drafters	\$59,000	753	55	64	21
Autodesk Certification Program (Pass any one exam at fundamentals level)	37	19	Mechanical Drafters	\$59,000	753	55	64	21
Autodesk Fusion 360 Certified User Examination: Autodesk	0.2	0.2	Mechanical Drafters	\$59,000	753	55	64	21
Autodesk Inventor Certified Professional Examination: Autodesk	94	59	Mechanical Drafters	\$59,000	753	55	64	21
Autodesk Inventor Certified User: Autodesk	801	434	Drafters, Engineering Technicians, and Mapping Technicians	\$60,320	21,054	1,517	1,900	640
Autodesk Revit Architecture Certified User Examination: Autodesk	43	13	Architects, Except Landscape and Naval	\$85,380	3,198	144	234	80
Autodesk Revit Certified Professional Examination: Autodesk	257	133	Architects, Except Landscape and Naval	\$85,380	3,198	144	234	80
Autodesk: AutoCAD Certified User	1,372	585	Mechanical Drafters	\$59,000	753	55	64	21
Automotive Technician Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	0.2	0.2	Automotive Service Technicians and Mechanics	\$47,730	24,370	1,348	2,312	748
Automotive Technician Core Assessment: National Occupational Competency Testing Institute (NOCTI)	6	5	Automotive Service Technicians and Mechanics	\$47,730	24,370	1,348	2,312	748
Barbers Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	15	5	Hairdressers, Hairstylists, and Cosmetologists	\$34,250	18,711	1,881	2,263	1,187
Basic Refrigeration & Charging Procedures Employment Ready Examination: HVAC Excellence	5	5	Heating, Air Conditioning, and Refrigeration Mechanics and I	\$50,210	12,931	1,345	1,298	341
Beef Quality Assurance Certification	477	402	Farming, Fishing, and Forestry Occupations	\$36,230	8,582	585	1,193	304
BrainBench Desktop Publishing Software Examinations	54	47	Computer Operators	\$49,830	548	(136)	50	25
BrainBench Network Administration Examinations	74	23	Computer Operators	\$49,830	548	(136)	50	25
BrainBench Software Development Examinations	34	18	Computer Operators	\$49,830	548	(136)	50	25
BrainBench Systems Administration Examinations	9	9	Computer Operators	\$49,830	548	(136)	50	25

BrainBench Technical Support Examinations	38	22	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
BrainBench Web Administration Examinations	0.2	0.2	Web Developers	\$88,850	4,545	667	361	80
BrainBench Web Design and Development Examinations	19	17	Web Developers	\$88,850	4,545	667	361	80
Building Construction Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	18	11	Helpers--Construction Trades	\$31,340	7,974	528	1,123	327
Building Trades Maintenance Assessment: National Occupational Competency Testing Institute (NOCTI)	9	8	Helpers--Construction Trades	\$31,340	7,974	528	1,123	327
Cabinetmaking Assessment: National Occupational Competency Testing Institute (NOCTI)	20	7	Woodworkers	\$41,300	8,587	190	926	376
CAD Assessment: National Occupational Competency Testing Institute (NOCTI)	121	75	Mechanical Drafters	\$59,000	753	55	64	21
CAD/CAM Assessment: National Occupational Competency Testing Institute (NOCTI)	11	7	Mechanical Drafters	\$59,000	753	55	64	21
Carpentry Assessment: National Occupational Competency Testing Institute (NOCTI)	67	33	Woodworkers	\$41,300	8,587	190	926	376
Certification of Pharmacy Technicians (ExCPT) Examination: Virginia Board of Pharmacy	181	150	Pharmacy Technicians	\$32,370	10,020	1,139	840	306
Certified Clinical Medical Assistant (CCMA) Examination: National Healthcareer Association (NHA)	148	78	Medical Assistants	\$35,010	16,716	4,301	1,963	640
Certified Dental Assistant and National Entry Level Assistant: Infection Control (ICE) Examination: Dental Assisting National Board	5	4	Dental Assistants	\$44,640	10,134	2,030	1,194	466
Certified Dental Assistant and National Entry Level Assistant: Radiation Health & Safety (RHS) Examination: Dental Assisting National Board	86	56	Dental Assistants	\$44,640	10,134	2,030	1,194	466
Certified Emergency Telecommunicator Examination: International Academies of Emergency Dispatch (IAED)	30	30	Dispatchers, Except Police, Fire, and Ambulance	\$41,140	4,342	178	395	149
Certified Inpatient Coder (CIC) Examination: American Academy of Professional Coders (AAPC)	0.2	0.2	Medical Secretaries	\$37,940	5,551	1,128	644	270
Certified Medical Administrative Assistant (CMAA) Examination: National Healthcareer Association (NHA)	42	26	Medical Records and Health Information Technicians	\$43,590	5,541	762	378	151
Certified Patient Care Technician (CPCT) Examination: American Allied Health (AAH)	3	2	Nursing Assistants	\$28,770	45,783	7,906	5,446	2,540
Certified Patient Care Technician (CPCT/A) Examination: National Healthcareer Association (NHA)	1	1	Nursing Assistants	\$28,770	45,783	7,906	5,446	2,540
Certified Pharmacy Technician (CPht) Examination: American Allied Health (AAH)	3	2	Pharmacy Technicians	\$32,370	10,020	1,139	840	306

Certified Pharmacy Technician (ExCPT) Examination: National Healthcareer Association (NHA)	28	17	Pharmacy Technicians	\$32,370	10,020	1,139	840	306
Certified Phlebotomy Technician (CPT) Examination: National Healthcareer Association (NHA)	1	1	Phlebotomists	\$35,960	10,020	1,139	840	306
Certified Physical Therapy Aide (CPTA) Examination: American Allied Health (AAH)	57	48	Physical Therapist Aides	\$28,110	904	225	114	35
Certified Satellite Installer (CSI) Examination: Electronics Technicians Association (ETA), International	2	2	Telecommunications Line Installers and Repairers	\$61,070	4,443	(79)	435	111
Certified SOLIDWORKS Associate (CSWA) Examination: SOLIDWORKS Corporation	107	39	Drafters, Engineering Technicians, and Mapping Technicians	\$60,320	21,054	1,517	1,900	640
Certified Veterinary Assistant Examination: American Allied Health (AAH)	8	6	Veterinary Assistants and Laboratory Animal Caretakers	\$26,750	2,968	692	467	152
Certified Veterinary Assistant Examination: Texas Veterinary Medical Association	11	7	Veterinary Assistants and Laboratory Animal Caretakers	\$26,750	2,968	692	467	152
Child Development Associate Certification: CDA Council	2	2	Childcare Workers	\$24,620	22,726	1,464	3,304	1,793
Cisco Certified Entry Network Technician (CCENT) Examination: Cisco Systems, Inc.	42	14	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
Cisco Certified Networking Associate (CCNA) Routing and Switching Examination: Cisco Systems, Inc.	132	122	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
Cisco Certified Networking Associate (CCNA) Security Examination: Cisco Systems, Inc.	1	1	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
Cisco Composite Exam for CCNA (640-802): Cisco Systems	3	1	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
Cisco Interconnecting Cisco Networking Devices Part 2 (640-816)	8	3	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
Cisco IT Essentials, PC Hardware and Software End-of-Course Examination: Cisco Systems	20	18	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
CIW (Certified Internet Webmaster) Professional Examinations: Certification Partners, LLC (Pass any one exam at this level or above)	19	19	Web Developers	\$88,850	4,545	667	361	80
CIW Internet Business Associate Examination: Certification Partners, LLC	39	37	Web Developers	\$88,850	4,545	667	361	80
CIW Network Technology Associate Examination: Certification Partners, LLC	9	3	Web Developers	\$88,850	4,545	667	361	80
CIW Site Development Associate Examination: Certification Partners, LLC	66	53	Web Developers	\$88,850	4,545	667	361	80

Clinical Medical Assistant Certification (CMAC) Examination: American Medical Certification Association (AMCA)	0.2	0.2	Medical Assistants	\$35,010	16,716	4,301	1,963	640
Collision Repair and Refinishing Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	30	16	Automotive Body and Related Repairers	\$53,060	4,797	467	477	158
Collision Repair Assessment: National Occupational Competency Testing Institute (NOCTI)	4	2	Automotive Body and Related Repairers	\$53,060	4,797	467	477	158
Commercial Foods Assessment: National Occupational Competency Testing Institute (NOCTI)	15	8	Food Preparation and Serving Related Occupations	\$24,280	372,377	42,614	64,086	26,620
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	156	117	Pest Control Workers	\$40,800	1,523	123	208	56
CompTIA IT Fundamentals Certification Examination: CompTIA	160	112	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
CompTIA A+ Certification Examination (must pass both exams): CompTIA	250	143	Computer Hardware Engineers	\$119,500	1,384	140	96	26
CompTIA Linux+ Examination Program--Powered by Linux Professional Institute (must pass both exams): CompTIA	0.2	0.2	Computer Network Support Specialists	\$73,050	7,559	687	588	148
CompTIA Network+ Examination: CompTIA	75	29	Computer Network Support Specialists	\$73,050	7,559	687	588	148
CompTIA Security + Examination: CompTIA	44	22	Computer Network Support Specialists	\$73,050	7,559	687	588	148
CompTIA Server+ Examination: CompTIA	0.4	0.4	Computer Network Support Specialists	\$73,050	7,559	687	588	148
Computer Networking Fundamentals Assessment: National Occupational Competency Testing Institute (NOCTI)	78	50	Computer Network Support Specialists	\$73,050	7,559	687	588	148
Computer Programming Assessment: National Occupational Competency Testing Institute (NOCTI)	118	89	Computer Programmers	\$94,470	7,616	(412)	445	137
Computer Repair Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	88	52	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
Computer Service Technician (CST) Examination : Electronics Technicians Association (ETA), International	5	3	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
Computer Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	33	17	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
CompTIA A+ 901 Examination	138	85	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415

Conservation Assessment: National Occupational Competency Testing Institute (NOCTI)	6	5	Can't locate in NOCTI					
Construction Masonry-Block Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	Helpers--Construction Trades	\$31,340	7,974	528	1,123	327
Construction Masonry-Brick Assessment: National Occupational Competency Testing Institute (NOCTI)	31	20	Helpers--Construction Trades	\$31,340	7,974	528	1,123	327
Cosmetology Assessment: National Occupational Competency Testing Institute (NOCTI)	243	186	Personal Care and Service Occupations	\$27,580	197,503	42,254	29,662	13,048
Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	759	556	Hairdressers, Hairstylists, and Cosmetologists	\$34,250	18,711	1,881	2,263	1,187
Criminal Justice Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	4	2	Legal Occupations	\$103,820	46,115	4,446	3,263	1,168
Culinary Arts Prep Cook-Level 1 Assessment: National Occupational Competency Testing Institute (NOCTI)	200	138	Food Preparation and Serving Related Occupations	\$24,280	372,377	42,614	64,086	26,620
Culinary Arts Prep Cook-Level 2 Assessment: National Occupational Competency Testing Institute (NOCTI)	72	52	Chefs and Head Cooks	\$54,760	3,534	416	451	106
Data Cabling Installer (DCI) Certification Examination: Electronics Technicians Association (ETA), International	8	7	Telecommunications Line Installers and Repairers	\$61,070	4,443	(79)	435	111
Dental Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	84	52	Dental Assistants	\$44,640	10,134	2,030	1,194	466
Diesel Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	20	13	Automotive Service Technicians and Mechanics	\$47,730	24,370	1,348	2,312	748
Early Childhood Development and Services Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	Childcare Workers	\$24,620	22,726	1,464	3,304	1,793
Early Childhood Education and Care, Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	11	7	Teacher Assistants	\$28,000	32,596	3,221	3,438	1,702
Early Childhood Education and Care, Basic Assessment: National Occupational Competency Testing Institute (NOCTI)	338	280	Childcare Workers	\$24,620	22,726	1,464	3,304	1,793
Electric Power and Distribution Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	Helpers--Electricians	\$30,510	3,353	179	468	138
Electrical Construction Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	35	20	Helpers--Electricians	\$30,510	3,353	179	468	138
Electrical Employment Ready Examination: HVAC Excellence	2	2	Helpers--Electricians	\$30,510	3,353	179	468	138

Electrical Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	38	19	Helpers--Electricians	\$30,510	3,353	179	468	138
Electronic Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	37	7	Helpers--Electricians	\$30,510	3,353	179	468	138
Electronics Assessment: National Occupational Competency Testing Institute (NOCTI)	102	36	Electrical and Electronics Engineering Technicians	\$70,750	6,017	539	541	184
Emergency Medical First Responder Certification: Department of Health, Office of EMS	6	4	Emergency Medical Technicians and Paramedics	\$35,310	6,227	1,091	439	98
Emergency Medical Technician Examination: Department of Health, Office of Emergency Medical Services	119	78	Emergency Medical Technicians and Paramedics	\$35,310	6,227	1,091	439	98
EPA Universal Examination (pass all three types): Environmental Protection Agency (EPA)	122	111	Environmental Science and Protection Technicians, Including	\$47,150	336	28	39	13
Equine Science Examination – New York State Department of Education (Cornell University)	25	21	Farmworkers, Farm, Ranch, and Aquacultural Animals	\$28,020	780	100	120	27
Fiber Optics Installer (FOI) Certification: Electronics Technicians Association (ETA), International	9	8	Telecommunications Line Installers and Repairers	\$61,070	4,443	(79)	435	111
Firefighter II Certification Examination: Virginia Department of Fire Programs	29	25	Fire Fighting and Prevention Workers	\$83,440	11,363	1,000	815	250
Floriculture Assessment: National Occupational Competency Testing Institute (NOCTI)	25	19	Floral Designers	\$28,060	665	(52)	58	25
Floriculture-Greenhouse Assessment: National Occupational Competency Testing Institute (NOCTI)	12	6	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	\$27,910	793	37	120	28
Food Safety & Science Certification Examination: American Meat Science Association (Exam is administered by iCEV)	2	1	Food Preparation and Serving Related Occupations	\$24,280	372,377	42,614	64,086	26,620
Forestry Products & Processing Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	Forest, Conservation, and Logging Workers	\$41,130	1,904	29	244	67
Fundamentals of Animal Science Certification Examination: Elanco (Exam is administered by iCEV)	33	15	Veterinary Assistants and Laboratory Animal Caretakers	\$26,750	2,968	692	467	152
Fundamentals of Construction Assessment: National Occupational Competency Testing Institute (NOCTI)	125	53	Helpers--Construction Trades	\$31,340	7,974	528	1,123	327
Gas Heat Employment Ready Examination: HVAC Excellence	2	2	Heating, Air Conditioning, and Refrigeration Mechanics and I	\$50,210	12,931	1,345	1,298	341
Graphic Production Technology Assessment: National Occupational Competency Testing Institute	4	4	Printing Workers	\$38,790	5,380	(729)	555	258

Greenhouse Operators Certification Examination: Southeast Greenhouse Growers Association/Virginia Flower Growers Association	108	47	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	\$27,910	793	37	120	28
HBI/NAHB Building Construction Technology Advanced Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	0.4	0.4	Helpers--Construction Trades	\$31,340	7,974	528	1,123	327
HBI/NAHB Carpentry Advanced Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	1	1	Helpers--Construction Trades	\$31,340	7,974	528	1,123	327
Health Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	119	67	Healthcare Support Occupations	\$32,680	118,126	25,612	14,305	5,932
Heating, Electrical, Air Conditioning Technology Examination (HEAT): HVAC Excellence	2	2	Heating, Air Conditioning, and Refrigeration Mechanics and I	\$50,210	12,931	1,345	1,298	341
Heating, Ventilation, Air Conditioning & Refrigeration (HVAC/R) Assessment: National Occupational Competency Testing Institute (NOCTI)	11	6	Heating, Air Conditioning, and Refrigeration Mechanics and I	\$50,210	12,931	1,345	1,298	341
Horticulture Landscaping Assessment: National Occupational Competency Testing Institute (NOCTI)	52	26	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	\$27,910	793	37	120	28
Hospitality Management Food and Beverage Option Assessment: National Occupational Competency Testing Institute (NOCTI)	27	24	Food and Beverage Serving Workers	\$24,990	220,259	27,655	40,509	17,042
Hospitality Management Lodging Option Assessment: National Occupational Competency Testing Institute (NOCTI)	21	9	Hotel, Motel, and Resort Desk Clerks	\$22,300	7,270	291	1,127	394
HTML 5 CSS 3 Specialist Examination: Certification Partners, LLC	3	3	Web Developers	\$88,850	4,545	667	361	80
HVAC (EPA) Technician Examinations (Levels: Core, I, II, or III): Environmental Protection Agency	49	44	Heating, Air Conditioning, and Refrigeration Mechanics	\$50,210	12,931	1,345	1,298	341
HVAC Excellence Certification Program: HVAC Excellence	29	23	Heating, Air Conditioning, and Refrigeration Mechanics	\$50,210	12,931	1,345	1,298	341
IC3 Global Standard 5, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	257	166	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
IC3 Global Standard 4 Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	211	146	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415

International Code Council Certificates of Achievement Examinations (Pass any one exam): International Code Council (ICC)	96	83	Construction and Building Inspectors	\$60,170	5,107	581	566	236
Internet and Computing Core Certification Examinations/Windows 7--Office 2010: Certiport (student has passed all three examinations)	102	83	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
Intuit QuickBooks Certified User Certification Test: Certiport	11	4	Accountants and Auditors	\$85,640	48,072	6,042	4,525	1,330
Licensed Practical Nurse Examination: Virginia Board of Nursing (VBN)	4	4	Licensed Practical and Licensed Vocational Nurses	\$44,850	25,165	3,806	2,010	818
Logistics Technology/Distribution Center Services Assessment: National Competency Testing Institute (NOCTI)	5	4	Material Recording, Scheduling, Dispatching, and Distribution	\$43,950	108,787	6,651	12,147	4,965
Manufacturing Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	10	4	Mechanical Drafters	\$59,000	753	55	64	21
MCP - MCSA: Cloud Platform (pass any two exams): Microsoft	0.4	0.4	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
MCP - MCSA: Machine Learning (must pass both exams): Microsoft	0.4	0.4	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
MCP - MCSA: Microsoft Dynamics 365 for Operations (must pass two required exams): Microsoft	0.2	0.2	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
MCP - MCSA: SQL 2016 BI Development (must pass two required exams): Microsoft	2	2	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
MCP - MCSA: SQL 2016 Database Administration (must pass two required exams): Microsoft	0.4	0.4	Computer Programmers	\$94,470	7,616	(412)	445	137
Mechanical Apprentice Drafter Examination: American Design Drafting Association (ADDA)	0.4	0.4	Mechanical Drafters	\$59,000	753	55	64	21
Mechanical Certified Drafter Examination: American Design Drafting Association (ADDA)	28	17	Mechanical Drafters	\$59,000	753	55	64	21
Mechanical Drafting and Design Assessment: National Competency Testing Institute (NOCTI)	49	27	Mechanical Drafters	\$59,000	753	55	64	21
Mechatronics-Level 1 Assessment: National Competency Testing Institute (NOCTI)	47	31	Electro-Mechanical Technicians	\$56,020	504	23	44	16
Medical Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	121	93	Medical Assistants	\$35,010	16,716	4,301	1,963	640
MOS 2013, 2016 Master/Certiport (must pass four exams)	12	12	Computer Operators	\$49,830	548	(136)	50	25
MOS Examinations (Advanced level): Microsoft Office Specialist/Certiport (Pass any one exam at this level)	46	46	Computer Operators	\$49,830	548	(136)	50	25

MOS Excel Expert Level: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	73	33	Computer Operators	\$49,830	548	(136)	50	25
MOS Microsoft Office Expert 2013/Certiport (must pass both Word & Excel at expert levels)	5	5	Computer Operators	\$49,830	548	(136)	50	25
MOS Word Expert Level Examination: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	316	188	Word Processors and Typists	\$42,290	351	(148)	32	27
MTA Examination: .NET Fundamentals (98-372)	25	13	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
MTA Examination: Database Administration Fundamentals (98-364)	55	29	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
MTA Examination: Gaming Development Fundamentals	2	1	Computer Programmers	\$94,470	7,616	(412)	445	137
MTA Examination: HTML5 Application Development Fundamentals (98-375)	21	10	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
MTA Examination: Mobility and Device Fundamentals (98-368)	9	2	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
MTA Examination: Networking Fundamentals (98-366)	174	75	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
MTA Examination: Security Fundamentals (98-367)	355	130	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
MTA Examination: Software Development Fundamentals (98-361)	86	24	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
MTA Examination: Windows OS Fundamentals (98-349)	125	70	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
MTA Examination: Windows Server Administration Fundamentals (98-365)	15	10	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
MTA Examination: Introduction to Programming using HTML & CSS (98-383)	35	16	Computer Programmers	\$94,470	7,616	(412)	445	137
MTA Examination: Introduction to Programming using Java (98-388)	38	20	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
MTA Examination: Introduction to Programming using JavaScript (98-382)	8	7	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
MTA Examination: Introduction to Programming using Python (98-381)	136	40	Computer Programmers	\$94,470	7,616	(412)	445	137
MTA Examination: Introduction to Programming with Block-Based Languages (98-380)	23	9	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
Nail Technician Examination: Virginia Board for Barbers and Cosmetology	39	26	Hairdressers, Hairstylists, and Cosmetologists	\$34,250	18,711	1,881	2,263	1,187

National Certified Patient Care Technician (NCPCT) Examination: National Center for Competency Testing (NCCT)	1	1	Nursing Assistants	\$28,770	45,783	7,906	5,446	2,540
National Nurse Aide Assessment Program (NNAAP) Examination: Virginia Board of Nursing	1,057	868	Nursing Assistants	\$28,770	45,783	7,906	5,446	2,540
Nationally Registered Certified Dental Assistant (NRCDA) Examination: National Association of Health Professionals (NAHP)	59	26	Dental Assistants	\$44,640	10,134	2,030	1,194	466
Nationally Registered Certified Medical Assistant (NRCMA) Examination: National Association of Health Professionals (NAHP)	5	5	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
Nationally Registered Certified Pharmacy Technician (NRCPhT) Examination: National Association for Health Professionals (NAHP)	8	7	Pharmacy Technicians	\$32,370	10,020	1,139	840	306
Network Cabling Specialist Certification Examination: C-Tech Associates	25	24	Telecommunications Line Installers and Repairers	\$61,070	4,443	(79)	435	111
Network Pro Certification Examination: Test Out Corporation (TOC)	24	15	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
NHA: Certified Medical Laboratory Assistant (CMLA)	0.2	0.2	Medical Assistants	\$35,010	16,716	4,301	1,963	640
Nursing Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	135	99	Nursing Assistants	\$28,770	45,783	7,906	5,446	2,540
Oracle Certification Program Examination: PL SQL	4	1	Computer Operators	\$49,830	548	(136)	50	25
Oracle Certification Program Examinations (Pass any one exam from this certification program): Oracle Corporation	20	4	Computer Operators	\$49,830	548	(136)	50	25
ParaPro: Educational Testing Service (ETS)	363	327	Teacher Assistants	\$28,000	32,596	3,221	3,438	1,702
PC Pro Certification Examination: Test Out Corporation (TOC)	66	49	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
Phlebotomy Technical Certification (PTC) Examination: American Medical Certification Association (AMCA)	5	4	Phlebotomists	\$35,960	10,020	1,139	840	306
Plant Science Certification Examination: Bayer Crop Science (exam is adm. by iCEV)	16	8	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	\$27,910	793	37	120	28
Pork Quality Assurance Certification	20	19	Farming, Fishing, and Forestry Occupations	\$36,230	8,582	585	1,193	304
Practical Nursing Assessment: National Occupational Competency Testing Institute	29	19	Nursing Assistants	\$28,770	45,783	7,906	5,446	2,540
Praxis Core Academic Skills for Educators Tests: Educational Testing Service (must pass all three tests)	1	1	Teacher Assistants	\$28,000	32,596	3,221	3,438	1,702

Precision Machining Assessment: National Occupational Competency Testing Institute (NOCTI)	13	10	Production Occupations	\$38,390	168,422	(6,885)	18,628	7,217
Pre-Engineering/Engineering Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	472	275	Industrial Engineering Technicians	\$55,940	415	14	36	13
Principles of Floral Design Certification Examination: Benz School of Floral Design (exam is adm. by iCEV)	3	1	Floral Designers	\$29,760	665	(52)	58	25
Principles of Livestock Selection and Evaluation Certification Examination: National Collegiate Livestock Coaches Association (exam is adm. by iCEV)	13	5	Farming, Fishing, and Forestry Occupations	\$36,230	8,582	585	1,193	304
Private Applicator Certification Examination: VA Dept. of Agriculture and Consumer Services	553	386	Pest Control Workers	\$40,800	1,523	123	208	56
Production Agriculture Assessment: National Occupational Competency Testing Institute (NOCTI)	23	14	Farming, Fishing, and Forestry Occupations	\$36,230	8,582	585	1,193	304
ProStart Program End-of-Course Examination (Level 2): Education Foundation of the National Restaurant Association	120	87	Food Preparation and Serving Related Occupations	\$24,280	372,377	42,614	64,086	26,620
Real Estate Salesperson Examination: Virginia Real Estate Board	5	5	Real Estate Sales Agents	\$66,230	15,672	821	1,457	780
Registered Technician Certification Examination: VA Dept. of Agriculture and Consumer Services	6	3	Pest Control Workers	\$40,800	1,523	123	208	56
Restaurant, Food and Beverage Services Assessment: National Occupational Competency Testing Institute (NOCTI)	58	41	Food Preparation and Serving Related Occupations	\$24,280	372,377	42,614	64,086	26,620
Retail Commercial Baking Assessment: National Occupational Competency Testing Institute (NOCTI)	30	18	Chefs and Head Cooks	\$54,760	3,534	416	451	106
Retail Management Certification Assessment: National Retail Federation (NRF) Foundation	14	13	Sales and Related Occupations	\$41,140	437,498	17,499	60,690	25,941
Retail Merchandising Assessment: National Occupational Competency Testing Institute (NOCTI)	25	12	Sales and Related Occupations	\$41,140	437,498	17,499	60,690	25,941
Security Pro Certification Examination: Test Out Corporation (TOC)	23	15	Computer User Support Specialists	\$58,290	21,825	2,636	1,738	415
ServSafe Manager Certification Examination: National Restaurant Association	1,375	870	Food Preparation and Serving Related Occupations	\$24,280	372,377	42,614	64,086	26,620
Small Animal Care Examination New York Dept. of Education (Cornell Univ.)	135	116	Animal Care and Service Workers	\$27,720	11,405	2,420	1,718	676
Small Animal Science and Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	309	206	Animal Care and Service Workers	\$27,720	11,405	2,420	1,718	676

Small Engine Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	309	126	Outdoor Power Equipment and Other Small Engine Mechanics	\$37,810	490	41	52	19
Technical Drafting Assessment: National Occupational Competency Testing Institute	67	48	Mechanical Drafters	\$59,000	753	55	64	21
Television Production Assessment: National Occupational Competency Testing Institute (NOCTI)	156	109	Production Occupations	\$38,390	168,422	(6,885)	18,628	7,217
Therapeutic Services Assessment: National Occupational Competency Testing Institute (NOCTI)	2	2	Personal Care and Service Occupations	\$27,580	197,503	42,254	29,662	13,048
Veterinary Medical Applications Certification Examination: Elanco (exam is adm. by iCEV)	35	21	Veterinary Assistants and Laboratory Animal Caretakers	\$26,750	2,968	692	467	152
Virginia Motor Vehicle Safety Inspection Program Examination: Virginia State Police	6	6	Automotive Service Technicians and Mechanics	\$47,730	24,370	1,348	2,312	748
Visual Communications and Multimedia Design Assessment: National Occupational Competency Testing Institute (NOCTI)	35	22	Media and Communication Equipment Workers	\$93,390	6,991	638	628	230
Web Design Assessment: National Occupational Competency Testing Institute (NOCTI)	51	40	Web Developers	\$88,850	4,545	667	361	80
Welding Assessment: National Occupational Competency Testing Institute (NOCTI)	129	72	Welders, Cutters, Solderers, and Brazers	\$46,360	7,627	432	820	198

Research Question 4: What is the potential economic impact for the state if the number of CTE students earning industry credentials were to increase by 10% annually?

To determine the economic impact for the Commonwealth of Virginia if the number of CTE students earning industry credentials were to increase 10% annually, each of the 46 different industry credentials aligned with an occupation in Table 30, was calculated to determine its growth of 10% annually. These results were then used to determine the income tax associated with that credential and occupation. Table 30 provides a breakout, by year, of the potential income tax revenue the Commonwealth of Virginia could potentially receive if the number of completer students earning industry credentials was to increase by 10% annually.

Table 30

Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually

VA	Credential *10%	Compound Credentials	Income Tax Due	Compound Income Tax
Year 1	1,516	16,680	\$ 38,291,661.52	\$ 41,412,734.02
Year 2	1,668	18,348	\$ 42,120,827.67	\$ 83,533,561.69
Year 3	1,835	20,183	\$ 46,332,910.44	\$ 29,866,472.13
Year 4	2,018	22,202	\$ 50,966,201.48	\$ 180,832,673.62
Year 5	2,220	24,422	\$ 56,062,821.63	\$ 236,895,495.25

Credential numbers are rounded

A component of this study was a survey distributed to 40 representatives of Virginia's economy to determine the value added to the earning of industry credentials. Eighteen respondents indicated a candidate applying for a position in their company/organization, as a holder of industry credentials, would enter the company at a larger starting salary than a non-credentialed candidate. The range of the increased starting salary was between 5% and 25%.

Using the average of these numbers, 14% could be used as the value-added to the earning of industry credentials, however, to ensure this study creates a floor rather than a ceiling of value, 10% was used as the value-added to those earning industry credentials as this was the percentage that 6 of the respondents chose.

Table 31 shows the projected data of completers if their number were to increase by 10% annually. Data in the table also presents the new potential income tax revenue available to Virginia's Treasury if the 10% value-added sum is applied to the projected economic impact of the earning of CTE industry credentials on Virginia's economy.

Table 31

Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually - AND Allows a 10% Increase in Beginning Salary

VA	Credential *10%	Compound Credentials	Income Tax Due	Compound Income Tax
Year 1	1,516	16,680	\$ 42,550,347.97	\$ 46,014,942.72
Year 2	1,668	18,348	\$ 46,805,382.77	\$ 92,820,325.49
Year 3	1,835	20,183	\$ 51,485,921.05	\$ 144,306,246.54
Year 4	2,018	22,202	\$ 56,634,513.15	\$ 200,940,759.69
Year 5	2,220	24,422	\$ 62,297,964.47	\$ 263,238,724.16

Credential numbers are rounded

Region One: Central Virginia

Central Virginia, as Superintendent Region One, consists of 15 school divisions, comprising, among its number 38 high schools. Of the 8 Superintendent regions, this region lists 4th in the number of high schools available to its students (VDOE, 2020).

Table 32

VDOE Superintendent Region 1: Central Virginia

Charles City County	Hanover County	Powhatan County
Chesterfield County	Henrico County	Prince George County
Colonial Heights	Hopewell	Richmond
Dinwiddie County	New Kent County	Surry County
Goochland County	Petersburg	Sussex County

Source: Commonwealth of Virginia, Department of Education Superintendent's Regions, http://www.doe.virginia.gov/directories/va_region_map.pdf

Data in Table 33 presents the alignment of the school divisions in Superintendent Region One to the Local Workforce Investment Area (LWIA) regions. This data was created by the Demographics group at the Weldon Cooper Center for Public Service at the University of Virginia to help administrators and teachers in completing the “Application for Career and Technical Education New Program/Course in 2019. The LWIA’s were designated by the Workforce Innovation and Opportunity Act (WIOA) State Plan for the Commonwealth of Virginia (TrailBlazers, 2019). The alignment of the superintendent region to the LWIA region undergirds the findings of this study.

Table 33

Local Workforce Investment Areas (LWIAs) in Virginia by VDOE Superintendent Region

Region 1: Central Virginia	LWIA Region
Charles City County	LWIA IX: Capital Region Workforce Partnership
Chesterfield County	LWIA IX: Capital Region Workforce Partnership
Colonial Heights	LWIA XV: Crater Area
Dinwiddie County	LWIA XV: Crater Area
Goochland County	LWIA IX: Capital Region Workforce Partnership

Hanover County	LWIA IX: Capital Region Workforce Partnership
Henrico County	LWIA IX: Capital Region Workforce Partnership
Hopewell	LWIA XV: Crater Area
New Kent County	LWIA IX: Capital Region Workforce Partnership
Petersburg	LWIA XV: Crater Area
Powhattan County	LWIA IX: Capital Region Workforce Partnership
Prince George County	LWIA XV: Crater Area
Richmond	LWIA IX: Capital Region Workforce Partnership
Surry County	LWIA XV: Crater Area
Sussex County	LWIA XV: Crater Area

Source: School Report Card Data: Year 2016-2017

http://www.doe.virginia.gov/instruction/career_technical/path_industry_certification/index.shtml

Virginia Department of Education, School Report Card Data for School Year: 2015 - 2016

Local Workforce Investment Areas (LWIAs) in Virginia

Research Question 1: What is the trend for high school participation in CTE programs in Virginia (Region One) over the past five years?

In order to determine the average number of high school CTE completer students in Region One, over the last five years, data retrieved from the VDOE's Office of Education Information Management (2019) was used. Data in Table 34 presents the number of completers by year, then when averaged out over five years. By examining this table, it is possible to observe the specific number of CTE completer students in this region, and whether the number has increased, decreased or remained the same.

Table 34

Number of CTE Completers in Region One: 2014-2019

Year	Total Completers	5 Year Avg Completers
2014-2015	5,612	1,122
2015-2016	6,843	1,369
2016-2017	5,595	1,119
2017-2018	5,835	1,167
2018-2019	5,951	1,190
TOTAL	29,836	5,967

Source: Completer data by region retrieved from Virginia Department of Education, Office of Education Information Management, (2019).

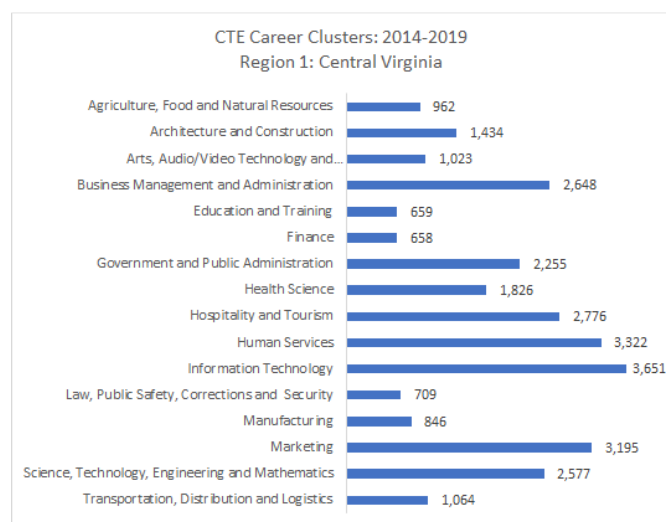
Research Question 2: What is the trend for high school completer students earning industry certifications in Virginia (Region One) over the past five years?

To enable school administration to organize curriculum design, and career counselors to provide the necessary guidance to students, the Virginia Department of Education groups CTE programs and courses in a “Career Cluster.” According to VDOE (2020), these career clusters help to:

- Organize academic and technical knowledge and skills into a coherent sequence
- Identify pathways from secondary to postsecondary education
- Provide a framework for seamless education
- Provide institutional support of rigorous academic teaching and learning
- Provide alignment of academic and technical skills with workplace readiness skills
- Provide opportunities to involve parents, business and industry, and the school community
- Provide the development of effective plans of study that are based on career assessments

Using data drawn from the Weldon-Cooper Center for Public Service: CTE Completer Data: 2014-2019, over five years, Region One: Central Virginia CTE completer students are seen to favor the Information Technology cluster (3,651), with the least numerous cluster of Finance reflecting 658 completer students.

Figure 9 CTE Career Clusters in Region One: 2014-2019



Source: Weldon-Cooper Center for Public Service: CTE Completer Data: 2014-2019

Using industry credential test data provided by the *Virginia Department of Education, Office of Education Information Management, (2019)*, data were disaggregated using SPSS. Disaggregation was used to determine the credential type earned, the number of students taking and earning the credential, and what this looks like over a five-year average. Because this study aims to determine the relationship between the earning of Career and Technical industry credentials and the Virginia economy, the superintendent region in which these industry credentials were earned is the primary format of Table 35. Further, because the focus of this study is on CTE completers, the data was analyzed to determine which of the credentials earned would be the final steps in the completer process. The disaggregated data demonstrating the “completer industry credentials earned by Region One CTE students: 2014-2019” is presented in Table 35.

Table 35

Region One: Industry Credentials Taken and Passed: 2014-2019- “Completers”

“Technical” Industry Credential Assessments & Assessment Provider	Attempts	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
AAFCS: Culinary Arts Examination	10	9	2	2
AAFCS: Early Childhood Education Examination	83	61	17	12
AAFCS: Education Fundamentals Examination	21	21	4	4
AAFCS: Fashion, Textiles, and Apparel Examination	2	2	0	0
ACCESS Examination: American Culinary Federation, Inc. (ACF)	15	7	3	1
Accounting (Basic) Assessment: National Occupational Competency Testing Institute (NOCTI)	1,147	844	229	169
Accounting--Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	36	27	7	5
ACF Culinary Arts Certification Assessment: American Culinary Federation, Inc. (Assessment is administered by NOCTI)	17	11	3	2
Administrative Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	95	65	19	13
Administrative Services Assessment: National Occupational Competency Testing Institute (NOCTI)	117	99	23	20
Adobe Certified Associate: Dreamweaver CS5 Examination/Certiport	36	14	7	3
Adobe Certified Associate: Flash CC 2013 Examination/Certiport	21	10	4	2
Adobe Certified Associate: Photoshop Cloud 2013 Examination/Certiport	93	45	19	9
Adobe Certified Associate: Photoshop Cloud 2015 Examination/Certiport	262	89	52	18
Adobe Certified Associate: Photoshop CS5 Examination/Certiport	22	11	4	2
Adobe Certified Associate: Photoshop CS6 Examination/Certiport	21	18	4	4
Adobe Certified Associate: Dreamweaver CS6 Examination/Certiport	214	82	43	16
Adobe Certified Associate: Illustration 2018 Examination/Certiport	123	18	25	4
Adobe Certified Associate: Illustrator Cloud 2015 Examination/Certiport	478	88	96	18
Adobe Certified Associate: Illustrator Cloud Examination/Certiport	41	33	8	7
Adobe Certified Associate: Illustrator CS6 Examination/Certiport	15	14	3	3
Adobe Certified Associate: InDesign 2018 Examination/Certiport	31	4	6	1
Adobe Certified Associate: InDesign Cloud 2015 Examination/Certiport	90	36	18	7
Adobe Certified Associate: InDesign Cloud Examination/Certiport	20	13	4	3
Adobe Certified Associate: Premier Pro 2018 Examination/Certiport	1	1	0	0
Adobe Certified Associate: Premiere Pro CC 2015 Examination/Certiport	116	11	23	2
Adobe Certified Associate: Premiere Pro CS6 Examination/Certiport	67	34	13	7
Adobe Certified Associates: Photoshop 2018 Examination/Certiport	108	41	22	8
Advanced Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	272	203	54	41
AHLA Certified Hospitality and Tourism Management Professional Examination (Must pass Level 1 and Level 2 exams): American Hotel and Lodging Association	29	16	6	3
American Medical Certification Association Examinations: AMCA	62	13	12	3

Architectural Apprentice Drafter Examination: American Design Drafting Association (ADDA)	2	2	0	0
ASE Auto Maintenance and Light Repair Examination (G1): National Institute for Automotive Service Excellence	29	23	6	5
ASE Automotive & Light Truck Certification Test-Brakes (A5): National Institute for Automotive Service Excellence	43	30	9	6
ASE Automotive & Light Truck Certification Test-Electrical/Electronic Systems (A6): National Institute for Automotive Service Excellence	105	91	21	18
ASE Automotive & Light Truck Certification Test-Engine Performance (A8): National Institute for Automotive Service Excellence	1	1	0	0
ASE Automotive & Light Truck Certification Test-Engine Repair (A1): National Institute for Automotive Service Excellence	16	12	3	2
ASE Automotive & Light Truck Certification Test-Heating and Air Conditioning (A7): National Institute for Automotive Service Excellence	1	1	0	0
ASE Automotive & Light Truck Certification Test-Manual Drive Train and Axles (A3): National Institute for Automotive Service Excellence	1	1	0	0
ASE Automotive & Light Truck Certification Test-Suspension & Steering (A4): National Institute for Automotive Service Excellence	9	9	2	2
ASE Collision Repair & Refinish Certification Test - Structural Analysis & Damage Repair: National Institute for Automotive Service Excellence	15	9	3	2
ASE Collision Repair and Refinish Certification Test - Painting & Refinishing (B2): National Institute for Automotive Service Excellence	22	22	4	4
ASE Student Certification Automotive: Electrical/Electronic Systems: National Institute for Automotive Service Excellence	323	185	65	37
ASE Student Certification Automotive: Engine Performance: National Institute for Automotive Service Excellence	280	147	56	29
ASE Student Certification Automotive: Engine Repair: National Institute for Automotive Service Excellence	286	168	57	34
ASE Student Certification Automotive: Heating and Air Conditioning: National Institute for Automotive Service Excellence	252	148	50	30
ASE Student Certification Automotive: Maintenance and Light Repair: National Institute for Automotive Service Excellence	551	387	110	77
ASE Student Certification Automotive: Manual Drive Train and Axles: National Institute for Automotive Service Excellence	242	119	48	24
ASE Student Certification Automotive: Automatic Transmission/Transaxle: National Institute for Automotive Service Excellence	245	114	49	23
ASE Student Certification Automotive: Automotive Service Technology National Institute for Automotive Service Excellence	158	99	32	20
ASE Student Certification Automotive: Brakes: National Institute for Automotive Service Excellence	416	246	83	49
ASE Student Certification Automotive: Suspension and Steering: National Institute for Automotive Service Excellence	310	186	62	37
ASE Student Certification Collision Repair & Refinish: Mechanical and Electrical: National Institute for Automotive Service Excellence	133	44	27	9
ASE Student Certification Collision Repair & Refinish: Non-structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	182	66	36	13
ASE Student Certification Collision Repair & Refinish: Painting and Refinishing: National Institute for Automotive Service Excellence	250	69	50	14
ASE Student Certification Collision Repair & Refinish: Structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	100	39	20	8
ASK Concepts of Entrepreneurship and Management Assessment: ASK Business Institute	64	18	13	4

AutoCAD Certified User: Autodesk	2,094	866	419	173
Autodesk Certification Program (Pass any one exam at fundamentals level)	157	80	31	16
Autodesk Fusion 360 Certified User Examination: Autodesk	1	1	0	0
Autodesk Inventor Certified Professional Examination: Autodesk	85	61	17	12
Autodesk Inventor Certified User: Autodesk	1,463	712	293	142
Autodesk Revit Certified Professional Examination: Autodesk	590	256	118	51
Barbers Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	75	23	15	5
Beef Quality Assurance Certification	91	90	18	18
BrainBench Desktop Publishing Software Examination	27	25	5	5
BrainBench Software Development Examinations	46	15	9	3
BrainBench Technical Support Examinations	15	13	3	3
CAD Assessment: National Occupational Competency Testing Institute (NOCTI)	12	9	2	2
Certification of Pharmacy Technicians (ExCPT) Examination: Virginia Board of Pharmacy	140	104	28	21
Certified Dental Assistant and National Entry Level Assistant: Radiation Health & Safety (RHS) Examination: Dental Assisting National Board	25	25	5	5
Certified Medical Administrative Assistant (CMAA) Examination: National Healthcareer Association (NHA)	48	12	10	2
Certified Physical Therapy Aide (CPTA) Examination: American Allied Health (AAH)	245	202	49	40
Certified SolidWorks Associate (CSWA) Examination: SOLIDWORKS Corporation	30	10	6	2
Child Development Associate Certification: CDA Council	11	11	2	2
Cisco Certified Entry Network Technician (CCENT) Examination: Cisco Systems, Inc.	8	8	2	2
Cisco Certified Networking Associate (CCNA) Routing and Switching Examination: Cisco Systems, Inc.	5	5	1	1
CIW (Certified Internet Webmaster) Professional Examinations: Certification Partners, LLC	74	74	15	15
CIW Network Technology Associate Examination: Certification Partners, LLC	35	3	7	1
CIW Site Development Associate Examination: Certification Partners, LLC	43	29	9	6
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	34	28	7	6
CompTIA IT Fundamentals Certification Examination: CompTIA	34	18	7	4
CompTIA A+ Certification Examination (must pass both exams): CompTIA	173	109	35	22
CompTIA Security + Examination: CompTIA	2	2	0	0
Computer Programming Assessment: National Occupational Competency Testing Institute (NOCTI)	146	106	29	21
Computer Service Technician (CST) Examination : Electronics Technicians Association (ETA), International	26	14	5	3
CompTIA A+ 901 Examination	97	65	19	13
Cosmetology Assessment: National Occupational Competency Testing Institute (NOCTI)	42	26	8	5

Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	553	415	111	83
Culinary Arts Prep Cook-Level 1 Assessment: National Occupational Competency Testing Institute (NOCTI)	265	168	53	34
Culinary Arts Prep Cook-Level 2 Assessment: National Occupational Competency Testing Institute (NOCTI)	2	2	0	0
Diesel Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	0	0
Early Childhood Education and Care, Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	33	23	7	5
Early Childhood Education and Care, Basic Assessment: National Occupational Competency Testing Institute (NOCTI)	460	401	92	80
Electrical Construction Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	25	20	5	4
Electrical Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	20	14	4	3
Emergency Medical First Responder Certification: Department of Health, Office of EMS	1	1	0	0
Emergency Medical Technician Examination: Department of Health, Office of Emergency Medical Services	73	33	15	7
EPA Universal Examination (pass all three types): Environmental Protection Agency (EPA)	90	89	18	18
Firefighter II Certification Examination: Virginia Department of Fire Programs	13	11	3	2
Floriculture-Greenhouse Assessment: National Occupational Competency Testing Institute (NOCTI)	11	6	2	1
Greenhouse Operators Certification Examination: Southeast Greenhouse Growers Association/Virginia Flower Growers Association	91	39	18	8
Health Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	60	17	12	3
Heating, Ventilation, Air Conditioning & Refrigeration (HVAC/R) Assessment: National Occupational Competency Testing Institute (NOCTI)	7	7	1	1
Horticulture Landscaping Assessment: National Occupational Competency Testing Institute (NOCTI)	22	7	4	1
HVAC (EPA) Technician Examinations (Levels: Core, I, II, or III): Environmental Protection Agency	77	60	15	12
IC3 Global Standard 5, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	149	141	30	28
IC3 Global Standard 4 Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	199	151	40	30
International Code Council Certificates of Achievement Examinations (Pass any one exam): International Code Council (ICC)	58	55	12	11
Internet and Computing Core Certification Examinations/2007 (IC3): (student has passed all three examinations)	16	7	3	1
Internet and Computing Core Certification Examinations/Windows 7--Office 2010: Certiport (student has passed all three examinations)	218	218	44	44
Logistics Technology/Distribution Center Services Assessment: National Competency Testing Institute (NOCTI)	26	18	5	4
Mechatronics-Level 1 Assessment: National Competency Testing Institute (NOCTI)	16	9	3	2
Medical Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	157	123	31	25
MOS Microsoft Office Expert Excel 2016/Certiport (only one exam)	24	6	5	1

MOS Microsoft Office Specialist Master 2010/Certiport	1	1	0	0
MOS Word Expert Examination: Microsoft Office 2010/Certiport	68	30	14	6
MOS Word Expert Examination: Microsoft Office 2016/Certiport	162	50	32	10
MOS Word Expert Level Examination: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	5	5	1	1
MTA Examination: Database Administration Fundamentals (98-364)	107	54	21	11
MTA Examination: Gaming Development Fundamentals	1	1	0	0
MTA Examination: HTML5 Application Development Fundamentals (98-375)	10	10	2	2
MTA Examination: Mobility and Device Fundamentals (98-368)	2	2	0	0
MTA Examination: Networking Fundamentals (98-366)	216	60	43	12
MTA Examination: Security Fundamentals (98-367)	213	78	43	16
MTA Examination: Software Development Fundamentals (98-361)	10	7	2	1
MTA Examination: Windows OS Fundamentals (98-349)	136	82	27	16
MTA Examination: Introduction to Programming using HTML & CSS (98-383)	2	2	0	0
MTA Examination: Introduction to Programming using Python (98-381)	12	6	2	1
Nail Technician Examination: Virginia Board for Barbers and Cosmetology	75	60	15	12
National Certified Patient Care Technician (NCPCT) Examination: National Center for Competency Testing (NCCT)	7	7	1	1
National Nurse Aide Assessment Program (NNAAP) Examination: Virginia Board of Nursing	737	565	147	113
Nationally Registered Certified Dental Assistant (NRCDA) Examination: National Association of Health Professionals (NAHP)	228	79	46	16
Nationally Registered Certified Medical Assistant (NRCMA) Examination: National Association of Health Professionals (NAHP)	26	26	5	5
Nationally Registered Certified Pharmacy Technician (NRCPhT) Examination: National Association for Health Professionals (NAHP)	22	16	4	3
NHA: Certified Medical Laboratory Assistant (CMLA)	1	1	0	0
Nursing Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	253	187	51	37
Oracle Certification Program Examinations (Pass any one exam from this certification program): Oracle Corporation	4	4	1	1
ParaPro: Educational Testing Service (ETS)	410	384	82	77
Precision Machining Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	0	0
Pre-Engineering/Engineering Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	558	500	112	100
Private Applicator Certification Examination: VA Dept. of Agriculture and Consumer Services	509	374	102	75
ProStart Program End-of-Course Examination (Level 2): Education Foundation of the National Restaurant Association	244	155	49	31
Real Estate Salesperson Examination: Virginia Real Estate Board	25	24	5	5
Restaurant, Food and Beverage Services Assessment: National Occupational Competency Testing Institute (NOCTI)	277	197	55	39
ServSafe Manager Certification Examination: National Restaurant Association	997	572	199	114
Small Animal Care Examination New York Dept. of Education (Cornell Univ.)	28	27	6	5

Small Animal Science and Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	230	191	46	38
Small Engine Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	286	169	57	34
Television Production Assessment: National Occupational Competency Testing Institute (NOCTI)	32	24	6	5
Veterinary Medical Applications Certification Examination: Elanco (exam is adm. by iCEV)	83	48	17	10
Virginia Motor Vehicle Safety Inspection Program Examination: Virginia State Police	23	23	5	5
Web Design Assessment: National Occupational Competency Testing Institute (NOCTI)	116	108	23	22
Welding Assessment: National Occupational Competency Testing Institute (NOCTI)	42	32	8	6
TOTAL	22,401	13,382	4,480	2,676

Because a full picture of the industry credentialing test data is needed to determine trends in the earning of industry certifications in Region One, one must be aware of the data for those currently on their CTE pathway, as seen in Table 36. Students earning credentials in this table are currently on a CTE program, as seen in the “certification,” “pre-apprentice,” or “other” pathway certifications, and non-CTE specific certifications. Although the data from this table is not included in the final calculation to determine economic impact, this does not negate their value or economic potential. This study focuses on completer students.

Table 36

Other” industry credentials earned by Region One CTE students, 2014-2019

“Other” Industry Credential Assessments & Assessment Provider	Attempts	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
AAFCS: Broad Field Family and Consumer Sciences Examination	10	7	2	1
AAFCS: Leadership Fundamentals Assessment	44	44	9	9
Agribusiness Examination: New York State Department of Education	1	1	0	0
Agricultural Biotechnology Assessment: National Occupational Competency Testing Institute (NOCTI)	88	80	18	16
AutoCAD 2004 Certification Examination: BrainBench	21	16	4	3
Broadcasting and Journalism Assessment: National Occupational Competency Testing Institute (NOCTI)	77	71	15	14
Carpenter Level One - Entry Level Assessment: National Center for Construction Education & Research (NCCER)	63	57	13	11
College Level Examination Program (CLEP): Principles of Marketing: The College Board	29	13	6	3

Core: Introductory Craft Skills Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	570	489	114	98
Criminal Justice Assessment: National Occupational Competency Testing Institute (NOCTI)	123	89	25	18
Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	4,417	3,832	883	766
EETC Two Stroke Engine Certification Test: Equipment and Engine Training Council (EETC)	11	2	2	0
Electrician Level One - Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	121	115	24	23
Electronics Module: DC (EM1): Electronics Technicians Association (ETA), International	98	51	20	10
Emergency Medical Services Assessment: National Occupational Competency Testing Institute (NOCTI)	50	45	10	9
EPA Technician Examination (Core): Environmental Protection Agency (EPA)	188	135	38	27
EPA Technician Examination (Type I): Environmental Protection Agency (EPA)	145	88	29	18
EPA Technician Examination (Type II): Environmental Protection Agency (EPA)	172	71	34	14
EPA Technician Examination (Type III): Environmental Protection Agency (EPA)	175	73	35	15
Firefighter I Certification Examination: Virginia Department of Fire Programs	56	33	11	7
General Management Assessment: National Occupational Competency Testing Institute (NOCTI)	23	17	5	3
HBI/NAHB HVAC Basic Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	1	1	0	0
HBI/NAHB Plumbing Basic Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	6	6	1	1
HVAC Level One Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	103	55	21	11
IC3 Spark, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	14	8	3	2
Installer (or Service) Core Certification Examination : North American Technician Excellence, Inc. (NATE)	4	4	1	1
International Baccalaureate for Business & Management (Standard Level) Examination: The International Baccalaureate Organization	34	35	7	7
Landscape Management Certification Examination: Green Industry Web Portal	1	1	0	0
Lodging Assessment: National Competency Testing Institute (NOCTI)	26	25	5	5
MOS Access Examination: Microsoft Office 2016/Certiport	31	15	6	3
MOS Access Examination: Microsoft Office 2010/Certiport	2	2	0	0
MOS Access Examination: Microsoft Office 2013/Certiport	61	46	12	9
MOS Excel Examination: Microsoft Office 2013/Certiport	165	144	33	29
MOS Excel Examination: Microsoft Office 2010/Certiport	132	55	26	11
MOS Excel Examination: Microsoft Office 2016/Certiport	459	172	92	34
MOS One Note Examination: Microsoft Office 2016/Certiport	1	1	0	0
MOS Outlook Examination: Microsoft Office 2013/Certiport	27	17	5	3
MOS Outlook Examination: Microsoft Office 2016/Certiport	25	5	5	1

MOS PowerPoint Examination: Microsoft Office 2013/Certiport	1,069	866	214	173
MOS PowerPoint Examination: Microsoft Office 2007/Certiport	1	1	0	0
MOS PowerPoint Examination: Microsoft Office 2010/Certiport	666	523	133	105
MOS PowerPoint Examination: Microsoft Office 2016/Certiport	1,777	764	355	153
MOS Word Examination: Microsoft Office 2010/Certiport	758	429	152	86
MOS Word Examination: Microsoft Office 2013/Certiport	916	789	183	158
MOS Word Examination: Microsoft Office 2007/Certiport	3	3	1	1
MOS Word Examination: Microsoft Office 2016/Certiport	1,108	645	222	129
NCCT Carpentry Level One, National Construction Career Test: National Center for Construction Education and Research (NCCER)	48	19	10	4
NCCT Core: Introductory Craft Skills, National Construction Career Test: National Center for Construction Education & Research (NCCER)	311	256	62	51
NCCT Electrical Examination, National Construction Career Test: National Center for Construction Education & Research (NCCER)	33	25	7	5
NIMS Machining - Level I - CNC Lathe - Programming Setup & Operations: National Institute for Metalworking Skills, Inc	1	1	0	0
NIMS Machining - Level I - Turning I Between Centers: National Institute for Metalworking Skills, Inc.	3	3	1	1
NIMS Machining - Level I - Job Planning, Benchwork, & Layout Skills: National Institute for Metalworking Skills, Inc.	19	16	4	3
NIMS Machining - Level I - Measurement, Materials, & Safety Skills: National Institute for Metalworking Skills, Inc.	72	57	14	11
Pet Sitters Certification: National Association of Professional Pet Sitters	1	1	0	0
PLTW Examination: Civil Engineering and Architecture: Project Lead the Way (PLTW)	36	3	7	1
PLTW Examination: Digital Electronics: Project Lead the Way (PLTW)	24	14	5	3
PLTW Examination: Engineering Design and Development: Project Lead the Way (PLTW)	15	15	3	3
PLTW Examination: Introduction to Engineering Design: Project Lead the Way (PLTW)	171	94	34	19
PLTW Examination: Principles of Engineering: Project Lead the Way (PLTW)	73	42	15	8
PLTW Examination: Computer Science Principles: Project Lead the Way (PLTW)	31	26	6	5
Plumbing Level One Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	3	3	1	1
Pre-Engineering Industry Certification Examination: Robotics Education Competition Foundation (RECF)	1	1	0	0
Professional Communications Certification Examination: Southwest Airlines (exam is adm. by iCEV)	39	14	8	3
ProStart Program End-of-Course Examination (Level 1): Education Foundation of the National Restaurant Association	474	397	95	79
Recreation, Amusements, and Attractions Assessment: National Occupational Competency Testing Institute (NOCTI)	41	41	8	8
Safety Examination: Manufacturing Skill Standards Council (MSSC)	19	12	4	2
SENSE Training Program Certification Examination: American Welding Society (AWS)	15	13	3	3
SkillsUSA: 3D Visualization & Animation Examination	10	4	2	1
SkillsUSA: Architectural Drafting Examination	85	37	17	7
SkillsUSA: Audio-Radio Production Examination	24	23	5	5

SkillsUSA: Automated Manufacturing Technology Examination:	49	21	10	4
SkillsUSA: Carpentry Examination	49	35	10	7
SkillsUSA: Cosmetology Examination	23	17	5	3
SkillsUSA: Criminal Justice and CSI Examination	142	116	28	23
SkillsUSA: Customer Service Examination	948	842	190	168
SkillsUSA: Electrical Construction (Residential) Wiring Examination	30	24	6	5
SkillsUSA: Engineering Technology Examination	12	6	2	1
SkillsUSA: Masonry Examination	20	11	4	2
SkillsUSA: Photography Examination	100	31	20	6
SkillsUSA: Robotics and Automation Technology Assessment	22	3	4	1
SkillsUSA: Screen Printing Examination (PrintED co-brand)	13	2	3	0
SkillsUSA: Technical Drafting Examination	71	30	14	6
SkillsUSA: Television Video Production Examination	100	71	20	14
SkillsUSA: Introduction to Graphic Communications Examination (PrintED co-brand)	11	4	2	1
Virtual Enterprises Assessment: National Occupational Competency Testing Institute (NOCTI)	20	20	4	4
Welding Level One Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	19	19	4	4
TOTAL	17,050	12,310	3,410	2,462

As a final measure to determine the trend for the earning of CTE industry credentials at the high school level in Region One, Table 37 presents the data specific to “Soft skills/College & Career Readiness” certifications. Because these certifications are included in the VDOE approved list of industry certifications, they are included in the industry credential test data provided by the Virginia Department of Education, Office of Education Information Management (VDOE, 2019). The value of this data lies in its relationship to the overall earning of industry credentials by high school students in Region One, and the bigger picture when determining any trend.

Table 37

Soft skills/College & Career Readiness industry credentials earned in Region One: 2014-2019

“Soft skills/College & Career Readiness” Assessments & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
Armed Services Vocational Aptitude Battery Examination: United States Military Entrance Processing Command	1,226	818	245	164
Avid Certified User for Media Composer Certification Examination: Avid	20	7	4	1
National Career Readiness Certificate (ACT)	2,391	2,289	478	458
W!SE Financial Literacy Certification: Working in Support of Education (W!SE)	67,391	52,294	13,478	10,459
Workplace Readiness Skills for the Commonwealth Examination	22,619	17,000	4,524	3,400
TOTAL	93,647	72,408	11,706	14,482

To determine the trend for high school completer students earning industry credentials in Region One over the past five years, a finalized set of summarized data can be seen in Table 38. These data present the number of students who have earned a CTE industry credential approved by Virginia’s Board of Education. The three categories of assessment type are represented in Table 38 and present the five year total, and five-year average number of earned (a) “technical” credentials (sufficient for a student to successfully end their completer program); (b) “other” assessments taken where students are on the CTE path, working towards certifications; and (c), the “Soft skills/College & Career Readiness” certifications.

Table 38

Total Number of Industry Certifications Earned in Region One: 2014-2019

Industry Credential Assessment & Type	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
"Technical" Completer Certifications	22,401	13,382	4,480	2,676
"Other" CTE certifications - pathway/level one/PLTW/Skills USA	17,050	12,310	2,131	2,462
“Soft skills/College & Career Readiness” certifications.	93,647	72,408	11,706	14,482
TOTAL	133,098	98,100	26,620	19,620

Research Question 3: What are the potential earnings for students gaining industry credentials in Virginia's (Region One) labor market?

To determine the potential earning for students gaining industry credentials in Virginia's labor market, it is crucial to understand the labor market's occupational openings by educational attainment level. Through the review of these data, one can examine the extent to which Region One students are entering a labor market saturated with similarly qualified candidates, or into the market with high-demand, high-salary openings. Data in Table 39, as extracted from the Bureau of Labor Statistics (BLS, 2019) and the Virginia Employment Commission projection to 2026, show the probable occupational openings by education level attainment for Region One as a whole.

Table 39

Occupational Openings by Education Attainment Level to 2026 – Region One

Region 1- Central Virginia	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Associate's Degree	20,755	2,318	1,831	547
Bachelor's Degree	110,460	12,657	9,602	2,894
Doctoral or Professional Degree	19,214	2,614	1,281	505
High School Diploma or Equivalent	261,842	14,748	28,301	11,278
Less Than High School	179,850	19,048	27,256	11,557
Master's Degree	11,276	2,276	1,110	347
Not Applicable	1,494,091	137,293	167,671	64,803
Postsecondary Non-Degree Award	22,946	2,387	2,216	902
Some College, No Degree	142	8	14	7
TOTAL	2,120,576	193,349	239,282	92,840

Source: May 2018 State Occupational Employment and Wage Estimates,
https://www.bls.gov/oes/current/oes_va.htm#00-0000

While data in Table 39 specify occupations in the “Not Applicable” category as the largest group to access to occupational openings, a precise definition of the education included in that category is not available. The second-largest estimated category in labor market openings is found in the “High School Diploma or Equivalent” category. However, when the “Not

Applicable” category is removed from the data, along with “Less than High School” as in Table 40 numbers show that the two categories of education with greater access to projected employment are those with “High School Diploma or Equivalent” and “Bachelor’s Degree.”

Table 40

Occupational Openings by Education Attainment Level – Region 1 - "Less than High School" and "Not Applicable" removed

Region 1- Central Virginia	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Associate's Degree	20,755	2,318	1,831	547
Bachelor’s Degree	110,460	12,657	9,602	2,894
Doctoral or Professional Degree	19,214	2,614	1,281	505
High School Diploma or Equivalent	261,842	14,748	28,301	11,278
Master's Degree	11,276	2,276	1,110	347
Postsecondary Non-Degree Award	22,946	2,387	2,216	902
Some College, No Degree	142	8	14	7
TOTAL	446,635	37,008	44,355	16,480

Source: May 2018 State Occupational Employment and Wage Estimates,
https://www.bls.gov/oes/current/oes_va.htm#00-0000

Data presented in Table 41 show the occupations available to Region One CTE completer students who have earned a series of industry credentials. These data present the estimated mean salary expected, the projected occupational openings to 2026 of that particular occupation, the number of annual openings, and annual exits. Data included in this table show completer data specifically and does not include those who are currently enrolled in a CTE pathway, or who have completed credentials with a career readiness focus. The data in Table 41 brings together data points from:

- a) *Region One: Industry Credentials Taken and Passed: 2014-2019- “Completers”* (see Table 35). Data from this source is seen in the columns “Assessment,” “Taken 5 Yr. Avg.” and “Pass 5 Yr. Avg”.

- b) Bureau of Labor Statistics *May 2019 State Occupational Employment and Wage Estimates: Virginia* (Bureau of Labor Statistics, 2020). Data from this source is seen in the columns “Occupation” and “Mean Annual Salary.”
- c) TrailBlazers: Career and Technical Education in Virginia. Labor market data for the *LWIA IX Capital Region Workforce Partnership* region (TrailBlazers, 2020) and *LWIA XV’s Crater Area* region (TrailBlazers, 2020), is seen in columns: “Occupation,” “Projected Employment,” “Numeric Change,” “Annual Openings,” and “Annual Exits.”

Table 41

CTE Industry Credential to Occupational Alignment and Projections – Region One: Central Virginia and Capital Region Workforce Partnership LWIA IX and Crater Area LWIA XV

Assessment	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.	Occupation	Mean Annual Wage	Projected Employment	Numeric Change	Annual Openings	Annual Exits
AAFCS: Culinary Arts Examination	2	2	Food Preparation and Serving Related Occupations	\$24,280	59,300	6,861	10,153	4,182
AAFCS: Early Childhood Education Examination	17	12	Preschool Teachers, Except Special Education	\$37,880	1,186	98	120	49
AAFCS: Education Fundamentals Examination	4	4	Teacher Assistants	\$28,000	4,081	427	433	213
AAFCS: Fashion, Textiles, and Apparel Examination	0.4	0.4	Personal Appearance Workers	\$31,700	4,931	563	592	303
ACCESS Examination: American Culinary Federation, Inc. (ACF)	3	1	Chefs and Head Cooks	\$54,760	517	65	66	16
Accounting (Basic) Assessment: National Occupational Competency Testing Institute (NOCTI)	229	169	Financial Clerks	\$40,410	15,345	494	1,661	785
Accounting--Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	7	5	Accountants and Auditors	\$85,640	8,891	955	828	248
ACF Culinary Arts Certification Assessment: American Culinary Federation, Inc. (Assessment is administered by NOCTI)	3	2	Chefs and Head Cooks	\$54,760	517	65	66	16
Administrative Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	19	13	Office and Administrative Support Occupations	\$39,030	105,577	3,975	11,956	5,263
Administrative Services Assessment: National Occupational Competency Testing Institute (NOCTI)	23	20	Office and Administrative Support Occupations	\$39,030	105,577	3,975	11,956	5,263
Adobe Certified Associate: Dreamweaver CS5 Examination/Certiport	7	3	Web Developers	\$88,850	865	100	66	15
Adobe Certified Associate: Flash CC 2013 Examination/Certiport	4	2	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	10,684	918	1,093	414
Adobe Certified Associate: Photoshop Cloud 2013 Examination/Certiport	19	9	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	10,684	918	1,093	414
Adobe Certified Associate: Photoshop Cloud 2015 Examination/Certiport	52	18	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	10,684	918	1,093	414
Adobe Certified Associate: Photoshop CS5 Examination/Certiport	4	2	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	10,684	918	1,093	414
Adobe Certified Associate: Photoshop CS6 Examination/Certiport	4	4	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	10,684	918	1,093	414

Adobe Certified Associate: Dreamweaver CS6 Examination/Certiport	43	16	Web Developers	\$88,850	865	100	66	15
Adobe Certified Associate: Illustration 2018 Examination/Certiport	25	4	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	10,684	918	1,093	414
Adobe Certified Associate: Illustrator Cloud 2015 Examination/Certiport	96	18	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	10,684	918	1,093	414
Adobe Certified Associate: Illustrator Cloud Examination/Certiport	8	7	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	10,684	918	1,093	414
Adobe Certified Associate: Illustrator CS6 Examination/Certiport	3	3	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	10,684	918	1,093	414
Adobe Certified Associate: InDesign 2018 Examination/Certiport	6	1	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	10,684	918	1,093	414
Adobe Certified Associate: InDesign Cloud 2015 Examination/Certiport	18	7	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	10,684	918	1,093	414
Adobe Certified Associate: InDesign Cloud Examination/Certiport	4	3	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	10,684	918	1,093	414
Adobe Certified Associate: Premier Pro 2018 Examination/Certiport	0.2	0.2	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	10,684	918	1,093	414
Adobe Certified Associate: Premiere Pro CC 2015 Examination/Certiport	23	2	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	10,684	918	1,093	414
Adobe Certified Associate: Premiere Pro CS6 Examination/Certiport	13	7	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	10,684	918	1,093	414
Adobe Certified Associates: Photoshop 2018 Examination/Certiport	22	8	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	10,684	918	1,093	414
Advanced Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	54	41	Sales and Related Occupations	\$41,140	75,631	2,768	10,333	4,369
AHLA Certified Hospitality and Tourism Management Professional Examination (Must pass Level 1 and Level 2 exams): American Hotel and Lodging Association	6	3	Hotel, Motel, and Resort Desk Clerks	\$22,300	925	46	143	49
American Medical Certification Association Examinations: AMCA	12	3	Medical Assistants	\$35,010	2,861	729	337	110
Architectural Apprentice Drafter Examination: American Design Drafting Association (ADDA)	0.4	0.4	Mechanical Drafters	\$59,000	176	13	15	5
ASE Auto Maintenance and Light Repair Examination (G1): National Institute for Automotive Service Excellence	6	5	Automotive Service Technicians and Mechanics	\$47,730	4,139	308	395	125

ASE Automotive & Light Truck Certification Test-Engine Repair (A1), ASE Automotive & Light Truck Certification Test-Manual Drive Train and Axles (A3), ASE Automotive & Light Truck Certification Test-Suspension & Steering (A4), ASE Automotive & Light Truck Certification Test-Brakes (A5), ASE Automotive & Light Truck Certification Test-Electrical/Electronic Systems (A6), ASE Automotive & Light Truck Certification Test-Heating and Air Conditioning (A7), ASE Automotive & Light Truck Certification Test-Engine Performance (A8)	5	4	Automotive Service Technicians and Mechanics	\$47,730	4,139	308	395	125
ASE Collision Repair & Refinish Certification Test - Structural Analysis & Damage Repair; Painting & Refinishing (B2): National Institute for Automotive Service Excellence	4	3	Automotive Body and Related Repairers	\$53,060	615	66	62	20
ASE Student Certification Automotive: Electrical/Electronic Systems; Engine Performance; Engine Repair; Heating and Air Conditioning; Maintenance and Light Repair; Manual Drive Train and Axles; Automatic Transmission/Transaxle; Brakes; Suspension and Steering: National Institute for Automotive Service Excellence	61	36	Automotive Service Technicians and Mechanics	\$47,730	4,139	308	395	125
ASE Student Certification Collision Repair & Refinish: Mechanical and Electrical; Non-structural Analysis and Damage Repair; Painting and Refinishing; Structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	49	20	Automotive Service Technicians and Mechanics	\$47,730	4,139	308	395	125
ASK Concepts of Entrepreneurship and Management Assessment: ASK Business Institute	13	4	Sales and Related Occupations	\$41,140	75,631	2,768	10,333	4,369
AutoCAD Certified User: Autodesk	419	173	Mechanical Drafters	\$59,000	176	13	15	5
Autodesk Certification Program (Pass any one exam at fundamentals level)	31	16	Mechanical Drafters	\$59,000	176	13	15	5
Autodesk Fusion 360 Certified User Examination: Autodesk	0.2	0.2	Mechanical Drafters	\$59,000	176	13	15	5
Autodesk Inventor Certified Professional Examination: Autodesk	17	12	Mechanical Drafters	\$59,000	176	13	15	5
Autodesk Inventor Certified User: Autodesk	293	142	Drafters, Engineering Technicians, and Mapping Technicians	\$60,320	2,008	132	184	61
Autodesk Revit Certified Professional Examination: Autodesk	118	51	Architects, Except Landscape and Naval	\$85,380	557	26	41	14

Barbers Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	15	5	Hairdressers, Hairstylists, and Cosmetologists	\$34,250	3,808	431	462	240
Beef Quality Assurance Certification	18	18	Farming, Fishing, and Forestry Occupations	\$36,230	881	57	124	31
BrainBench Desktop Publishing Software Examinations	5	5	Computer Operators	\$49,830	155	(43)	14	7
BrainBench Software Development Examinations	9	3	Computer Operators	\$49,830	155	(43)	14	7
BrainBench Technical Support Examinations	3	3	Computer User Support Specialists	\$58,290	3,209	360	254	62
CAD Assessment: National Occupational Competency Testing Institute (NOCTI)	2	2	Mechanical Drafters	\$59,000	176	13	15	5
Certification of Pharmacy Technicians (ExCPT) Examination: Virginia Board of Pharmacy	28	21	Pharmacy Technicians	\$32,370	2,247	275	190	68
Certified Dental Assistant and National Entry Level Assistant: Radiation Health & Safety (RHS) Examination: Dental Assisting National Board	5	5	Dental Assistants	\$44,640	1,327	244	156	62
Certified Medical Administrative Assistant (CMAA) Examination: National Healthcareer Association (NHA)	10	2	Medical Records and Health Information Technicians	\$43,590	1,269	166	86	35
Certified Physical Therapy Aide (CPTA) Examination: American Allied Health (AAH)	49	40	Physical Therapist Aides	\$28,110	228	53	29	9
Certified SolidWorks Associate (CSWA) Examination: SolidWorks Corporation	6	2	Drafters, Engineering Technicians, and Mapping Technicians	\$60,320	2,008	132	184	61
Child Development Associate Certification: CDA Council	2	2	Childcare Workers	\$24,620	3,746	235	545	296
Cisco Certified Entry Network Technician (CCENT) Examination: Cisco Systems, Inc.	2	2	Computer User Support Specialists	\$58,290	3,209	360	254	62
Cisco Certified Networking Associate (CCNA) Routing and Switching Examination: Cisco Systems, Inc.	1	1	Computer User Support Specialists	\$58,290	3,209	360	254	62
CIW (Certified Internet Webmaster) Professional Examinations: Certification Partners, LLC (Pass any one exam at this level or above)	15	15	Web Developers	\$88,850	865	100	66	15
CIW Network Technology Associate Examination: Certification Partners, LLC	7	1	Web Developers	\$88,850	865	100	66	15
CIW Site Development Associate Examination: Certification Partners, LLC	9	6	Web Developers	\$88,850	865	100	66	15
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	7	6	Pest Control Workers	\$40,800	356	25	49	13

CompTIA IT Fundamentals Certification Examination: CompTIA	7	4	Computer User Support Specialists	\$58,290	3,209	360	254	62
CompTIA A+ Certification Examination (must pass both exams): CompTIA	35	22	Computer Hardware Engineers*	\$119,500	1,384	140	96	26
CompTIA Security + Examination: CompTIA	0.4	0.4	Computer Network Support Specialists	\$73,050	1,087	76	83	21
Computer Programming Assessment: National Occupational Competency Testing Institute (NOCTI)	29	21	Computer Programmers	\$94,470	922	(70)	53	17
Computer Service Technician (CST) Examination : Electronics Technicians Association (ETA), International	5	3	Computer User Support Specialists	\$58,290	3,209	360	254	62
CompTIA A+ 901 Examination	19	13	Computer User Support Specialists	\$58,290	3,209	360	254	62
Cosmetology Assessment: National Occupational Competency Testing Institute (NOCTI)	8	5	Personal Care and Service Occupations	\$27,580	33,513	7,486	5,063	2,216
Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	111	83	Hairdressers, Hairstylists, and Cosmetologists	\$34,250	3,808	431	462	240
Culinary Arts Prep Cook-Level 1 Assessment: National Occupational Competency Testing Institute (NOCTI)	53	34	Food Preparation and Serving Related Occupations	\$24,280	59,300	6,861	10,153	4,182
Culinary Arts Prep Cook-Level 2 Assessment: National Occupational Competency Testing Institute (NOCTI)	0.4	0.4	Chefs and Head Cooks	\$54,760	517	65	66	16
Diesel Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	0.2	0.2	Automotive Service Technicians and Mechanics	\$47,730	4,139	308	395	125
Early Childhood Education and Care, Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	7	5	Teacher Assistants	\$28,000	4,081	427	433	213
Early Childhood Education and Care, Basic Assessment: National Occupational Competency Testing Institute (NOCTI)	92	80	Childcare Workers	\$24,620	3,746	235	545	296
Electrical Construction Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	5	4	Helpers--Electricians	\$30,510	756	30	106	32
Electrical Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	4	3	Helpers--Electricians	\$30,510	756	30	106	32
Emergency Medical First Responder Certification: Department of Health, Office of EMS	0.2	0.2	Emergency Medical Technicians and Paramedics	\$35,310	926	129	63	15
Emergency Medical Technician Examination: Department of Health, Office of Emergency Medical Services	15	7	Emergency Medical Technicians and Paramedics	\$35,310	926	129	63	15
EPA Universal Examination (pass all three types): Environmental Protection Agency (EPA)	18	18	Environmental Science and Protection Technicians, Including	\$47,150	176	14	21	7

Firefighter II Certification Examination: Virginia Department of Fire Programs	3	2	Fire Fighting and Prevention Workers	\$83,440	1,910	176	135	41
Floriculture-Greenhouse Assessment: National Occupational Competency Testing Institute (NOCTI)	2	1	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	\$27,910	107	6	17	4
Greenhouse Operators Certification Examination: Southeast Greenhouse Growers Association/Virginia Flower Growers Association	18	8	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	\$27,910	107	6	17	4
Health Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	12	3	Healthcare Support Occupations	\$32,680	18,694	4,050	2,256	939
Heating, Ventilation, Air Conditioning & Refrigeration (HVAC/R) Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	Heating, Air Conditioning, and Refrigeration Mechanics	\$50,210	2,104	195	211	56
Horticulture Landscaping Assessment: National Occupational Competency Testing Institute (NOCTI)	4	1	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	\$27,910	107	6	17	4
HVAC (EPA) Technician Examinations (Levels: Core, I, II, or III): Environmental Protection Agency	15	12	Heating, Air Conditioning, and Refrigeration Mechanics	\$50,210	2,104	195	211	56
IC3 Global Standard 5, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	30	28	Computer User Support Specialists	\$58,290	3,209	360	254	62
IC3 Global Standard 4 Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	40	30	Computer User Support Specialists	\$58,290	3,209	360	254	62
International Code Council Certificates of Achievement Examinations (Pass any one exam): International Code Council (ICC)	12	11	Construction and Building Inspectors	\$60,170	844	86	93	39
Internet and Computing Core Certification Examinations/2007 (IC3): (student has passed all three examinations)	3	1	Computer User Support Specialists	\$58,290	3,209	360	254	62
Internet and Computing Core Certification Examinations/Windows 7--Office 2010: Certiport (student has passed all three examinations)	44	44	Computer User Support Specialists	\$58,290	3,209	360	254	62
Logistics Technology/Distribution Center Services Assessment: National Competency Testing Institute (NOCTI)	5	4	Material Recording, Scheduling, Dispatching, and Distribution	\$43,950	19,969	1,179	2,230	914
Mechatronics-Level 1 Assessment: National Competency Testing Institute (NOCTI)	3	2	Electro-Mechanical Technicians	\$56,020	504	23	44	16
Medical Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	31	25	Medical Assistants	\$35,010	2,861	729	337	110
MOS Microsoft Office Expert Excel 2016/Certiport (only one exam)	5	1	Computer Operators	\$49,830	155	(43)	14	7
MOS Microsoft Office Specialist Master 2010/Certiport	0.2	0.2	Computer Operators	\$49,830	155	(43)	14	7

MOS Word Expert Level Examination: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	1	1	Word Processors and Typists	\$42,290	351	(148)	32	27
MTA Examination: Database Administration Fundamentals (98-364)	21	11	Computer User Support Specialists	\$58,290	3,209	360	254	62
MTA Examination: Gaming Development Fundamentals	0.2	0.2	Computer Programmers	\$94,470	922	(70)	53	17
MTA Examination: HTML5 Application Development Fundamentals (98-375)	2	2	Computer User Support Specialists	\$58,290	3,209	360	254	62
MTA Examination: Mobility and Device Fundamentals (98-368)	0.4	0.4	Computer User Support Specialists	\$58,290	3,209	360	254	62
MTA Examination: Networking Fundamentals (98-366)	43	12	Computer User Support Specialists	\$58,290	3,209	360	254	62
MTA Examination: Security Fundamentals (98-367)	43	16	Computer User Support Specialists	\$58,290	3,209	360	254	62
MTA Examination: Software Development Fundamentals (98-361)	2	1	Computer User Support Specialists	\$58,290	3,209	360	254	62
MTA Examination: Windows OS Fundamentals (98-349)	27	16	Computer User Support Specialists	\$58,290	3,209	360	254	62
MTA Examination: Introduction to Programming using HTML & CSS (98-383)	0.4	0.4	Computer Programmers	\$94,470	922	(70)	53	17
MTA Examination: Introduction to Programming using Python (98-381)	2	1	Computer Programmers	\$94,470	922	(70)	53	17
Nail Technician Examination: Virginia Board for Barbers and Cosmetology	15	12	Hairdressers, Hairstylists, and Cosmetologists	\$34,250	3,808	431	462	240
National Certified Patient Care Technician (NCPCT) Examination: National Center for Competency Testing (NCCT)	1	1	Nursing Assistants	\$28,770	8,297	1,616	996	455
National Nurse Aide Assessment Program (NNAAP) Examination: Virginia Board of Nursing	147	113	Nursing Assistants	\$28,770	8,297	1,616	996	455
Nationally Registered Certified Dental Assistant (NRCDA) Examination: National Association of Health Professionals (NAHP)	46	16	Dental Assistants	\$44,640	1,327	244	156	62
Nationally Registered Certified Medical Assistant (NRCMA) Examination: National Association of Health Professionals (NAHP)	5	5	Computer User Support Specialists	\$58,290	3,209	360	254	62
Nationally Registered Certified Pharmacy Technician (NRCPhT) Examination: National Association for Health Professionals (NAHP)	4	3	Pharmacy Technicians	\$32,370	2,247	275	190	68
NHA: Certified Medical Laboratory Assistant (CMLA)	0.2	0.2	Medical Assistants	\$35,010	2,861	729	337	110
Nursing Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	51	37	Nursing Assistants	\$28,770	8,297	1,616	996	455

Oracle Certification Program Examinations (Pass any one exam from this certification program): Oracle Corporation	1	1	Computer Operators	\$49,830	155	(43)	14	7
ParaPro: Educational Testing Service (ETS)	82	77	Teacher Assistants	\$28,000	4,081	427	433	213
Precision Machining Assessment: National Occupational Competency Testing Institute (NOCTI)	0.2	0.2	Production Occupations	\$38,390	28,094	(840)	3,120	1,185
Pre-Engineering/Engineering Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	112	100	Industrial Engineering Technicians	\$55,940	415	14	36	13
Private Applicator Certification Examination: VA Dept. of Agriculture and Consumer Services	102	75	Pest Control Workers	\$40,800	356	25	49	13
ProStart Program End-of-Course Examination (Level 2): Education Foundation of the National Restaurant Association	49	31	Food Preparation and Serving Related Occupations	\$24,280	59,300	6,861	10,153	4,182
Real Estate Salesperson Examination: Virginia Real Estate Board	5	5	Real Estate Sales Agents	\$62,060	2,492	145	232	124
Restaurant, Food and Beverage Services Assessment: National Occupational Competency Testing Institute (NOCTI)	55	39	Food Preparation and Serving Related Occupations	\$24,280	59,300	6,861	10,153	4,182
ServSafe Manager Certification Examination: National Restaurant Association	199	114	Food Preparation and Serving Related Occupations	\$24,280	59,300	6,861	10,153	4,182
Small Animal Care Examination New York Dept. of Education (Cornell Univ.)	6	5	Animal Care and Service Workers	\$27,720	1,732	377	262	102
Small Animal Science and Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	46	38	Animal Care and Service Workers	\$27,720	1,732	377	262	102
Small Engine Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	57	34	Outdoor Power Equipment and Other Small Engine Mechanics	\$37,810	210	9	22	8
Television Production Assessment: National Occupational Competency Testing Institute (NOCTI)	6	5	Production Occupations	\$38,390	28,094	(840)	3,120	1,185
Veterinary Medical Applications Certification Examination: Elanco (exam is adm. by iCEV)	17	10	Veterinary Assistants and Laboratory Animal Caretakers	\$26,750	2,968	692	467	152
Virginia Motor Vehicle Safety Inspection Program Examination: Virginia State Police	5	5	Automotive Service Technicians and Mechanics	\$47,730	4,139	308	395	125
Web Design Assessment: National Occupational Competency Testing Institute (NOCTI)	23	22	Web Developers	\$88,850	865	100	66	15
Welding Assessment: National Occupational Competency Testing Institute (NOCTI)	8	6	Welders, Cutters, Solderers, and Brazers	\$46,360	1,516	103	163	39

Research Question 4: What is the potential economic impact for the state if the number of CTE students earning industry credentials were to increase by 10% annually?

To determine the economic impact for the Commonwealth of Virginia if the number of CTE students earning industry credentials in Superintendent Region One were to increase 10% annually, each of the 244 different industry credentials aligned with an occupation in Table 42, was calculated to determine its growth of 10% annually. These results were then used to determine the income tax associated with that credential and occupation. Table 42 provides a breakout, by year, of the potential income tax revenue the Commonwealth of Virginia could potentially see if the number of completer students earning industry credentials in Superintendent Region One was to increase by 10% annually.

Table 42

Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually

Region One	Credentials *10%	Compound Credentials	Income Tax Due	Compound Income Tax
Year 1	229	2,514	\$ 6,025,482.24	\$ 7,799,354.74
Year 2	251	2,765	\$ 6,628,030.46	\$ 14,427,385.20
Year 3	277	3,042	\$ 7,290,833.51	\$ 21,718,218.71
Year 4	304	3,346	\$ 8,019,916.86	\$ 29,738,135.57
Year 5	335	3,680	\$ 8,821,908.55	\$ 38,560,044.11

Credential numbers are rounded

A component of this study was a survey distributed to forty representatives of Virginia's economy to determine the value added to the earning of industry credentials. Eighteen respondents indicated a candidate applying for a position in their company/organization, as a holder of industry credentials, would enter the company at a larger starting salary than a non-credentialed candidate. The range of the increased starting salary was between 5% and 25%. Using the average of these numbers, 14% could be used as the value-added to the earning of

industry credentials, however, to ensure this study creates a floor rather than a ceiling of value, 10% will be used as the value-added to those earning industry credentials.

Table 43 presents the projected data of Superintendent Region One completers if their number were to increase by 10% annually. Data in the table also shows the new potential income tax revenue available to Virginia's Treasury if the 10% value-added sum is applied to the projected economic impact of the earning of CTE industry credentials on Virginia's economy.

Table 43

Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually - AND Allows a 10% Increase in Beginning Salary

Region One	Credentials *10%	Compound Credentials	Income Tax Due	Compound Income Tax
Year 1	229	2,514	\$ 6,692,758.55	\$ 8,661,142.05
Year 2	251	2,765	\$ 7,362,034.41	\$ 16,023,176.46
Year 3	277	3,042	\$ 8,098,237.85	\$ 24,121,414.30
Year 4	304	3,346	\$ 8,908,061.63	\$ 33,029,475.93
Year 5	335	3,680	\$ 9,798,867.79	\$ 42,828,343.72

Credential numbers are rounded

Region Two: Tidewater

Tidewater, as Superintendent Region 2, consists of 14 school divisions, comprising among its number 63 high schools (including specialist technical centers). Of the 8 Superintendent regions, this region lists second in the number of high schools available to its students (VDOE, 2020).

Table 44

VDOE Superintendent Region 2: Tidewater

Accomack County	Newport News	Southampton County
Chesapeake	Norfolk	Suffolk
Franklin	Northampton County	Virginia Beach
Hampton	Poquoson	Williamsburg James City County
Isle of Wight County	Portsmouth	York County

Source: Commonwealth of Virginia, Department of Education Superintendent's Regions,
http://www.doe.virginia.gov/directories/va_region_map.pdf

Data in Table 45 presents the alignment of the school divisions in Superintendent Region Two to the Local Workforce Investment Area (LWIA) regions. This data was created by the Demographics group at the Weldon Cooper Center for Public Service at the University of Virginia to help administrators and teachers in completing the “Application for Career and Technical Education New Program/Course in 2019. The LWIA’s were designated by the Workforce Innovation and Opportunity Act (WIOA) State Plan for the Commonwealth of Virginia (TrailBlazers, 2019). The alignment of the superintendent region to the LWIA region undergirds the findings of this study.

Table 45

Local Workforce Investment Areas (LWIAs) in Virginia by VDOE Superintendent Region

Region 2: Tidewater	LWIA Region
Accomack County	LWIA XIII - Bay Consortium
Chesapeake	LWIA XVI - Hampton Roads
Franklin	LWIA XVI - Hampton Roads

Hampton	LWIA XIV - Greater Peninsula
Isle of Wight County	LWIA XVI - Hampton Roads
James City County	LWIA XIV - Greater Peninsula
Newport News	LWIA XIV - Greater Peninsula
Norfolk	LWIA XVI - Hampton Roads
Northampton County	LWIA XIII - Bay Consortium
Poquoson	LWIA XIV - Greater Peninsula
Portsmouth	LWIA XVI - Hampton Roads
Southampton County	LWIA XVI - Hampton Roads
Suffolk	LWIA XVI - Hampton Roads
Virginia Beach	LWIA XVI - Hampton Roads
Williamsburg-James City County	LWIA XIV - Greater Peninsula
York County	LWIA XIV - Greater Peninsula

Source: School Report Card Data: Year 2016-2017

http://www.doe.virginia.gov/instruction/career_technical/path_industry_certification/index.shtml

Virginia Department of Education, School Report Card Data for School Year: 2015 - 2016

Local Workforce Investment Areas (LWIAs) in Virginia

Research Question 1: What is the trend for high school participation in CTE programs in Virginia (Region Two), over the past five years?

In order to determine the average number of high school CTE completer students in Region Two, over the last five years, data retrieved from the VDOE's Office of Education Information Management (2019). Data in Table 46 presents the number of completers by year, then when averaged out over five years. By examining this table, it is possible to observe the specific number of CTE completer students in this region, and whether the number has increased, decreased or remained the same.

Table 46

Number of CTE Completers in Region Two: 2014-2019

Year	Total Completers	5 Year Avg Completers
2014-2015	7,996	1,599
2015-2016	8,123	1,625
2016-2017	8,135	1,627
2017-2018	8,142	1,628
2018-2019	8,046	1,609
TOTAL	40,442	8,088

Source: Completer data by region retrieved from Virginia Department of Education, Office of Education Information Management, (2019).

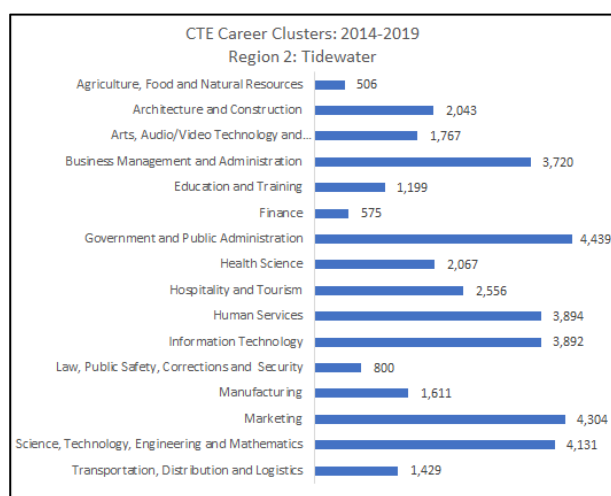
Research Question 2: What is the trend for high school completer students earning industry certifications in Virginia (Region Two), over the past five years?

To enable school administration to organize curriculum design, and career counselors to provide the necessary guidance to students, the Virginia Department of Education groups CTE programs and courses in a “Career Cluster.” According to VDOE (2020), these career clusters help to:

- Organize academic and technical knowledge and skills into a coherent sequence
- Identify pathways from secondary to postsecondary education
- Provide a framework for seamless education
- Provide institutional support of rigorous academic teaching and learning
- Provide alignment of academic and technical skills with workplace readiness skills
- Provide opportunities to involve parents, business and industry, and the school community
- Provide the development of effective plans of study that are based on career assessments

Using data drawn from the Weldon-Cooper Center for Public Service: CTE Completer Data: 2014-2019, over five years, Region Two: Central Virginia CTE completer students are seen to favor the Government and Public Administration cluster (4,439), with the least numerous cluster of Agriculture, Food and Natural Resources reflecting 506 completer students.

Figure 10 CTE Career Clusters in Region Two: 2014-2019



Source: Weldon-Cooper Center for Public Service: CTE Completer Data: 2014-2019

Using industry credential test data provided by the *Virginia Department of Education, Office of Education Information Management, (2019)*, data were disaggregated using SPSS. Disaggregation was used to determine the credential type earned, the number of students taking and earning the credential, and what this looks like over a five-year average. Because this study aims to determine the relationship between the earning of Career and Technical industry credentials and the Virginia economy, the superintendent region in which these industry credentials were earned is the primary format of Table 47. Further, because the focus of this study is on CTE completers, the data was analyzed to determine which of the credentials earned would be the final steps in the completer process. The disaggregated data demonstrating the “completer industry credentials earned by Region Two CTE students: 2014-2019” is presented in Table 47.

Table 47

Region Two: Industry Credentials Taken and Passed: 2014-2019- “Completers”

Industry Credential Assessment & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
AAFCS: Culinary Arts Examination	838	340	168	68

AAFCS: Early Childhood Education Examination	11	8	2	2
AAFCS: Education Fundamentals Examination	1,220	1,037	244	207
AAFCS: Fashion, Textiles, and Apparel Examination	53	43	11	9
AAFCS: Food Science Fundamentals Examination	67	6	13	1
AAFCS: Interior Design Fundamentals Examination	1	1	0	0
AAFCS: Nutrition, Food and Wellness Examination	96	38	19	8
Accounting (Basic) Assessment: National Occupational Competency Testing Institute (NOCTI)	603	343	121	69
Accounting--Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	48	41	10	8
Adobe Certified Associate: Dreamweaver Cloud 2015 Examination/Certiport	58	40	12	8
Adobe Certified Associate: Dreamweaver CS5 Examination/Certiport	1	1	0	0
Adobe Certified Associate: Flash CC 2013 Examination/Certiport	1	1	0	0
Adobe Certified Associate: Illustrator Examination/Certiport	49	17	10	3
Adobe Certified Associate: Photoshop Cloud 2015 Examination/Certiport	6	6	1	1
Adobe Certified Associate: Photoshop CS4 Examination/Certiport	22	7	4	1
Adobe Certified Associate: Photoshop CS5 Examination/Certiport	89	15	18	3
Adobe Certified Associate: Photoshop CS6 Examination/Certiport	160	37	32	7
Adobe Certified Associate: Dreamweaver CS6 Examination/Certiport	96	48	19	10
Adobe Certified Associate: Flash CS6 Examination/Certiport	11	4	2	1
Adobe Certified Associate: Illustrator CS6 Examination/Certiport	102	83	20	17
Adobe Certified Associate: InDesign CS6 Examination/Certiport	16	16	3	3
Advanced Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	1,583	729	317	146
Advertising and Design Assessment: National Occupational Competency Testing Institute (NOCTI)	328	173	66	35
AHLA Certified Hospitality and Tourism Management Professional Examination (Must pass Level 1 and Level 2 exams): American Hotel and Lodging Association	12	8	2	2
Architectural Drafting Assessment: National Occupational Competency Testing Institute (NOCTI)	521	271	104	54
ASE Auto Maintenance and Light Repair Examination (G1): National Institute for Automotive Service Excellence	293	120	59	24
ASE Automotive & Light Truck Certification Test-Automatic Transmission/Transaxle (A2): National Institute for Automotive Service Excellence	53	32	11	6
ASE Automotive & Light Truck Certification Test-Brakes (A5): National Institute for Automotive Service Excellence	193	83	39	17
ASE Automotive & Light Truck Certification Test-Electrical/Electronic Systems (A6): National Institute for Automotive Service Excellence	60	44	12	9
ASE Automotive & Light Truck Certification Test-Engine Performance (A8): National Institute for Automotive Service Excellence	77	47	15	9
ASE Automotive & Light Truck Certification Test-Engine Repair (A1): National Institute for Automotive Service Excellence	160	83	32	17
ASE Automotive & Light Truck Certification Test-Heating and Air Conditioning (A7): National Institute for Automotive Service Excellence	75	54	15	11

ASE Automotive & Light Truck Certification Test-Manual Drive Train and Axles (A3): National Institute for Automotive Service Excellence	79	43	16	9
ASE Automotive & Light Truck Certification Test-Suspension & Steering (A4): National Institute for Automotive Service Excellence	155	90	31	18
ASE Collision Repair & Refinish Certification Test - Mechanical & Electrical Components (B5): National Institute for Automotive Service Excellence	3	3	1	1
ASE Student Certification Automotive: Electrical/Electronic Systems: National Institute for Automotive Service Excellence	289	198	58	40
ASE Student Certification Automotive: Engine Performance: National Institute for Automotive Service Excellence	111	71	22	14
ASE Student Certification Automotive: Engine Repair: National Institute for Automotive Service Excellence	272	165	54	33
ASE Student Certification Automotive: Heating and Air Conditioning: National Institute for Automotive Service Excellence	161	96	32	19
ASE Student Certification Automotive: Maintenance and Light Repair: National Institute for Automotive Service Excellence	280	140	56	28
ASE Student Certification Automotive: Manual Drive Train and Axles: National Institute for Automotive Service Excellence	62	36	12	7
ASE Student Certification Automotive: Automatic Transmission/Transaxle: National Institute for Automotive Service Excellence	57	24	11	5
ASE Student Certification Automotive: Automotive Service Technology National Institute for Automotive Service Excellence	192	64	38	13
ASE Student Certification Automotive: Brakes: National Institute for Automotive Service Excellence	386	200	77	40
ASE Student Certification Automotive: Suspension and Steering: National Institute for Automotive Service Excellence	401	227	80	45
ASE Student Certification Collision Repair & Refinish: Mechanical and Electrical: National Institute for Automotive Service Excellence	59	20	12	4
ASE Student Certification Collision Repair & Refinish: Non-structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	158	57	32	11
ASE Student Certification Collision Repair & Refinish: Painting and Refinishing: National Institute for Automotive Service Excellence	184	69	37	14
ASE Student Certification Collision Repair & Refinish: Structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	69	22	14	4
AutoCAD Certified User: Autodesk	1,482	770	296	154
Autodesk 3ds Max Certified User Examination: Autodesk	154	19	31	4
Autodesk AutoCAD Certified Professional Examination: Autodesk	27	27	5	5
Autodesk Certification Program (Pass any one exam at fundamentals level)	27	16	5	3
Autodesk Inventor Certified Professional Examination: Autodesk	205	93	41	19
Autodesk Inventor Certified User: Autodesk	550	390	110	78
Autodesk Revit Architecture Certified User Examination: Autodesk	94	24	19	5
Autodesk Revit Certified Professional Examination: Autodesk	279	181	56	36
Basic Refrigeration & Charging Procedures Employment Ready Examination: HVAC Excellence	10	9	2	2
BrainBench Desktop Publishing Software Examination	141	116	28	23
BrainBench Network Administration Examinations	32	26	6	5

CAD Assessment: National Occupational Competency Testing Institute (NOCTI)	250	161	50	32
Carpentry Assessment: National Occupational Competency Testing Institute (NOCTI)	179	98	36	20
Certification of Pharmacy Technicians (ExCPT) Examination: Virginia Board of Pharmacy	186	183	37	37
Certified Clinical Medical Assistant (CCMA) Examination: National Healthcareer Association (NHA)	13	6	3	1
Certified Dental Assistant and National Entry Level Assistant: Infection Control (ICE) Examination: Dental Assisting National Board	4	4	1	1
Certified Dental Assistant and National Entry Level Assistant: Radiation Health & Safety (RHS) Examination: Dental Assisting National Board	51	47	10	9
Certified Emergency Telecommunicator Examination: International Academies of Emergency Dispatch (IAED)	71	70	14	14
Certified Medical Administrative Assistant (CMAA) Examination: National Healthcareer Association (NHA)	76	47	15	9
Certified Pharmacy Technician (ExCPT) Examination: National Healthcareer Association (NHA)	82	56	16	11
Certified Physical Therapy Aide (CPTA) Examination: American Allied Health (AAH)	42	37	8	7
Certified Satellite Installer (CSI) Examination: Electronics Technicians Association (ETA), International	9	9	2	2
Certified SolidWorks Associate (CSWA) Examination: SolidWorks Corporation	274	87	55	17
Cisco Certified Entry Network Technician (CCENT) Examination: Cisco Systems, Inc.	33	23	7	5
Cisco Certified Networking Associate (CCNA) Routing and Switching Examination: Cisco Systems, Inc.	7	7	1	1
Cisco Interconnecting Cisco Networking Devices Part 2 (640-816)	13	11	3	2
CIW (Certified Internet Webmaster) Professional Examinations: Certification Partners, LLC (Pass any one exam at this level or above)	20	19	4	4
CIW Internet Business Associate Examination: Certification Partners, LLC	9	9	2	2
CIW Network Technology Associate Examination: Certification Partners, LLC	6	6	1	1
CIW Site Development Associate Examination: Certification Partners, LLC	64	53	13	11
Collision Repair and Refinishing Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	42	15	8	3
CompTIA IT Fundamentals Certification Examination: CompTIA	30	17	6	3
CompTIA A+ Certification Examination (must pass both exams): CompTIA	315	173	63	35
CompTIA Linux+ Examination Program--Powered by Linux Professional Institute: (must pass both exams):: CompTIA	1	1	0	0
CompTIA Network+ Examination: CompTIA	162	63	32	13
CompTIA Security + Examination: CompTIA	81	48	16	10
Computer Networking Fundamentals Assessment: National Occupational Competency Testing Institute (NOCTI)	157	108	31	22
Computer Programming Assessment: National Occupational Competency Testing Institute (NOCTI)	307	272	61	54
Computer Repair Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	65	32	13	6

Computer Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	151	84	30	17
CompTIA A+ 901 Examination	150	93	30	19
Cosmetology Assessment: National Occupational Competency Testing Institute (NOCTI)	373	283	75	57
Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	695	485	139	97
Criminal Justice Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	19	11	4	2
Culinary Arts Prep Cook-Level 1 Assessment: National Occupational Competency Testing Institute (NOCTI)	31	27	6	5
Culinary Arts Prep Cook-Level 2 Assessment: National Occupational Competency Testing Institute (NOCTI)	165	119	33	24
Data Cabling Installer (DCI) Certification Examination: Electronics Technicians Association (ETA), International	42	35	8	7
Dental Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	215	123	43	25
Early Childhood Education and Care, Basic Assessment: National Occupational Competency Testing Institute (NOCTI)	362	278	72	56
Electric Power and Distribution Assessment: National Occupational Competency Testing Institute (NOCTI)	4	4	1	1
Electrical Construction Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	68	39	14	8
Electrical Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	55	16	11	3
Electronic Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	149	16	30	3
Electronics Assessment: National Occupational Competency Testing Institute (NOCTI)	415	96	83	19
Emergency Medical First Responder Certification: Department of Health, Office of EMS	12	7	2	1
Emergency Medical Technician Examination: Department of Health, Office of Emergency Medical Services	88	52	18	10
EPA Universal Examination (pass all three types): Environmental Protection Agency (EPA)	144	139	29	28
Fiber Optics Installer (FOI) Certification: Electronics Technicians Association (ETA), International	45	41	9	8
Firefighter II Certification Examination: Virginia Department of Fire Programs	16	16	3	3
Fundamentals of Construction Assessment: National Occupational Competency Testing Institute (NOCTI)	624	265	125	53
Greenhouse Operators Certification Examination: Southeast Greenhouse Growers Association/Virginia Flower Growers Association	183	101	37	20
HBI/NAHB Building Construction Technology Advanced Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	2	2	0	0
Health Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	193	71	39	14
Horticulture Landscaping Assessment: National Occupational Competency Testing Institute (NOCTI)	50	13	10	3
Hospitality Management Food and Beverage Option Assessment: National Occupational Competency Testing Institute (NOCTI)	134	121	27	24
Hospitality Management Lodging Option Assessment: National Occupational Competency Testing Institute (NOCTI)	96	37	19	7

HVAC (EPA) Technician Examinations (Levels: Core, I, II, or III): Environmental Protection Agency	75	73	15	15
HVAC Excellence Certification Program: HVAC Excellence	52	43	10	9
IC3 Global Standard 5, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	766	458	153	92
IC3 Global Standard 4 Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	177	146	35	29
Internet and Computing Core Certification Examinations/2007 (IC3): (student has passed all three examinations)	20	3	4	1
Internet and Computing Core Certification Examinations/Windows 7-- Office 2010: Certiport (student has passed all three examinations)	113	91	23	18
Intuit QuickBooks Certified User Certification Test: Certiport	53	18	11	4
Licensed Practical Nurse Examination: Virginia Board of Nursing (VBN)	18	18	4	4
Mechanical Drafting and Design Assessment: National Competency Testing Institute (NOCTI)	168	83	34	17
Mechatronics-Level 1 Assessment: National Competency Testing Institute (NOCTI)	218	145	44	29
Medical Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	305	233	61	47
MOS Examinations (Advanced level): Microsoft Office Specialist/Certiport (Pass any one exam at this level)	2	2	0	0
MOS Excel Expert Examination: Microsoft Office 2010	4	4	1	1
MOS Excel Expert Level: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	87	44	17	9
MOS Microsoft Office Expert 2013/Certiport (must pass both Word & Excel at expert levels)	2	2	0	0
MOS Microsoft Office Expert Excel 2016/Certiport (only one exam)	284	98	57	20
MOS Microsoft Office Specialist Master 2010/Certiport	1	1	0	0
MOS Word Expert Examination: Microsoft Office 2010/Certiport	2	2	0	0
MOS Word Expert Examination: Microsoft Office 2016/Certiport	557	357	111	71
MOS Word Expert Level Examination: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	514	333	103	67
MTA Examination: .NET Fundamentals (98-372)	124	66	25	13
MTA Examination: Database Administration Fundamentals (98-364)	90	57	18	11
MTA Examination: Gaming Development Fundamentals	10	3	2	1
MTA Examination: HTML5 Application Development Fundamentals (98-375)	78	23	16	5
MTA Examination: Networking Fundamentals (98-366)	186	86	37	17
MTA Examination: Security Fundamentals (98-367)	257	164	51	33
MTA Examination: Software Development Fundamentals (98-361)	167	43	33	9
MTA Examination: Windows OS Fundamentals (98-349)	181	114	36	23
MTA Examination: Windows Server Administration Fundamentals (98-365)	38	34	8	7
MTA Examination: Introduction to Programming using HTML & CSS (98-383)	4	4	1	1
MTA Examination: Introduction to Programming using Java (98-388)	92	69	18	14
MTA Examination: Introduction to Programming using JavaScript (98- 382)	15	15	3	3

MTA Examination: Introduction to Programming using Python (98-381)	34	24	7	5
MTA Examination: Introduction to Programming with Block-Based Languages (98-380)	1	1	0	0
Nail Technician Examination: Virginia Board for Barbers and Cosmetology	109	60	22	12
National Nurse Aide Assessment Program (NNAAP) Examination: Virginia Board of Nursing	399	245	80	49
Nationally Registered Certified Dental Assistant (NRCDA) Examination: National Association of Health Professionals (NAHP)	67	50	13	10
Nursing Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	65	34	13	7
ParaPro: Educational Testing Service (ETS)	47	47	9	9
Pre-Engineering/Engineering Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	1,480	695	296	139
Principles of Livestock Selection and Evaluation Certification Examination: National Collegiate Livestock Coaches Association (exam is adm. by iCEV)	19	2	4	0
Private Applicator Certification Examination: VA Dept. of Agriculture and Consumer Services	20	10	4	2
ProStart Program End-of-Course Examination (Level 2): Education Foundation of the National Restaurant Association	116	73	23	15
Registered Technician Certification Examination: VA Dept. of Agriculture and Consumer Services	28	15	6	3
Retail Commercial Baking Assessment: National Occupational Competency Testing Institute (NOCTI)	149	92	30	18
Retail Management Certification Assessment: National Retail Federation (NRF) Foundation	21	21	4	4
ServSafe Manager Certification Examination: National Restaurant Association	1,999	1,075	400	215
Small Animal Science and Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	233	218	47	44
Small Engine Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	890	310	178	62
Technical Drafting Assessment: National Occupational Competency Testing Institute	176	123	35	25
Television Production Assessment: National Occupational Competency Testing Institute (NOCTI)	273	193	55	39
Welding Assessment: National Occupational Competency Testing Institute (NOCTI)	244	140	49	28
TOTAL	30,882	17,468	6,176	3,494

Because a full picture of the industry credentialing test data is needed to determine trends in the earning of industry certifications in Region Two, one must be aware of the data for those currently on their CTE pathway, as seen in Table 48. Students earning credentials in this table are currently on a CTE program, as seen in the “certification,” “pre-apprentice,” or “other” pathway certifications, and non-CTE specific certifications. Although the data from this table is

not included in the final calculation to determine economic impact, this does not negate their value or economic potential. This study focuses on completer students.

Table 48

“Other” industry credentials earned by Region Two CTE students, 2014-2019

“Other” Industry Credential Assessments & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
AAFCS: Broad Field Family and Consumer Sciences Examination	225	148	45	30
AAFCS: Broad Field Family and Consumer Sciences Examination	626	421	125	84
AAFCS: Leadership Fundamentals Assessment	47	26	9	5
Advanced Placement (AP) Computer Science Principles Examination: The College Board	10	10	2	2
Agribusiness Examination: New York State Department of Education	35	31	7	6
Agribusiness Examination: New York State Department of Education	31	28	6	6
AutoCAD 2000 Certification Examination: BrainBench	124	93	25	19
Briggs & Stratton Master Service Technician Program Examination	7	7	1	1
Business Financial Management Assessment: National Occupational Competency Testing Institute (NOCTI)	225	163	45	33
Criminal Justice Assessment: National Occupational Competency Testing Institute (NOCTI)	533	397	107	79
Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	10,996	9,024	2,199	1,805
Electronics Module: DC (EM1): Electronics Technicians Association (ETA), International	60	12	12	2
Emergency and Fire Management Services Assessment: National Occupational Competency Testing Institute (NOCTI)	43	33	9	7
Emergency Medical Services Assessment: National Occupational Competency Testing Institute (NOCTI)	49	47	10	9
EPA Technician Examination (Core): Environmental Protection Agency (EPA)	333	206	67	41
EPA Technician Examination (Type I): Environmental Protection Agency (EPA)	435	230	87	46
EPA Technician Examination (Type II): Environmental Protection Agency (EPA)	478	199	96	40
EPA Technician Examination (Type III): Environmental Protection Agency (EPA)	507	189	101	38
Firefighter I Certification Examination: Virginia Department of Fire Programs	17	17	3	3
HBI/NAHB Basic Principles of Construction Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	15	7	3	1
HBI/NAHB House Wiring Basic Assessment: Home Builders Institute- National Association of Home Builders (Assessment is administered by NOCTI)	12	1	2	0
HBI/NAHB HVAC Basic Assessment: Home Builders Institute- National Association of Home Builders (Assessment is administered by NOCTI)	12	4	2	1

HBI/NAHB Plumbing Basic Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	6	6	1	1
Health Informatics Assessment: National Occupational Competency Testing Institute (NOCTI)	61	56	12	11
Heavy Equipment Operator Level One Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	27	13	5	3
IC3 Spark, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	356	265	71	53
International Baccalaureate Computer Science (Standard Level) Examination: The International Baccalaureate Organization	2	2	0	0
International Baccalaureate for Business & Management (Standard Level) Examination: The International Baccalaureate Organization	17	16	3	3
Manufacturing Specialist Certification: Manufacturing Skills Institute	73	39	15	8
Manufacturing Technician Level 1 Certification Examination: Manufacturing Skills Institute	51	41	10	8
MOS Access Examination: Microsoft Office 2016/Certiport	164	97	33	19
MOS Access Examination: Microsoft Office 2010/Certiport	30	23	6	5
MOS Access Examination: Microsoft Office 2013/Certiport	267	186	53	37
MOS Excel Examination: Microsoft Office 2013/Certiport	1,188	896	238	179
MOS Excel Examination: Microsoft Office 2010/Certiport	366	139	73	28
MOS Excel Examination: Microsoft Office 2016/Certiport	1,403	778	281	156
MOS One Note Examination: Microsoft Office 2013/Certiport	10	5	2	1
MOS One Note Examination: Microsoft Office 2016/Certiport	2	2	0	0
MOS Outlook Examination: Microsoft Office 2010/Certiport	7	7	1	1
MOS Outlook Examination: Microsoft Office 2013/Certiport	139	62	28	12
MOS Outlook Examination: Microsoft Office 2016/Certiport	186	123	37	25
MOS PowerPoint Examination: Microsoft Office 2013/Certiport	2,674	2,374	535	475
MOS PowerPoint Examination: Microsoft Office 2007/Certiport	19	14	4	3
MOS PowerPoint Examination: Microsoft Office 2010/Certiport	766	580	153	116
MOS PowerPoint Examination: Microsoft Office 2016/Certiport	2,806	1,997	561	399
MOS SharePoint Examination: Microsoft Office 2013/Certiport	1	1	0	0
MOS Word Examination: Microsoft Office 2010/Certiport	920	535	184	107
MOS Word Examination: Microsoft Office 2013/Certiport	3,821	3,025	764	605
MOS Word Examination: Microsoft Office 2016/Certiport	4,221	3,036	844	607
National Health Science Assessment: National Consortium for Health Science Education (Administered by Precision Exams)	37	10	7	2
NCCT Core: Introductory Craft Skills, National Construction Career Test: National Center for Construction Education & Research (NCCER)	35	27	7	5
NCCT Heavy Equipment Operations Level One: National Center for Construction Education & Research (NCCER)	43	34	9	7
Non-Structural Technician – Pro Level 1 Certification Test: ICAR	36	36	7	7
PLTW Examination: Aerospace Engineering: Project Lead the Way (PLTW)	84	58	17	12
PLTW Examination: Civil Engineering and Architecture: Project Lead the Way (PLTW)	192	151	38	30

PLTW Examination: Computer Integrated Manufacturing: Project Lead the Way (PLTW)	71	38	14	8
PLTW Examination: Digital Electronics: Project Lead the Way (PLTW)	357	181	71	36
PLTW Examination: Human Body Systems: Project Lead the Way (PLTW)	218	129	44	26
PLTW Examination: Introduction to Engineering Design: Project Lead the Way (PLTW)	1,294	597	259	119
PLTW Examination: Medical Interventions: Project Lead the Way (PLTW)	48	33	10	7
PLTW Examination: Principles of Biomedical Sciences: Project Lead the Way (PLTW)	626	434	125	87
PLTW Examination: Principles of Engineering: Project Lead the Way (PLTW)	564	309	113	62
PLTW Examination: Computer Science Essentials: Project Lead the Way (PLTW)	40	39	8	8
PLTW Examination: Computer Science Principles: Project Lead the Way (PLTW)	20	19	4	4
Pre-Engineering Industry Certification Examination: Robotics Education Competition Foundation (RECF)	42	25	8	5
ProStart Program End-of-Course Examination (Level 1): Education Foundation of the National Restaurant Association	254	130	51	26
SENSE Training Program Certification Examination: American Welding Society (AWS)	216	209	43	42
SkillsUSA: Carpentry Examination	22	16	4	3
SkillsUSA: Computer Maintenance Technology Examination	4	4	1	1
SkillsUSA: Cosmetology Examination	11	11	2	2
SkillsUSA: Criminal Justice and CSI Examination	12	5	2	1
SkillsUSA: Customer Service Examination	17	17	3	3
SkillsUSA: Electrical Construction (Residential) Wiring Examination	24	5	5	1
SkillsUSA: Engineering Technology Examination	22	4	4	1
SkillsUSA: Plumbing Examination	13	3	3	1
SkillsUSA: Robotics and Automation Technology Assessment	78	35	16	7
SkillsUSA: Welding Examination	74	55	15	11
Student Electronics Technician (SET) Certification Examination: Electronics Technicians Association (ETA), International	106	1	21	0
Virtual Enterprises Assessment: National Occupational Competency Testing Institute (NOCTI)	451	422	90	84
TOTAL	39,414	28,648	7,883	5,730

As a final measure to determine the trend for the earning of CTE industry credentials at the high school level in Region Two, Table 49 presents the data specific to “Soft skills/College & Career Readiness” certifications. Because these certifications are included in the VDOE approved list of industry certifications, they are included in the industry credential test data provided by the Virginia Department of Education, Office of Education Information

Management (VDOE, 2019). The value of this data lies in its relationship to the overall earning of industry credentials by high school students in Region Two, and the bigger picture when determining any trend.

Table 49

Soft skills/College & Career Readiness industry credentials earned in Region Two: 2014-2019

“Soft skills/College & Career Readiness” Assessments & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
Armed Services Vocational Aptitude Battery Examination: United States Military Entrance Processing Command	2,593	1,892	519	378
College and Work Readiness Assessment (CWRA+): Council for Aid to Education	8,523	4,883	1,705	977
National Career Readiness Certificate (ACT)	8	8	2	2
W!SE Financial Literacy Certification: Working in Support of Education (W!SE)	89,800	70,262	17,960	14,052
Workplace Readiness Skills for the Commonwealth Examination	47,893	38,296	9,579	7,659
TOTAL	148,817	115,341	29,763	23,068

To determine the trend for high school completer students earning industry credentials in Region Two over the past five years, a finalized set of summarized data can be seen in Table 50. These data present the number of students who have earned a CTE industry credential approved by Virginia’s Board of Education. The three categories of assessment type are represented in Table 50 and present the five year total, and five-year average number of earned (a) “technical” credentials (sufficient for a student to successfully end their completer program); (b) “other” assessments taken where students are on the CTE path, working towards certifications; and (c), the “Soft skills/College & Career Readiness” certifications.

Table 50

Total Number of Industry Certifications Earned in Region Two: 2014-2019

Industry Credential Assessment & Type	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
"Technical" Completer Certifications	30,882	17,468	6,176	3,494
"Other" CTE certifications - pathway/level one/PLTW/Skills USA	39,414	28,648	7,883	5,730
"Soft skills/College & Career Readiness" certifications.	148,817	115,341	29,763	23,068
TOTAL	219,113	161,457	43,823	32,291

Research Question 3: What are the potential earnings for students gaining industry credentials in Virginia's (Region Two) labor market?

To determine the potential earning for students gaining industry credentials in Virginia's labor market, it is crucial to understand the labor market's occupational openings by educational attainment level. Through the review of these data, one can examine the extent to which Region Two students are entering a labor market saturated with similarly qualified candidates, or into the market with high-demand, high-salary openings. Data in Table 51, as extracted from the Bureau of Labor Statistics and the Virginia Employment Commission projection to 2026, show the probable occupational openings by education level attainment for Region Two as a whole.

Table 51

Occupational Openings by Education Attainment Level to 2026 – Region Two

Region 2 – Tidewater	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Associate's Degree	29,927	3,035	2,626	821
Bachelor's Degree	114,726	12,797	9,991	3,107
Doctoral or Professional Degree	16,996	2,358	1,181	455
High School Diploma or Equivalent	289,510	14,705	31,586	12,684
Less Than High School	226,299	21,141	34,461	14,793
Master's Degree	13,216	2,475	1,271	411
Not Applicable	1,738,472	147,826	196,305	78,113
Postsecondary Non-Degree Award	27,623	2,635	2,607	1,022
Some College, No Degree	354	62	59	21
TOTAL	2,457,123	207,034	280,087	111,427

Source: May 2018 State Occupational Employment and Wage Estimates,
https://www.bls.gov/oes/current/oes_va.htm#00-0000

While data in Table 51 specify occupations in the “Not Applicable” category as the largest group to access to occupational openings, a precise definition of the education included in that category is not available. The second-largest estimated category in labor market openings is found in the “High School Diploma or Equivalent” category. However, when the “Not Applicable” category is removed from the data, along with “Less than High School” as in Table 52 numbers show that the two categories of education with greater access to projected employment are those with “High School Diploma or Equivalent” and “Bachelor’s Degree.”

Table 52

Occupational Openings by Education Attainment Level – Region 2 - "Less than High School" and "Not Applicable" removed

Region 2 – Tidewater	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Associate's Degree	29,927	3,035	2,626	821
Bachelor's Degree	114,726	12,797	9,991	3,107
Doctoral or Professional Degree	16,996	2,358	1,181	455
High School Diploma or Equivalent	289,510	14,705	31,586	12,684
Master's Degree	13,216	2,475	1,271	411
Postsecondary Non-Degree Award	27,623	2,635	2,607	1,022
Some College, No Degree	354	62	59	21
TOTAL	492,352	38,067	49,321	18,521

Source: May 2018 State Occupational Employment and Wage Estimates,
https://www.bls.gov/oes/current/oes_va.htm#00-0000

Data presented in Table 53 show the occupations available to Region Eight’s CTE completer students who have earned a series of industry credentials. These data present the estimated mean salary expected, the projected occupational openings to 2026 of that particular occupation, the number of annual openings, and annual exits. Data included in this table show completer data specifically and does not include those who are currently enrolled in a CTE pathway, or who have completed credentials with a career readiness focus. The data in Table 53 brings together data points from:

- a) *Region Two: Industry Credentials Taken and Passed: 2014-2019 – Completers* (see Table 47). Data from this source, is seen in the columns “Assessment,” “Taken 5 Yr. Avg.” and “Pass 5 Yr. Avg”.
- b) Bureau of Labor Statistics *May 2019 State Occupational Employment and Wage Estimates: Virginia* (Bureau of Labor Statistics, 2020). Data from this source is seen in the columns “Occupation” and “Mean Annual Salary.”
- c) TrailBlazers: Career and Technical Education in Virginia (TrailBlazers, 2020). Labor market data for the LWIA XIV: Greater Peninsula region (TrailBlazers, 2020) and the LWIA XVI: Hampton Roads region (TrailBlazers, 2020) is seen in columns: “Occupation,” “Projected Employment,” “Numeric Change,” “Annual Openings,” and “Annual Exits.”

Table 53

CTE Industry Credential to Occupational Alignment and Projections – Region Two: Tidewater; LWIA XIV: Greater Peninsula and LWIA XVI: Hampton Roads

Assessment	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.	Occupation	Mean Annual Wage	Projected Employment	Numeric Change	Annual Openings	Annual Exits
AAFCS: Culinary Arts Examination	168	68	Food Preparation and Serving Related Occupations	\$24,280	81,036	8,286	13,940	5,809
AAFCS: Early Childhood Education Examination	2	2	Preschool Teachers, Except Special Education	\$37,880	2,055	134	204	85
AAFCS: Education Fundamentals Examination	244	207	Teacher Assistants	\$28,000	6,599	613	694	346
AAFCS: Fashion, Textiles, and Apparel Examination	11	9	Personal Appearance Workers	\$31,700	4,289	373	509	266
AAFCS: Food Science Fundamentals Examination	13	1	Dietetic Technicians	\$32,430	151	15	13	5
AAFCS: Interior Design Fundamentals Examination	0.2	0.2	Interior Designers	\$52,670	128	5	11	4
AAFCS: Nutrition, Food and Wellness Examination	19	8	Dietetic Technicians	\$32,430	151	15	13	5
Accounting (Basic) Assessment: National Occupational Competency Testing Institute (NOCTI)	121	69	Financial Clerks	\$40,410	15,927	267	1,723	844
Accounting--Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	10	8	Accountants and Auditors	\$85,640	7,532	849	703	209
Adobe Certified Associate: Dreamweaver Cloud 2015 Examination/Certiport	12	8	Web Developers	\$88,850	599	69	47	11
Adobe Certified Associate: Dreamweaver CS5 Examination/Certiport	0.2	0.2	Web Developers	\$88,850	599	69	47	11
Adobe Certified Associate: Flash CC 2013 Examination/Certiport	0.2	0.2	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	11,564	874	1,167	452
Adobe Certified Associate: Illustrator Examination/Certiport	10	3	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	11,564	874	1,167	452
Adobe Certified Associate: Photoshop Cloud 2015 Examination/Certiport	1	1	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	11,564	874	1,167	452
Adobe Certified Associate: Photoshop CS4 Examination/Certiport	4	1	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	11,564	874	1,167	452
Adobe Certified Associate: Photoshop CS5 Examination/Certiport	18	3	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	11,564	874	1,167	452
Adobe Certified Associate: Photoshop CS6 Examination/Certiport	32	7	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	11,564	874	1,167	452

Adobe Certified Associate: Dreamweaver CS6 Examination/Certiport	19	10	Web Developers	\$88,850	599	69	47	11
Adobe Certified Associate: Flash CS6 Examination/Certiport	2	1	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	11,564	874	1,167	452
Adobe Certified Associate: Illustrator CS6 Examination/Certiport	20	17	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	11,564	874	1,167	452
Adobe Certified Associate: InDesign CS6 Examination/Certiport	3	3	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	11,564	874	1,167	452
Advanced Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	317	146	Sales and Related Occupations	\$41,140	93,652	2,536	13,118	5,753
Advertising and Design Assessment: National Occupational Competency Testing Institute (NOCTI)	66	35	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	11,564	874	1,167	452
AHLA Certified Hospitality and Tourism Management Professional Examination (Must pass Level 1 and Level 2 exams): American Hotel and Lodging Association	2	2	Hotel, Motel, and Resort Desk Clerks	\$22,300	1,806	69	280	98
Architectural Drafting Assessment: National Occupational Competency Testing Institute (NOCTI)	104	54	Mechanical Drafters	\$59,000	183	16	16	5
ASE Auto Maintenance and Light Repair Examination (G1): National Institute for Automotive Service Excellence	59	24	Automotive Service Technicians and Mechanics	\$47,730	5,068	316	483	155
ASE Automotive & Light Truck Engine Repair (A1); Automatic Transmission/Transaxle (A2); Manual Drive Train and Axles (A3); Suspension & Steering (A4); Brakes (A5); Electrical/Electronic Systems (A6); Heating and Air Conditioning (A7); Engine Performance (A8) National Institute for Automotive Service Excellence	107	60	Automotive Service Technicians and Mechanics	\$47,730	5,068	316	483	155
ASE Student Certification Automotive: Electrical/Electronic Systems; Engine Performance; Engine Repair; Heating and Air Conditioning; Maintenance and Light Repair; Manual Drive Train and Axles; Automatic Transmission/Transaxle; Automotive Service Technology; Brakes; Suspension and Steering: National Institute for Automotive Service Excellence	221	122	Automotive Service Technicians and Mechanics	\$47,730	5,068	316	483	155
ASE Student Certification Collision Repair & Refinish: Mechanical and Electrical; National Institute for Automotive Service Excellence; Mechanical and Electrical; Non-structural Analysis and Damage Repair; Painting and Refinishing; Structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	95	34	Automotive Body and Related Repairers	\$53,060	1,388	129	138	46
AutoCAD Certified User: Autodesk	296	154	Mechanical Drafters	\$59,000	183	16	16	5

Autodesk 3ds Max Certified User Examination: Autodesk	31	4	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	11,564	874	1,167	452
Autodesk AutoCAD Certified Professional Examination: Autodesk	5	5	Mechanical Drafters	\$59,000	183	16	16	5
Autodesk Certification Program (Pass any one exam at fundamentals level)	5	3	Mechanical Drafters	\$59,000	183	16	16	5
Autodesk Inventor Certified Professional Examination: Autodesk	41	19	Mechanical Drafters	\$59,000	183	16	16	5
Autodesk Inventor Certified User: Autodesk	110	78	Drafters, Engineering Technicians, and Mapping Technicians	\$60,320	8,679	636	775	264
Autodesk Revit Architecture Certified User Examination: Autodesk	19	5	Architects, Except Landscape and Naval	\$85,380	594	27	44	15
Autodesk Revit Certified Professional Examination: Autodesk	56	36	Architects, Except Landscape and Naval	\$85,380	594	27	44	15
Basic Refrigeration & Charging Procedures Employment Ready Examination: HVAC Excellence	2	2	Heating, Air Conditioning, and Refrigeration Mechanics and I	\$50,210	2,723	186	267	73
BrainBench Desktop Publishing Software Examinations	28	23	Computer Operators	\$49,830	129	(32)	12	6
BrainBench Network Administration Examinations	6	5	Computer Operators	\$49,830	129	(32)	12	6
CAD Assessment: National Occupational Competency Testing Institute (NOCTI)	50	32	Mechanical Drafters	\$59,000	183	16	16	5
Carpentry Assessment: National Occupational Competency Testing Institute (NOCTI)	36	20	Woodworkers	\$41,300	948	38	102	43
Certification of Pharmacy Technicians (ExCPT) Examination: Virginia Board of Pharmacy	37	37	Pharmacy Technicians	\$32,370	2,123	237	177	65
Certified Clinical Medical Assistant (CCMA) Examination: National Healthcareer Association (NHA)	3	1	Medical Assistants	\$35,010	4,043	1,061	475	154
Certified Dental Assistant and National Entry Level Assistant: Infection Control (ICE) Examination: Dental Assisting National Board	1	1	Dental Assistants	\$44,640	2,084	379	244	97
Certified Dental Assistant and National Entry Level Assistant: Radiation Health & Safety (RHS) Examination: Dental Assisting National Board	10	9	Dental Assistants	\$44,640	2,084	379	244	97
Certified Emergency Telecommunicator Examination: International Academies of Emergency Dispatch (IAED)	14	14	Dispatchers, Except Police, Fire, and Ambulance	\$41,140	913	31	83	31
Certified Medical Administrative Assistant (CMAA) Examination: National Healthcareer Association (NHA)	15	9	Medical Records and Health Information Technicians	\$43,590	1,205	170	83	33
Certified Pharmacy Technician (ExCPT) Examination: National Healthcareer Association (NHA)	16	11	Pharmacy Technicians	\$32,370	2,123	237	177	65

Certified Physical Therapy Aide (CPTA) Examination: American Allied Health (AAH)	8	7	Physical Therapist Aides	\$28,110	174	45	22	7
Certified Satellite Installer (CSI) Examination: Electronics Technicians Association (ETA), International	2	2	Telecommunications Line Installers and Repairers	\$61,070	657	(25)	65	17
Certified SolidWorks Associate (CSWA) Examination: SolidWorks Corporation	55	17	Drafters, Engineering Technicians, and Mapping Technicians	\$60,320	8,679	636	775	264
Cisco Certified Entry Network Technician (CCENT) Examination: Cisco Systems, Inc.	7	5	Computer User Support Specialists	\$58,290	3,698	357	289	71
Cisco Certified Networking Associate (CCNA) Routing and Switching Examination: Cisco Systems, Inc.	1	1	Computer User Support Specialists	\$58,290	3,698	357	289	71
Cisco Interconnecting Cisco Networking Devices Part 2 (640-816)	3	2	Computer User Support Specialists	\$58,290	3,698	357	289	71
CIW (Certified Internet Webmaster) Professional Examinations: Certification Partners, LLC (Pass any one exam at this level or above)	4	4	Web Developers	\$88,850	599	69	47	11
CIW Internet Business Associate Examination: Certification Partners, LLC	2	2	Web Developers	\$88,850	599	69	47	11
CIW Network Technology Associate Examination: Certification Partners, LLC	1	1	Web Developers	\$88,850	599	69	47	11
CIW Site Development Associate Examination: Certification Partners, LLC	13	11	Web Developers	\$88,850	599	69	47	11
Collision Repair and Refinishing Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	8	3	Automotive Body and Related Repairers	\$53,060	1,388	129	138	46
CompTIA IT Fundamentals Certification Examination: CompTIA	6	3	Computer User Support Specialists	\$58,290	3,698	357	289	71
CompTIA A+ Certification Examination (must pass both exams): CompTIA	63	35	Computer Hardware Engineers	\$119,500	254	20	18	5
CompTIA Linux+ Examination Program--Powered by Linux Professional Institute: (must pass both exams):: CompTIA	0.2	0.2	Computer Network Support Specialists	\$73,050	657	65	51	13
CompTIA Network+ Examination: CompTIA	32	13	Computer Network Support Specialists	\$73,050	657	65	51	13
CompTIA Security + Examination: CompTIA	16	10	Computer Network Support Specialists	\$73,050	657	65	51	13
Computer Networking Fundamentals Assessment: National Occupational Competency Testing Institute (NOCTI)	31	22	Computer Network Support Specialists	\$73,050	657	65	51	13
Computer Programming Assessment: National Occupational Competency Testing Institute (NOCTI)	61	54	Computer Programmers	\$94,470	746	(72)	42	14

Computer Repair Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	13	6	Computer User Support Specialists	\$58,290	3,698	357	289	71
Computer Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	30	17	Computer User Support Specialists	\$58,290	3,698	357	289	71
CompTIA A+ 901 Examination	30	19	Computer User Support Specialists	\$58,290	3,698	357	289	71
Cosmetology Assessment: National Occupational Competency Testing Institute (NOCTI)	75	57	Personal Care and Service Occupations	\$27,580	36,387	7,345	5,586	2,469
Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	139	97	Hairdressers, Hairstylists, and Cosmetologists	\$34,250	2,987	262	360	191
Criminal Justice Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	4	2	Legal Occupations	\$103,820	5,681	535	417	143
Culinary Arts Prep Cook-Level 1 Assessment: National Occupational Competency Testing Institute (NOCTI)	6	5	Food Preparation and Serving Related Occupations	\$24,280	81,036	8,286	13,940	5,809
Culinary Arts Prep Cook-Level 2 Assessment: National Occupational Competency Testing Institute (NOCTI)	33	24	Chefs and Head Cooks	\$54,760	1,167	120	148	35
Data Cabling Installer (DCI) Certification Examination: Electronics Technicians Association (ETA), International	8	7	Telecommunications Line Installers and Repairers	\$61,070	657	(25)	65	17
Dental Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	43	25	Dental Assistants	\$44,640	2,084	379	244	97
Early Childhood Education and Care, Basic Assessment: National Occupational Competency Testing Institute (NOCTI)	72	56	Childcare Workers	\$24,620	3,465	302	506	270
Electric Power and Distribution Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	Helpers--Electricians	\$30,510	639	4	88	27
Electrical Construction Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	14	8	Helpers--Electricians	\$30,510	639	4	88	27
Electrical Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	11	3	Helpers--Electricians	\$30,510	639	4	88	27
Electronic Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	30	3	Helpers--Electricians	\$30,510	639	4	88	27
Electronics Assessment: National Occupational Competency Testing Institute (NOCTI)	83	19	Electrical and Electronics Engineering Technicians	\$70,750	2,333	240	211	70
Emergency Medical First Responder Certification: Department of Health, Office of EMS	2	1	Emergency Medical Technicians and Paramedics	\$35,310	1,550	304	113	24
Emergency Medical Technician Examination: Department of Health, Office of Emergency Medical Services	18	10	Emergency Medical Technicians and Paramedics	\$35,310	1,550	304	113	24
EPA Universal Examination (pass all three types): Environmental Protection Agency (EPA)	29	28	Environmental Science and Protection Technicians	\$47,150	336	28	39	13

Fiber Optics Installer (FOI) Certification: Electronics Technicians Association (ETA), International	9	8	Telecommunications Line Installers and Repairers	\$61,070	657	(25)	65	17
Firefighter II Certification Examination: Virginia Department of Fire Programs	3	3	Fire Fighting and Prevention Workers	\$83,440	2,964	244	210	65
Fundamentals of Construction Assessment: National Occupational Competency Testing Institute (NOCTI)	125	53	Helpers--Construction Trades	\$31,340	1,606	45	224	67
Greenhouse Operators Certification Examination: Southeast Greenhouse Growers Association/Virginia Flower Growers Association	37	20	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	\$27,910	202	8	31	7
HBI/NAHB Building Construction Technology Advanced Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	0.4	0.4	Helpers--Construction Trades	\$31,340	1,606	45	224	67
Health Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	39	14	Healthcare Support Occupations	\$32,680	28,403	6,403	3,450	1,418
Horticulture Landscaping Assessment: National Occupational Competency Testing Institute (NOCTI)	10	3	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	\$27,910	202	8	31	7
Hospitality Management Food and Beverage Option Assessment: National Occupational Competency Testing Institute (NOCTI)	27	24	Food and Beverage Serving Workers	\$24,990	48,904	5,480	8,982	3,795
Hospitality Management Lodging Option Assessment: National Occupational Competency Testing Institute (NOCTI)	19	7	Hotel, Motel, and Resort Desk Clerks	\$22,300	1,806	69	280	98
HVAC (EPA) Technician Examinations (Levels: Core, I, II, or III): Environmental Protection Agency	15	15	Heating, Air Conditioning, and Refrigeration Mechanics	\$50,210	2,723	186	267	73
HVAC Excellence Certification Program: HVAC Excellence (Pass an one exam in this program)	10	9	Heating, Air Conditioning, and Refrigeration Mechanics	\$50,210	2,723	186	267	73
IC3 Global Standard 5, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	153	92	Computer User Support Specialists	\$58,290	3,698	357	289	71
IC3 Global Standard 4 Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	35	29	Computer User Support Specialists	\$58,290	3,698	357	289	71
Internet and Computing Core Certification Examinations/2007 (IC3): (student has passed all three examinations)	4	1	Computer User Support Specialists	\$58,290	3,698	357	289	71
Internet and Computing Core Certification Examinations/Windows 7--Office 2010: Certiport (student has passed all three examinations)	23	18	Computer User Support Specialists	\$58,290	3,698	357	289	71
Intuit QuickBooks Certified User Certification Test: Certiport	11	4	Accountants and Auditors	\$85,640	7,532	849	703	209
Licensed Practical Nurse Examination: Virginia Board of Nursing (VBN)	4	4	Licensed Practical and Licensed Vocational Nurses	\$44,850	5,429	729	427	178

Mechanical Drafting and Design Assessment: National Competency Testing Institute (NOCTI)	34	17	Mechanical Drafters	\$59,000	183	16	16	5
Mechatronics-Level 1 Assessment: National Competency Testing Institute (NOCTI)	44	29	Electro-Mechanical Technicians	\$56,020	259	12	22	8
Medical Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	61	47	Medical Assistants	\$35,010	4,043	1,061	475	154
MOS Examinations (Advanced level): Microsoft Office Specialist/Certiport (Pass any one exam at this level)	0.4	0.4	Computer Operators	\$49,830	129	(32)	12	6
MOS Excel Expert Level: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	17	9	Computer Operators	\$49,830	129	(32)	12	6
MOS Microsoft Office Expert 2013/Certiport (must pass both Word & Excel at expert levels)	0.4	0.4	Computer Operators	\$49,830	129	(32)	12	6
MOS Microsoft Office Expert Excel 2016/Certiport (only one exam)	57	20	Computer Operators	\$49,830	129	(32)	12	6
MOS Microsoft Office Specialist Master 2010/Certiport	0.2	0.2	Computer Operators	\$49,830	129	(32)	12	6
MOS Word Expert Level Examination: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	103	67	Word Processors and Typists	\$42,290	136	(57)	12	10
MTA Examination: .NET Fundamentals (98-372)	25	13	Computer User Support Specialists	\$58,290	3,698	357	289	71
MTA Examination: Database Administration Fundamentals (98-364)	18	11	Computer User Support Specialists	\$58,290	3,698	357	289	71
MTA Examination: Gaming Development Fundamentals	2	1	Computer Programmers	\$94,470	746	(72)	42	14
MTA Examination: HTML5 Application Development Fundamentals (98-375)	16	5	Computer User Support Specialists	\$58,290	3,698	357	289	71
MTA Examination: Networking Fundamentals (98-366)	37	17	Computer User Support Specialists	\$58,290	3,698	357	289	71
MTA Examination: Security Fundamentals (98-367)	51	33	Computer User Support Specialists	\$58,290	3,698	357	289	71
MTA Examination: Software Development Fundamentals (98-361)	33	9	Computer User Support Specialists	\$58,290	3,698	357	289	71
MTA Examination: Windows OS Fundamentals (98-349)	36	23	Computer User Support Specialists	\$58,290	3,698	357	289	71
MTA Examination: Windows Server Administration Fundamentals (98-365)	8	7	Computer User Support Specialists	\$58,290	3,698	357	289	71
MTA Examination: Introduction to Programming using HTML & CSS (98-383)	1	1	Computer Programmers	\$94,470	746	(72)	42	14
MTA Examination: Introduction to Programming using Java (98-388)	18	14	Computer User Support Specialists	\$58,290	3,698	357	289	71

MTA Examination: Introduction to Programming using JavaScript (98-382)	3	3	Computer User Support Specialists	\$58,290	3,698	357	289	71
MTA Examination: Introduction to Programming using Python (98-381)	7	5	Computer Programmers	\$94,470	746	(72)	42	14
MTA Examination: Introduction to Programming with Block-Based Languages (98-380)	0.2	0.2	Computer User Support Specialists	\$58,290	3,698	357	289	71
Nail Technician Examination: Virginia Board for Barbers and Cosmetology	22	12	Hairdressers, Hairstylists, and Cosmetologists	\$34,250	2,987	262	360	191
National Nurse Aide Assessment Program (NNAAP) Examination: Virginia Board of Nursing	80	49	Nursing Assistants	\$28,770	9,410	1,479	1,112	526
Nationally Registered Certified Dental Assistant (NRCDA) Examination: National Association of Health Professionals (NAHP)	13	10	Dental Assistants	\$44,640	2,084	379	244	97
Nursing Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	13	7	Nursing Assistants	\$28,770	9,410	1,479	1,112	526
ParaPro: Educational Testing Service (ETS)	9	9	Teacher Assistants	\$28,000	6,599	613	694	346
Pre-Engineering/Engineering Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	296	139	Industrial Engineering Technicians	\$55,940	312	15	27	10
Principles of Livestock Selection and Evaluation Certification Examination: National Collegiate Livestock Coaches Association (exam is adm. by iCEV)	4	0	Farming, Fishing, and Forestry Occupations	\$36,230	935	51	131	34
Private Applicator Certification Examination: VA Dept. of Agriculture and Consumer Services	4	2	Pest Control Workers	\$40,800	1,523	123	208	56
ProStart Program End-of-Course Examination (Level 2): Education Foundation of the National Restaurant Association	23	15	Food Preparation and Serving Related Occupations	\$24,280	81,036	8,286	13,940	5,809
Registered Technician Certification Examination: VA Dept. of Agriculture and Consumer Services	6	3	Pest Control Workers	\$40,800	1,523	123	208	56
Retail Commercial Baking Assessment: National Occupational Competency Testing Institute (NOCTI)	30	18	Chefs and Head Cooks	\$54,760	1,167	120	148	35
Retail Management Certification Assessment: National Retail Federation (NRF) Foundation	4	4	Sales and Related Occupations	\$41,140	93,652	2,536	13,118	5,753
ServSafe Manager Certification Examination: National Restaurant Association	400	215	Food Preparation and Serving Related Occupations	\$24,280	81,036	8,286	13,940	5,809
Small Animal Science and Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	47	44	Animal Care and Service Workers	\$27,720	1,855	397	281	111
Small Engine Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	178	62	Outdoor Power Equipment and Other Small Engine Mechanics	\$37,810	490	41	52	19
Technical Drafting Assessment: National Occupational Competency Testing Institute	35	25	Mechanical Drafters	\$59,000	183	16	16	5

Television Production Assessment: National Occupational Competency Testing Institute (NOCTI)	55	39	Production Occupations	\$38,390	34,622	(949)	3,842	1,464
Welding Assessment: National Occupational Competency Testing Institute (NOCTI)	49	28	Welders, Cutters, Solderers, and Brazers	\$46,360	2,477	157	266	63

Research Question 4: What is the potential economic impact for the state if the number of CTE students earning industry credentials were to increase by 10% annually?

To determine the economic impact for the Commonwealth of Virginia if the number of CTE students earning industry credentials in Superintendent Region Two were to increase 10% annually, each of the 147 different industry credentials aligned with an occupation in Table 54, was calculated to determine its growth of 10% annually. These results were then used to determine the income tax associated with that credential and occupation. Table 54 provides a breakout, by year, of the potential income tax revenue the Commonwealth of Virginia could potentially see if the number of completer students earning industry credentials in Superintendent Region Two was to increase by 10% annually.

Table 54

Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually

Region Two	Credentials *10%	Compound Credentials	Income Tax Due	Compound Income Tax
Year 1	334	3,669	\$ 8,707,954.84	\$ 10,710,575.09
Year 2	367	4,036	\$ 9,578,750.33	\$ 20,289,325.42
Year 3	404	4,440	\$ 10,536,625.36	\$ 30,825,950.78
Year 4	444	4,884	\$ 11,590,287.90	\$ 42,416,238.68
Year 5	488	5,372	\$ 12,749,316.69	\$ 55,165,555.37

Credential numbers are rounded

A component of this study was a survey distributed to 40 representatives of Virginia's economy to determine the value added to the earning of industry credentials. Eighteen respondents indicated a candidate applying for a position in their company/organization, as a holder of industry credentials, would enter the company at a larger starting salary than a non-credentialed candidate. The range of the increased starting salary was between 5% and 25%. Using the average of these numbers, 14% could be used as the value-added to the earning of

industry credentials, however, to ensure this study creates a floor rather than a ceiling of value, 10% will be used as the value-added to those earning industry credentials.

Table 55 presents the projected data of Superintendent Region Two completers if their number were to increase by 10% annually. Data in the table also shows the new potential income tax revenue available to Virginia's Treasury if the 10% value-added sum is applied to the projected economic impact of the earning of CTE industry credentials on Virginia's economy.

Table 55

Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually - AND Allows a 10% Increase in Beginning Salary

Region Two	Credentials *10%	Compound Credentials	Income Tax Due	Compound Income Tax
Year 1	334	3,669	\$ 9,673,236.86	\$ 11,895,045.39
Year 2	367	4,036	\$ 10,640,560.55	\$ 22,535,605.94
Year 3	404	4,440	\$ 11,704,616.60	\$ 34,240,222.54
Year 4	444	4,884	\$ 12,875,078.26	\$ 47,115,300.81
Year 5	488	5,372	\$ 14,162,586.09	\$ 61,277,886.90

Credential numbers are rounded

Region Three: Northern Neck

Northern Neck, as Superintendent Region 3, consists of 17 school divisions, comprising among its number 29 high schools (including specialist technical centers). Of the 8 Superintendent regions, this region lists 7th in the number of high schools available to its students (VDOE, 2020).

Table 56

VDOE Superintendent Region 3: Northern Neck

Caroline County	King William County	Richmond County
Colonial Beach	King and Queen County	Spotsylvania County
Essex County	Lancaster County	Stafford County
Fredericksburg	Mathews County	Westmoreland County
Gloucester County	Middlesex County	West Point
King George County	Northumberland County	

Source: Commonwealth of Virginia, Department of Education Superintendent's Regions, http://www.doe.virginia.gov/directories/va_region_map.pdf

Data in Table 57 presents the alignment of the school divisions in Superintendent Region Three to the Local Workforce Investment Area (LWIA) regions. This data was created by the Demographics group at the Weldon Cooper Center for Public Service at the University of Virginia to help administrators and teachers in completing the “Application for Career and Technical Education New Program/Course in 2019. The LWIA’s were designated by the Workforce Innovation and Opportunity Act (WIOA) State Plan for the Commonwealth of Virginia (TrailBlazers, 2019). The alignment of the superintendent region to the LWIA region undergirds the findings of this study.

Table 57

Local Workforce Investment Areas (LWIAs) in Virginia by VDOE Superintendent Region

Region 3: Northern Neck	LWIA Region
Caroline County	LWIA XIII - Bay Consortium
Colonial Beach	LWIA XIII - Bay Consortium

Essex County	LWIA XIII - Bay Consortium
Fredericksburg	LWIA XIII - Bay Consortium
Gloucester County	LWIA XIV - Greater Peninsula
King George County	LWIA XIII - Bay Consortium
King William County	LWIA XIII - Bay Consortium
King and Queen County	LWIA XIII - Bay Consortium
Lancaster County	LWIA XIII - Bay Consortium
Mathews County	LWIA XIII - Bay Consortium
Middlesex County	LWIA XIII - Bay Consortium
Northumberland County	LWIA XIII - Bay Consortium
Richmond County	LWIA XIII - Bay Consortium
Spotsylvania County	LWIA XIII - Bay Consortium
Stafford County	LWIA XIII - Bay Consortium
Westmoreland County	LWIA XIII - Bay Consortium
West Point	LWIA XIII - Bay Consortium

Source: School Report Card Data: Year 2016-2017

http://www.doe.virginia.gov/instruction/career_technical/path_industry_certification/index.shtml

Virginia Department Of Education, School Report Card Data for School Year: 2015 - 2016

Local Workforce Investment Areas (LWIAs) in Virginia

Research Question 1: What is the trend for high school participation in CTE programs in Virginia (Region Three), over the past five years?

In order to determine the average number of high school CTE completer students in Region Three, over the last five years, data retrieved from the VDOE's Office of Education Information Management (2019). Data in Table 58 presents the number of completers by year, then when averaged out over five years. By examining this table, it is possible to observe the specific number of CTE completer students in this region, and whether the number has increased, decreased or remained the same.

Table 58

Number of CTE Completers in Region Three: 2014-2019

Year	Total Completers	5 Year Avg Completers
2014-2015	3,196	639
2015-2016	3,712	742
2016-2017	3,052	610
2017-2018	2,970	594

2018-2019	3,517	703
TOTAL	16,447	3,289

Source: Completer data by region retrieved from Virginia Department of Education, Office of Education Information Management, (2019).

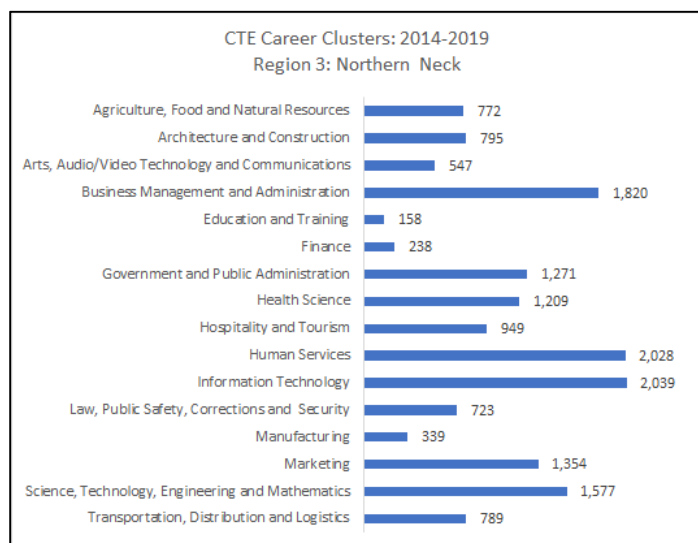
Research Question 2: What is the trend for high school completer students earning industry certifications in Virginia (Region Three), over the past five years?

To enable school administration to organize curriculum design, and career counselors to provide the necessary guidance to students, the Virginia Department of Education groups CTE programs and courses in a “Career Cluster.” According to VDOE (2020), these career clusters help to:

- Organize academic and technical knowledge and skills into a coherent sequence
- Identify pathways from secondary to postsecondary education
- Provide a framework for seamless education
- Provide institutional support of rigorous academic teaching and learning
- Provide alignment of academic and technical skills with workplace readiness skills
- Provide opportunities to involve parents, business and industry, and the school community
- Provide the development of effective plans of study that are based on career assessments

Using data drawn from the Weldon-Cooper Center for Public Service: CTE Completer Data: 2014-2019, over five years, Region Three: Central Virginia CTE completer students are seen to favor the Information Technology cluster (2,039), with the least numerous cluster of Education and Training reflecting 158 completer students.

Figure 11 CTE Career Clusters in Region Three: 2014-2019



Source: Weldon-Cooper Center for Public Service: CTE Completer Data: 2014-2019

Using industry credential test data provided by the *Virginia Department of Education, Office of Education Information Management, (2019)*, data were disaggregated using SPSS. Disaggregation was used to determine the credential type earned, the number of students taking and earning the credential, and what this looks like over a five-year average. Because this study aims to determine the relationship between the earning of Career and Technical industry credentials and the Virginia economy, the superintendent region in which these industry credentials were earned is the primary format of Table 59. Further, because the focus of this study is on CTE completers, the data was analyzed to determine which of the credentials earned would be the final steps in the completer process. The disaggregated data demonstrating the “completer industry credentials earned by Region Three CTE students: 2014-2019” is presented in Table 59.

Table 59

Region Three: Industry Credentials Taken and Passed: 2014-2019- “Completers”

Industry Credential Assessments & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
AAFCS: Early Childhood Education Examination	68	59	14	12
AAFCS: Education Fundamentals Examination	3	3	1	1
ACCESS Examination: American Culinary Federation, Inc. (ACF)	59	55	12	11
Accounting (Basic) Assessment: National Occupational Competency Testing Institute (NOCTI)	58	33	12	7
Adobe Certified Associate: Photoshop CS6 Examination/Certiport	66	19	13	4
Advanced Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	4	4	1	1
Architectural Certified Drafter Examination: American Design Drafting Association (ADDA)	13	8	3	2
Architectural Drafting Examination: American Design Drafting Association (ADDA)	26	8	5	2
ASE Auto Maintenance and Light Repair Examination (G1): National Institute for Automotive Service Excellence	116	57	23	11
ASE Automotive & Light Truck Certification Test-Automatic Transmission/Transaxle (A2): National Institute for Automotive Service Excellence	1	1	0	0
ASE Automotive & Light Truck Certification Test-Brakes (A5): National Institute for Automotive Service Excellence	230	88	46	18
ASE Automotive & Light Truck Certification Test-Electrical/Electronic Systems (A6): National Institute for Automotive Service Excellence	144	36	29	7
ASE Automotive & Light Truck Certification Test-Engine Performance (A8): National Institute for Automotive Service Excellence	151	33	30	7
ASE Automotive & Light Truck Certification Test-Engine Repair (A1): National Institute for Automotive Service Excellence	44	37	9	7
ASE Automotive & Light Truck Certification Test-Heating and Air Conditioning (A7): National Institute for Automotive Service Excellence	1	1	0	0
ASE Automotive & Light Truck Certification Test-Suspension & Steering (A4): National Institute for Automotive Service Excellence	147	41	29	8
ASE Collision Repair and Refinish Certification Test - Painting & Refinishing (B2): National Institute for Automotive Service Excellence	22	12	4	2
ASE Student Certification Automotive: Electrical/Electronic Systems: National Institute for Automotive Service Excellence	413	219	83	44
ASE Student Certification Automotive: Engine Performance: National Institute for Automotive Service Excellence	278	155	56	31
ASE Student Certification Automotive: Engine Repair: National Institute for Automotive Service Excellence	168	81	34	16
ASE Student Certification Automotive: Heating and Air Conditioning: National Institute for Automotive Service Excellence	99	47	20	9
ASE Student Certification Automotive: Maintenance and Light Repair: National Institute for Automotive Service Excellence	329	183	66	37
ASE Student Certification Automotive: Manual Drive Train and Axles: National Institute for Automotive Service Excellence	63	17	13	3
ASE Student Certification Automotive: Automatic Transmission/Transaxle: National Institute for Automotive Service Excellence	85	30	17	6

ASE Student Certification Automotive: Automotive Service Technology National Institute for Automotive Service Excellence	113	47	23	9
ASE Student Certification Automotive: Brakes: National Institute for Automotive Service Excellence	390	208	78	42
ASE Student Certification Automotive: Suspension and Steering: National Institute for Automotive Service Excellence	349	177	70	35
ASE Student Certification Collision Repair & Refinish: Mechanical and Electrical: National Institute for Automotive Service Excellence	13	7	3	1
ASE Student Certification Collision Repair & Refinish: Non-structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	60	36	12	7
ASE Student Certification Collision Repair & Refinish: Painting and Refinishing: National Institute for Automotive Service Excellence	66	39	13	8
ASE Student Certification Collision Repair & Refinish: Structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	14	10	3	2
AutoCAD Certified User: Autodesk	472	273	94	55
Autodesk Inventor Certified User: Autodesk	101	52	20	10
Beef Quality Assurance Certification	507	396	101	79
BrainBench Desktop Publishing Software Examinations	28	28	6	6
BrainBench Software Development Examinations	61	61	12	12
BrainBench Systems Administration Examinations	45	45	9	9
BrainBench Technical Support Examinations	39	39	8	8
BrainBench Web Administration Examinations	1	1	0	0
Carpentry Assessment: National Occupational Competency Testing Institute (NOCTI)	2	2	0	0
Certification of Pharmacy Technicians (ExCPT) Examination: Virginia Board of Pharmacy	4	4	1	1
Certified Clinical Medical Assistant (CCMA) Examination: National Healthcareer Association (NHA)	65	43	13	9
Certified Dental Assistant and National Entry Level Assistant: Radiation Health & Safety (RHS) Examination: Dental Assisting National Board	34	21	7	4
Certified Medical Administrative Assistant (CMAA) Examination: National Healthcareer Association (NHA)	78	65	16	13
Cisco Certified Networking Associate (CCNA) Routing and Switching Examination: Cisco Systems, Inc.	16	16	3	3
Cisco IT Essentials, PC Hardware and Software End-of-Course Examination: Cisco Systems	74	71	15	14
Collision Repair and Refinishing Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	2	2	0	0
Commercial Foods Assessment: National Occupational Competency Testing Institute (NOCTI)	13	2	3	0
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	7	7	1	1
CompTIA A+ Certification Examination (must pass both exams): CompTIA	35	13	7	3
Computer Programming Assessment: National Occupational Competency Testing Institute (NOCTI)	2	2	0	0
Computer Repair Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	0	0
CompTIA A+ 901 Examination	63	37	13	7

Cosmetology Assessment: National Occupational Competency Testing Institute (NOCTI)	39	20	8	4
Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	405	293	81	59
Culinary Arts Prep Cook-Level 1 Assessment: National Occupational Competency Testing Institute (NOCTI)	37	16	7	3
Culinary Arts Prep Cook-Level 2 Assessment: National Occupational Competency Testing Institute (NOCTI)	19	19	4	4
Dental Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	0	0
Diesel Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	11	11	2	2
Early Childhood Education and Care, Basic Assessment: National Occupational Competency Testing Institute (NOCTI)	72	62	14	12
Electronics Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	0	0
Emergency Medical Technician Examination: Department of Health, Office of Emergency Medical Services	111	78	22	16
EPA Universal Examination (pass all three types): Environmental Protection Agency (EPA)	75	69	15	14
Firefighter II Certification Examination: Virginia Department of Fire Programs	4	4	1	1
Greenhouse Operators Certification Examination: Southeast Greenhouse Growers Association/Virginia Flower Growers Association	13	12	3	2
Health Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	87	86	17	17
Heating, Ventilation, Air Conditioning & Refrigeration (HVAC/R) Assessment: National Occupational Competency Testing Institute (NOCTI)	7	7	1	1
HVAC (EPA) Technician Examinations (Levels: Core, I, II, or III): Environmental Protection Agency	9	9	2	2
HVAC Excellence Certification Program: HVAC Excellence	1	1	0	0
IC3 Global Standard 5, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	4	4	1	1
IC3 Global Standard 4 Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	16	16	3	3
International Code Council Certificates of Achievement Examinations (Pass any one exam): International Code Council (ICC)	104	88	21	18
Mechanical Certified Drafter Examination: American Design Drafting Association (ADDA)	74	31	15	6
Mechatronics-Level 1 Assessment: National Competency Testing Institute (NOCTI)	2	2	0	0
Medical Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	78	70	16	14
MOS Examinations (Advanced level): Microsoft Office Specialist/Certiport (Pass any one exam at this level)	72	72	14	14
MOS Excel Expert Examination: Microsoft Office 2010	35	35	7	7
MOS Excel Expert Level: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	1	1	0	0
MOS Microsoft Office Expert Excel 2016/Certiport (only one exam)	18	16	4	3
MOS Microsoft Office Specialist Master 2010/Certiport	9	9	2	2
MOS Word Expert Examination: Microsoft Office 2010/Certiport	43	42	9	8
MOS Word Expert Examination: Microsoft Office 2016/Certiport	37	35	7	7

MOS Word Expert Level Examination: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	20	20	4	4
MTA Examination: HTML5 Application Development Fundamentals (98-375)	17	17	3	3
MTA Examination: Networking Fundamentals (98-366)	1	1	0	0
MTA Examination: Security Fundamentals (98-367)	574	138	115	28
MTA Examination: Software Development Fundamentals (98-361)	3	3	1	1
MTA Examination: Windows OS Fundamentals (98-349)	11	11	2	2
MTA Examination: Windows Server Administration Fundamentals (98-365)	1	1	0	0
MTA Examination: Introduction to Programming using Java (98-388)	1	1	0	0
National Nurse Aide Assessment Program (NNAAP) Examination: Virginia Board of Nursing	293	262	59	52
Nationally Registered Certified Pharmacy Technician (NRCPhT) Examination: National Association for Health Professionals (NAHP)	2	2	0	0
Network Pro Certification Examination: Test Out Corporation (TOC)	1	1	0	0
Nursing Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	0	0
ParaPro: Educational Testing Service (ETS)	57	53	11	11
Pre-Engineering/Engineering Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	5	5	1	1
Private Applicator Certification Examination: VA Dept. of Agriculture and Consumer Services	134	92	27	18
ProStart Program End-of-Course Examination (Level 2): Education Foundation of the National Restaurant Association	77	72	15	14
Restaurant, Food and Beverage Services Assessment: National Occupational Competency Testing Institute (NOCTI)	13	6	3	1
Security Pro Certification Examination: Test Out Corporation (TOC)	1	1	0	0
ServSafe Manager Certification Examination: National Restaurant Association	521	360	104	72
Small Animal Science and Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	61	43	12	9
Television Production Assessment: National Occupational Competency Testing Institute (NOCTI)	140	105	28	21
Therapeutic Services Assessment: National Occupational Competency Testing Institute (NOCTI)	12	12	2	2
Web Design Assessment: National Occupational Competency Testing Institute (NOCTI)	2	2	0	0
Welding Assessment: National Occupational Competency Testing Institute (NOCTI)	26	15	5	3
TOTAL	8,602	5,266	1,720	1,053

Because a full picture of the industry credentialing test data is needed to determine trends in the earning of industry certifications in Region Three, one must be aware of the data for those currently on their CTE pathway, as seen in Table 60. Students earning credentials in this table are currently on a CTE program, as seen in the “certification,” “pre-apprentice,” or “other”

pathway certifications, and non-CTE specific certifications. Although the data from this table is not included in the final calculation to determine economic impact, this does not negate their value or economic potential. This study focuses on completer students.

Table 60

Other” industry credentials earned by Region Three CTE students, 2014-2019

“Other” Industry Credential Assessments & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
AutoCAD 2012 Certification Examination: BrainBench	104	85	21	17
Briggs & Stratton Master Service Technician Program Examination	67	67	13	13
Carpenter Level One - Entry Level Assessment: National Center for Construction Education & Research (NCCER)	6	6	1	1
College Level Examination Program (CLEP): Principles of Marketing: The College Board	30	20	6	4
Construction Technologist - Entry Level Assessment: National Center for Construction Education & Research (NCCER)	7	7	1	1
Core: Introductory Craft Skills Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	16	15	3	3
Criminal Justice Assessment: National Occupational Competency Testing Institute (NOCTI)	28	23	6	5
Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	1,520	1,359	304	272
Electrician Level One - Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	21	19	4	4
Emergency and Fire Management Services Assessment: National Occupational Competency Testing Institute (NOCTI)	5	5	1	1
Emergency Medical Services Assessment: National Occupational Competency Testing Institute (NOCTI)	2	2	0	0
Energy Industry Fundamentals Certificate Assessment: Center for Energy Workforce Development	4	4	1	1
EPA Technician Examination (Core): Environmental Protection Agency (EPA)	24	12	5	2
EPA Technician Examination (Type I): Environmental Protection Agency (EPA)	19	9	4	2
EPA Technician Examination (Type II): Environmental Protection Agency (EPA)	70	41	14	8
EPA Technician Examination (Type III): Environmental Protection Agency (EPA)	22	6	4	1
Firefighter I Certification Examination: Virginia Department of Fire Programs	4	4	1	1
HBI/NAHB Plumbing Basic Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	42	42	8	8
Landscape Management Certification Examination: Green Industry Web Portal	10	5	2	1
MOS Access Examination: Microsoft Office 2016/Certiport	28	20	6	4

MOS Access Examination: Microsoft Office 2010/Certiport	81	63	16	13
MOS Access Examination: Microsoft Office 2013/Certiport	24	24	5	5
MOS Excel Examination: Microsoft Office 2013/Certiport	357	289	71	58
MOS Excel Examination: Microsoft Office 2010/Certiport	89	74	18	15
MOS Excel Examination: Microsoft Office 2016/Certiport	227	160	45	32
MOS Outlook Examination: Microsoft Office 2010/Certiport	42	40	8	8
MOS Outlook Examination: Microsoft Office 2013/Certiport	2	2	0	0
MOS Outlook Examination: Microsoft Office 2016/Certiport	4	4	1	1
MOS PowerPoint Examination: Microsoft Office 2013/Certiport	1,565	1,348	313	270
MOS PowerPoint Examination: Microsoft Office 2010/Certiport	575	468	115	94
MOS PowerPoint Examination: Microsoft Office 2016/Certiport	581	485	116	97
MOS PowerPoint Examination: Microsoft Office Specialist/Certiport	16	16	3	3
MOS Word Examination: Microsoft Office 2010/Certiport	452	335	90	67
MOS Word Examination: Microsoft Office 2013/Certiport	1,121	896	224	179
MOS Word Examination: Microsoft Office 2016/Certiport	482	383	96	77
MOS Word Examination: Microsoft Office Specialist/Certiport	18	16	4	3
NCCT Core: Introductory Craft Skills, National Construction Career Test: National Center for Construction Education & Research (NCCER)	52	28	10	6
PLTW Examination: Aerospace Engineering: Project Lead the Way (PLTW)	104	84	21	17
PLTW Examination: Civil Engineering and Architecture: Project Lead the Way (PLTW)	140	86	28	17
PLTW Examination: Computer Integrated Manufacturing: Project Lead the Way (PLTW)	74	48	15	10
PLTW Examination: Digital Electronics: Project Lead the Way (PLTW)	71	19	14	4
PLTW Examination: Human Body Systems: Project Lead the Way (PLTW)	116	81	23	16
PLTW Examination: Introduction to Engineering Design: Project Lead the Way (PLTW)	536	349	107	70
PLTW Examination: Medical Interventions: Project Lead the Way (PLTW)	104	62	21	12
PLTW Examination: Principles of Biomedical Sciences: Project Lead the Way (PLTW)	287	186	57	37
PLTW Examination: Principles of Engineering: Project Lead the Way (PLTW)	211	145	42	29
ProStart Program End-of-Course Examination (Level 1): Education Foundation of the National Restaurant Association	106	101	21	20
Recreation, Amusements, and Attractions Assessment: National Occupational Competency Testing Institute (NOCTI)	29	23	6	5
SENSE Training Program Certification Examination: American Welding Society (AWS)	6	6	1	1
SkillsUSA: 3D Visualization & Animation Examination	27	21	5	4
SkillsUSA: Architectural Drafting Examination	26	1	5	0
SkillsUSA: Carpentry Examination	125	109	25	22
SkillsUSA: Customer Service Examination	321	234	64	47
SkillsUSA: Electrical Construction (Residential) Wiring Examination	95	39	19	8
SkillsUSA: Engineering Technology Examination	43	42	9	8

SkillsUSA: Technical Drafting Examination	181	164	36	33
SkillsUSA: Television Video Production Examination	22	12	4	2
SkillsUSA: Welding Examination	22	11	4	2
SkillsUSA: Graphic Design Examination (PrintED co-brand)	13	6	3	1
SkillsUSA: Introduction to Graphic Communications Examination (PrintED co-brand)	56	32	11	6
TOTAL	10,432	8,243	2,086	1,649

As a final measure to determine the trend for the earning of CTE industry credentials at the high school level in Region Three, Table 61 presents the data specific to “Soft skills/College & Career Readiness” certifications. Because these certifications are included in the VDOE approved list of industry certifications, they are included in the industry credential test data provided by the Virginia Department of Education, Office of Education Information Management (VDOE, 2019). The value of this data lies in its relationship to the overall earning of industry credentials by high school students in Region Three, and the bigger picture when determining any trend.

Table 61

Soft skills/College & Career Readiness industry credentials earned in Region Three: 2014-2019

“Soft skills/College & Career Readiness” Assessments & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
Armed Services Vocational Aptitude Battery Examination: United States Military Entrance Processing Command	1,930	1,482	386	296
College and Work Readiness Assessment (CWRA+): Council for Aid to Education	93	66	19	13
National Career Readiness Certificate (ACT)	60	55	12	11
W!SE Financial Literacy Certification: Working in Support of Education (W!SE)	27,409	22,248	5,482	4,450
Workplace Readiness Skills for the Commonwealth Examination	20,328	15,482	4,066	3,096
TOTAL	49,820	39,333	6,228	7,867

To determine the trend for high school completer students earning industry credentials in Region Three over the past five years, a finalized set of summarized data can be seen in Table

62. These data present the number of students who have earned a CTE industry credential approved by Virginia’s Board of Education. The three categories of assessment type are represented in Table 62 and present the five year total, and five-year average number of earned (a) “technical” credentials (sufficient for a student to successfully end their completer program); (b) “other” assessments taken where students are on the CTE path, working towards certifications; and (c), the “Soft skills/College & Career Readiness” certifications.

Table 62

Total Number of Industry Certifications Earned in Region Three: 2014-2019

Industry Credential Assessment & Type	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
"Technical" Completer Certifications	8,602	5,266	1,720	1,053
"Other" CTE certifications - pathway/level one/PLTW/Skills USA	10,432	8,243	2,086	1,649
“Soft skills/College & Career Readiness” certifications.	49,820	39,333	6,228	7,867
TOTAL	68,854	52,842	13,771	10,568

Research Question 3: What are the potential earnings for students gaining industry credentials in Virginia’s (Region Three) labor market?

To determine the potential earning for students gaining industry credentials in Virginia’s labor market, it is crucial to understand

the labor market’s occupational openings by educational attainment level. Through the review of these data, one can examine the extent to which Region Three students are entering a labor market saturated with similarly qualified candidates, or into the market with high-demand, high-salary openings. Data in Table 63, as extracted from the Bureau of Labor Statistics and the Virginia Employment Commission projection to 2026, show the probable occupational openings by education level attainment for Region Three as a whole.

Table 63

Occupational Openings by Education Attainment Level to 2026 – Region Three

Region 3 – Northern Neck	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Associate's Degree	4,336	578	379	107
Bachelor's Degree	24,845	3,272	2,081	643
Doctoral or Professional Degree	2,381	307	138	38
High School Diploma or Equivalent	58,427	4,369	6,313	2,531
Less Than High School	45,961	6,424	8,437	3,566
Master's Degree	3,197	669	312	99
Not Applicable	383,864	41,661	44,185	17,444
Postsecondary Non-Degree Award	4,130	492	404	163
TOTAL	527,141	57,772	62,249	24,591

Source: May 2018 State Occupational Employment and Wage Estimates,
https://www.bls.gov/oes/current/oes_va.htm#00-0000

While data in Table 63 specify occupations in the “Not Applicable” category as the largest group to access to occupational openings, a precise definition of the education included in that category is not available. The second-largest estimated category in labor market openings is found in the “High School Diploma or Equivalent” category. However, when the “Not Applicable” category is removed from the data, along with “Less than High School” as in Table 64 numbers show that the two categories of education with greater access to projected employment are those with “High School Diploma or Equivalent” and “Bachelor’s Degree.”

Table 64

Occupational Openings by Education Attainment Level – Region 3 - "Less than High School" and "Not Applicable" removed

Region 3 – Northern Neck	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Associate's Degree	4,336	578	379	107
Bachelor's Degree	24,845	3,272	2,081	643

Doctoral or Professional Degree	2,381	307	138	38
High School Diploma or Equivalent	58,427	4,369	6,313	2,531
Master's Degree	3,197	669	312	99
Postsecondary Non-Degree Award	4,130	492	404	163
	624,457	67,459	71,876	28,172

Source: May 2018 State Occupational Employment and Wage Estimates,
https://www.bls.gov/oes/current/oes_va.htm#00-0000

Data presented in Table 65 show the occupations available to Region Three CTE completer students who have earned a series of industry credentials. These data present the estimated mean salary expected, the projected occupational openings to 2026 of that particular occupation, the number of annual openings, and annual exits. Data included in this table show completer data specifically and does not include those who are currently enrolled in a CTE pathway, or who have completed credentials with a career readiness focus. The data in Table 65 brings together data points from:

- a) *Region Three: Industry Credentials Taken and Passed: 2014-2019 – Completers* (see Table 59). Data from this source is seen in the columns “Assessment,” “Taken 5 Yr. Avg.” and “Pass 5 Yr. Avg”.
- b) Bureau of Labor Statistics *May 2019 State Occupational Employment and Wage Estimates: Virginia* (Bureau of Labor Statistics, 2020). Data from this source is seen in the columns “Occupation” and “Mean Annual Salary.”
- c) TrailBlazers: Career and Technical Education in Virginia (TrailBlazers, 2020). Labor market data for the LWIA XIII: Bay Consortium region (TrailBlazers, 2020) is seen in columns: “Occupation,” “Projected Employment,” “Numeric Change,” “Annual Openings,” and “Annual Exits.”

Table 65

CTE Industry Credential to Occupational Alignment and Projections – Region Three: Northern Neck; LWIA XIII: Bay Consortium

Assessment	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.	Occupation	Mean Annual Wage	Projected Employment	Numeric Change	Annual Openings	Annual Exits
AAFCS: Early Childhood Education Examination	14	12	Preschool Teachers, Except Special Education	\$37,880	9,747	731	977	403
AAFCS: Education Fundamentals Examination	1	1	Teacher Assistants	\$28,000	1,854	202	196	96
ACCESS Examination: American Culinary Federation, Inc. (ACF)	12	11	Chefs and Head Cooks	\$54,760	3,534	416	451	106
Accounting (Basic) Assessment: National Occupational Competency Testing Institute (NOCTI)	12	7	Financial Clerks	\$40,410	3,504	147	387	188
Adobe Certified Associate: Photoshop CS6 Examination/Certiport	13	4	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	1,885	258	199	73
Advanced Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	1	1	Sales and Related Occupations	\$41,140	22,149	1,245	3,089	1,343
Architectural Certified Drafter Examination: American Design Drafting Association (ADDA)	3	2	Mechanical Drafters	\$59,000	753	55	64	21
Architectural Drafting Examination: American Design Drafting Association (ADDA)	5	2	Mechanical Drafters	\$59,000	753	55	64	21
ASE Auto Maintenance and Light Repair Examination (G1): National Institute for Automotive Service Excellence	23	11	Automotive Service Technicians and Mechanics	\$47,730	1,307	148	128	39
ASE Automotive & Light Truck Certification Test-Engine Repair (A1); Automatic Transmission/Transaxle (A2); Suspension & Steering (A4); Brakes (A5); Electrical/Electronic Systems (A6); Heating and Air Conditioning (A7); Engine Performance (A8) National Institute for Automotive Service Excellence	103	34	Automotive Service Technicians and Mechanics	\$47,730	1,307	148	128	39
ASE Student Certification Automotive: Electrical/Electronic Systems: Engine Performance; Engine Repair; Heating and Air Conditioning; Maintenance and Light Repair; Manual Drive Train and Axles; Automatic Transmission/Transaxle; Automotive Service Technology; Brakes: National Institute for Automotive Service Excellence	215	110	Automotive Service Technicians and Mechanics	\$47,730	1,307	148	128	39
ASE Collision Repair and Refinish Certification Test - Painting & Refinishing (B2); Suspension and Steering; Mechanical and Electrical; Non-structural Analysis and Damage Repair;	87	47	Automotive Body and Related Repairers	\$53,060	202	22	20	7

Painting and Refinishing; Structural Analysis and Damage Repair: National Institute for Automotive Service Excellence								
AutoCAD Certified User: Autodesk	94	55	Mechanical Drafters	\$59,000	753	55	64	21
Autodesk Inventor Certified User: Autodesk	20	10	Drafters, Engineering Technicians, & Mapping Technicians	\$60,320	21,054	1,517	1,900	640
Beef Quality Assurance Certification	101	79	Farming, Fishing, and Forestry Occupations	\$36,230	1,125	71	152	40
BrainBench Desktop Publishing Software Examinations	6	6	Computer Operators	\$49,830	548	(136)	50	25
BrainBench Software Development Examinations	12	12	Computer Operators	\$49,830	548	(136)	50	25
BrainBench Systems Administration Examinations	9	9	Computer Operators	\$49,830	548	(136)	50	25
BrainBench Technical Support Examinations	8	8	Computer User Support Specialists	\$58,290	367	47	30	7
BrainBench Web Administration Examinations	0.2	0.2	Web Developers	\$88,850	4,545	667	361	80
Carpentry Assessment: National Occupational Competency Testing Institute (NOCTI)	0.4	0.4	Woodworkers	\$41,300	559	1	62	24
Certification of Pharmacy Technicians (ExCPT) Examination: Virginia Board of Pharmacy	1	1	Pharmacy Technicians	\$32,370	382	26	31	12
Certified Clinical Medical Assistant (CCMA) Examination: National Healthcareer Association (NHA)	13	9	Medical Assistants	\$35,010	779	209	92	30
Certified Dental Assistant and National Entry Level Assistant: Radiation Health & Safety (RHS) Examination: Dental Assisting National Board	7	4	Dental Assistants	\$44,640	444	95	53	20
Certified Medical Administrative Assistant (CMAA) Examination: National Healthcareer Association (NHA)	16	13	Medical Records and Health Information Technicians	\$43,590	167	37	12	4
Cisco Certified Networking Associate (CCNA) Routing and Switching Examination: Cisco Systems, Inc.	3	3	Computer User Support Specialists	\$58,290	367	47	30	7
Cisco IT Essentials, PC Hardware and Software End-of-Course Examination: Cisco Systems	15	14	Computer User Support Specialists	\$58,290	367	47	30	7
Collision Repair and Refinishing Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	0.4	0.4	Automotive Body and Related Repairers	\$53,060	202	22	20	7
Commercial Foods Assessment: National Occupational Competency Testing Institute (NOCTI)	3	0	Food Preparation and Serving Related Occupations	\$24,280	19,125	2,372	3,303	1,358
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	1	1	Pest Control Workers	\$40,800	156	12	21	6
CompTIA A+ Certification Examination (must pass both exams): CompTIA	7	3	Computer Hardware Engineers	\$119,500	205	21	14	4

Computer Programming Assessment: National Occupational Competency Testing Institute (NOCTI)	0.4	0.4	Computer Programmers	\$94,470	7,616	(412)	445	137
Computer Repair Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	0.2	0.2	Computer User Support Specialists	\$58,290	367	47	30	7
CompTIA A+ 901 Examination	13	7	Computer User Support Specialists	\$58,290	367	47	30	7
Cosmetology Assessment: National Occupational Competency Testing Institute (NOCTI)	8	4	Personal Care and Service Occupations	\$27,580	11,104	2,749	1,663	733
Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	81	59	Hairdressers, Hairstylists, and Cosmetologists	\$34,250	1,067	76	128	69
Culinary Arts Prep Cook-Level 1 Assessment: National Occupational Competency Testing Institute (NOCTI)	7	3	Food Preparation and Serving Related Occupations	\$24,280	19,125	2,372	3,303	1,358
Culinary Arts Prep Cook-Level 2 Assessment: National Occupational Competency Testing Institute (NOCTI)	4	4	Chefs and Head Cooks	\$54,760	3,534	416	451	106
Dental Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	0.2	0.2	Dental Assistants	\$44,640	444	95	53	20
Diesel Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	2	2	Automotive Service Technicians and Mechanics	\$47,730	1,307	148	128	39
Early Childhood Education and Care, Basic Assessment: National Occupational Competency Testing Institute (NOCTI)	14	12	Childcare Workers	\$24,620	22,726	1,464	3,304	1,793
Electronics Assessment: National Occupational Competency Testing Institute (NOCTI)	0.2	0.2	Electrical and Electronics Engineering Technicians	\$70,750	602	66	55	18
Emergency Medical Technician Examination: Department of Health, Office of Emergency Medical Services	22	16	Emergency Medical Technicians and Paramedics	\$35,310	373	42	24	6
EPA Universal Examination (pass all three types): Environmental Protection Agency (EPA)	15	14	Environmental Science and Protection Technicians	\$47,150	336	28	39	13
Firefighter II Certification Examination: Virginia Department of Fire Programs	1	1	Fire Fighting and Prevention Workers	\$83,440	565	61	41	12
Greenhouse Operators Certification Examination: Southeast Greenhouse Growers Association/Virginia Flower Growers Association	3	2	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	\$27,910	116	3	17	4
Health Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	17	17	Healthcare Support Occupations	\$32,680	4,981	1,054	603	248
Heating, Ventilation, Air Conditioning & Refrigeration (HVAC/R) Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	Heating, Air Conditioning, and Refrigeration Mechanics	\$50,210	458	72	47	12
HVAC (EPA) Technician Examinations (Levels: Core, I, II, or III): Environmental Protection Agency	2	2	Heating, Air Conditioning, and Refrigeration Mechanics	\$50,210	458	72	47	12

HVAC Excellence Certification Program: HVAC Excellence (Pass an one exam in this program)	0.2	0.2	Heating, Air Conditioning, and Refrigeration Mechanics	\$50,210	458	72	47	12
IC3 Global Standard 5, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	1	1	Computer User Support Specialists	\$58,290	367	47	30	7
IC3 Global Standard 4 Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	3	3	Computer User Support Specialists	\$58,290	367	47	30	7
International Code Council Certificates of Achievement Examinations (Pass any one exam): International Code Council (ICC)	21	18	Construction and Building Inspectors	\$60,170	173	18	19	8
Mechanical Certified Drafter Examination: American Design Drafting Association (ADDA)	15	6	Mechanical Drafters	\$59,000	753	55	64	21
Mechatronics-Level 1 Assessment: National Competency Testing Institute (NOCTI)	0.4	0.4	Electro-Mechanical Technicians	\$56,020	504	23	44	16
Medical Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	16	14	Medical Assistants	\$35,010	779	209	92	30
MOS Examinations (Advanced level): Microsoft Office Specialist/Certiport (Pass any one exam at this level)	14	14	Computer Operators	\$49,830	548	(136)	50	25
MOS Excel Expert Level: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	0.2	0.2	Computer Operators	\$49,830	548	(136)	50	25
MOS Microsoft Office Expert Excel 2016/Certiport (only one exam)	4	3	Computer Operators	\$49,830	548	(136)	50	25
MOS Microsoft Office Specialist Master 2010/Certiport	2	2	Computer Operators	\$49,830	548	(136)	50	25
MOS Word Expert Level Examination: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	4	4	Word Processors and Typists	\$42,290	89	(39)	8	7
MTA Examination: HTML5 Application Development Fundamentals (98-375)	3	3	Computer User Support Specialists	\$58,290	367	47	30	7
MTA Examination: Networking Fundamentals (98-366)	0.2	0.2	Computer User Support Specialists	\$58,290	367	47	30	7
MTA Examination: Security Fundamentals (98-367)	115	28	Computer User Support Specialists	\$58,290	367	47	30	7
MTA Examination: Software Development Fundamentals (98-361)	1	1	Computer User Support Specialists	\$58,290	367	47	30	7
MTA Examination: Windows OS Fundamentals (98-349)	2	2	Computer User Support Specialists	\$58,290	367	47	30	7
MTA Examination: Windows Server Administration Fundamentals (98-365)	0.2	0.2	Computer User Support Specialists	\$58,290	367	47	30	7

MTA Examination: Introduction to Programming using Java (98-388)	0.2	0.2	Computer User Support Specialists	\$58,290	367	47	30	7
National Nurse Aide Assessment Program (NNAAP) Examination: Virginia Board of Nursing	59	52	Nursing Assistants	\$28,770	1,604	215	189	91
Nationally Registered Certified Pharmacy Technician (NRCPhT) Examination: National Association for Health Professionals (NAHP)	0.4	0.4	Pharmacy Technicians	\$32,370	382	26	31	12
Network Pro Certification Examination: Test Out Corporation (TOC)	0.2	0.2	Computer User Support Specialists	\$58,290	367	47	30	7
Nursing Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	0.2	0.2	Nursing Assistants	\$28,770	1,604	215	189	91
ParaPro: Educational Testing Service (ETS)	11	11	Teacher Assistants	\$28,000	1,854	202	196	96
Pre-Engineering/Engineering Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	Industrial Engineering Technicians	\$55,940	415	14	36	13
Private Applicator Certification Examination: VA Dept. of Agriculture and Consumer Services	27	18	Pest Control Workers	\$40,800	156	12	21	6
ProStart Program End-of-Course Examination (Level 2): Education Foundation of the National Restaurant Association	15	14	Food Preparation and Serving Related Occupations	\$24,280	19,125	2,372	3,303	1,358
Restaurant, Food and Beverage Services Assessment: National Occupational Competency Testing Institute (NOCTI)	3	1	Food Preparation and Serving Related Occupations	\$24,280	19,125	2,372	3,303	1,358
Security Pro Certification Examination: Test Out Corporation (TOC)	0.2	0.2	Computer User Support Specialists	\$58,290	367	47	30	7
ServSafe Manager Certification Examination: National Restaurant Association	104	72	Food Preparation and Serving Related Occupations	\$24,280	19,125	2,372	3,303	1,358
Small Animal Science and Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	12	9	Animal Care and Service Workers	\$27,720	851	184	125	49
Television Production Assessment: National Occupational Competency Testing Institute (NOCTI)	28	21	Production Occupations	\$38,390	6,737	(134)	766	291
Therapeutic Services Assessment: National Occupational Competency Testing Institute (NOCTI)	2	2	Personal Care and Service Occupations	\$27,580	11,104	2,749	1,663	733
Web Design Assessment: National Occupational Competency Testing Institute (NOCTI)	0.4	0.4	Web Developers	\$88,850	88,850	4,545	667	361
Welding Assessment: National Occupational Competency Testing Institute (NOCTI)	5	3	Welders, Cutters, Solderers, and Brazers	\$46,360	46,360	7,627	432	820

Research Question 4: What is the potential economic impact for the state if the number of CTE students earning industry credentials were to increase by 10% annually?

To determine the economic impact for the Commonwealth of Virginia if the number of CTE students earning industry credentials in Superintendent Region Three was to increase 10% annually, each of the 85 different industry credentials aligned with an occupation in Table 66, was calculated to determine its growth of 10% annually. These results were then used to determine the income tax associated with that credential and occupation. Table 66 provides a breakout, by year, of the potential income tax revenue the Commonwealth of Virginia could potentially see if the number of completer students earning industry credentials in Superintendent Region Three was to increase by 10% annually.

Table 66

Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually

Region Three	Credential *10%	Compound Credentials	Income Tax Due	Compound Income Tax
Year 1	93	1,020	\$ 2,233,908.69	\$ 3,304,908.82
Year 2	102	1,122	\$ 2,457,299.56	\$ 5,762,208.38
Year 3	112	1,234	\$ 2,703,029.52	\$ 8,465,237.90
Year 4	123	1,357	\$ 2,973,332.47	\$ 11,438,570.38
Year 5	136	1,493	\$ 3,270,665.72	\$ 14,709,236.10

Credential numbers are rounded

A component of this study was a survey distributed to 40 representatives of Virginia's economy to determine the value added to the earning of industry credentials. Eighteen respondents indicated a candidate applying for a position in their company/organization, as a holder of industry credentials, would enter the company at a larger starting salary than a non-credentialed candidate. The range of the increased starting salary was between 5% and 25%. Using the average of these numbers, 14% could be used as the value-added to the earning of

industry credentials, however, to ensure this study creates a floor rather than a ceiling of value, 10% will be used as the value-added to those earning industry credentials.

Table 67 presents the projected data of Superintendent Region Three completers if their number were to increase by 10% annually. Data in the table also shows the new potential income tax revenue available to Virginia's Treasury if the 10% value-added sum is applied to the projected economic impact of the earning of CTE industry credentials on Virginia's economy.

Table 67

Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually - AND Allows a 10% Increase in Beginning Salary

Region Three	Credential *10%	Compound Credentials	Income Tax Due	Compound Income Tax
Year 1	93	1,020	\$ 2,483,561.29	\$ 3,672,605.18
Year 2	102	1,122	\$ 2,731,917.42	\$ 6,404,522.60
Year 3	112	1,234	\$ 3,005,109.16	\$ 9,409,631.76
Year 4	123	1,357	\$ 3,305,620.08	\$ 12,715,251.84
Year 5	136	1,493	\$ 3,636,182.09	\$ 16,351,433.92

Credential numbers are rounded

Region Four: Northern Virginia

Northern Virginia, as Superintendent Region 4, consists of 19 school divisions, comprising among its number, 98 high schools (including specialist technical centers). Of the 8 Superintendent regions, this region has the largest number of high schools available to its students in the Commonwealth of Virginia (VDOE, 2020).

Table 68

VDOE Superintendent Region 4: Northern Virginia

Alexandria	Frederick County	Prince William County
Arlington County	Loudoun County	Rappahannock County
Clarke County	Madison County	Shenandoah County
Culpeper County	Manassas	Washington County
Fairfax County	Manassas Park	Winchester
Falls Church	Orange County	
Fauquier County	Page County	

Source: Commonwealth of Virginia, Department of Education Superintendent's Regions, http://www.doe.virginia.gov/directories/va_region_map.pdf

Data in Table 69 presents the alignment of the school divisions in Superintendent Region Four to the Local Workforce Investment Area (LWIA) regions. This data was created by the Demographics group at the Weldon Cooper Center for Public Service at the University of Virginia to help administrators and teachers in completing the “Application for Career and Technical Education New Program/Course in 2019. The LWIA’s were designated by the Workforce Innovation and Opportunity Act (WIOA) State Plan for the Commonwealth of Virginia (TrailBlazers, 2019). The alignment of the superintendent region to the LWIA region undergirds the findings of this study.

Table 69

Local Workforce Investment Areas (LWIAs) in Virginia by VDOE Superintendent Region

Region 4: Northern Virginia	LWIA Region
Alexandria	LWIA XI & XII - Northern Virginia
Arlington County	LWIA XI & XII - Northern Virginia

Clarke County	LWIA IV - Shenandoah Valley
Culpeper County	LWIA VI - Piedmont Workforce Network
Fairfax County	LWIA XI & XII - Northern Virginia
Falls Church	LWIA XI & XII - Northern Virginia
Fauquier County	LWIA VI - Piedmont Workforce Network
Frederick County	LWIA IV - Shenandoah Valley
Loudon County	LWIA XI & XII - Northern Virginia
Madison County	LWIA VI - Piedmont Workforce Network
Manassas	LWIA XI & XII - Northern Virginia
Manassas Park	LWIA XI & XII - Northern Virginia
Orange County	LWIA VI - Piedmont Workforce Network
Page County	LWIA IV - Shenandoah Valley
Prince William County	LWIA XI & XII - Northern Virginia
Rappahannock County	LWIA VI - Piedmont Workforce Network
Shenandoah County	LWIA IV - Shenandoah Valley
Warren County	LWIA IV - Shenandoah Valley
Winchester	LWIA IV - Shenandoah Valley

Source: School Report Card Data: Year 2016-2017

http://www.doe.virginia.gov/instruction/career_technical/path_industry_certification/index.shtml

Virginia Department Of Education, School Report Card Data for School Year: 2015 - 2016

Local Workforce Investment Areas (LWIAs) in Virginia

Research Question 1: What is the trend for high school participation in CTE programs in Virginia (Region Four), over the past five years?

In order to determine the average number of high school CTE completer students in Region Four, over the last five years, data retrieved from the VDOE's Office of Education Information Management (2019). Data in Table 70 presents the number of completers by year, then when averaged out over five years. By examining this table, it is possible to observe the specific number of CTE completer students in this region, and whether the number has increased, decreased or remained the same.

Table 70

Number of CTE Completers in Region Four: 2014-2019

Year	Total Completers	5 Year Avg Completers
2014-2015	11,597	2,319
2015-2016	12,381	2,476
2016-2017	12,834	2,567
2017-2018	13,547	2,709
2018-2019	13,639	2,728
TOTAL	63,998	12,800

Source: Completer data by region retrieved from Virginia Department of Education, Office of Education Information Management, (2019).

Research Question 2: What is the trend for high school completer students earning industry certifications in Virginia (Region Four), over the past five years?

To enable school administration to organize curriculum design, and career counselors to provide the necessary guidance to students, the Virginia Department of Education groups CTE programs and courses in a “Career Cluster.” According to the VDOE (2020), these career clusters help to:

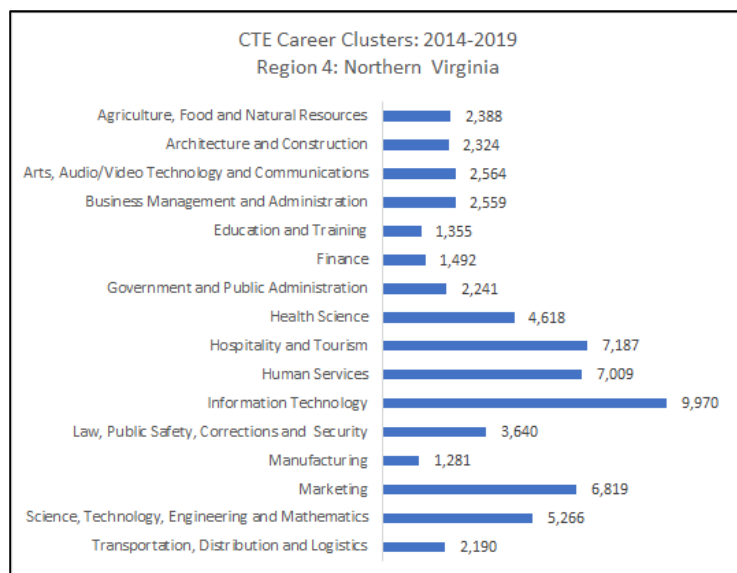
- Organize academic and technical knowledge and skills into a coherent sequence
- Identify pathways from secondary to postsecondary education
- Provide a framework for seamless education
- Provide institutional support of rigorous academic teaching and learning
- Provide alignment of academic and technical skills with workplace readiness skills
- Provide opportunities to involve parents, business and industry, and the school community
- Provide the development of effective plans of study that are based on career assessments

Using data drawn from the Weldon-Cooper Center for Public Service: CTE Completer Data:

2014-2019, over a five-year period, Region Four: Central Virginia CTE completer students are

seen to favor the Information Technology cluster (9,970), with the least numerous cluster of Manufacturing reflecting 1,281 completer students.

Figure 12 CTE Career Clusters in Region Four: 2014-2019



Source: Weldon-Cooper Center for Public Service: CTE Completer Data: 2014-2019

Using industry credential test data provided by the *Virginia Department of Education, Office of Education Information Management, (2019)*, data were disaggregated using SPSS. Disaggregation was used to determine the credential type earned, the number of students taking and earning the credential, and what this looks like over a five-year average. Because this study aims to determine the relationship between the earning of Career and Technical industry credentials and the Virginia economy, the superintendent region in which these industry credentials were earned is the primary format of Table 71. Further, because the focus of this study is on CTE completers, the data was analyzed to determine which of the credentials earned would be the final steps in the completer process. The disaggregated data demonstrating the “completer industry credentials earned by Region Four CTE students: 2014-2019” is presented in Table 71.

Table 71

Region Four: Industry Credentials Taken and Passed: 2014-2019- “Completers”

“Technical” Industry Credential Assessments & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
AAFCS: Early Childhood Education Examination	673	434	135	87
AAFCS: Education Fundamentals Examination	459	417	92	83
AAFCS: Food Science Fundamentals Examination	5	5	1	1
AAFCS: Housing and Furnishings Examination	1	1	0	0
Accounting (Basic) Assessment: National Occupational Competency Testing Institute (NOCTI)	145	50	29	10
Adobe Certified Associate: Animate CC 2015/Certiport	22	6	4	1
Adobe Certified Associate: Dreamweaver Cloud 2015 Examination/Certiport	185	51	37	10
Adobe Certified Associate: Flash CC 2013 Examination/Certiport	46	20	9	4
Adobe Certified Associate: Illustrator Examination/Certiport	24	9	5	2
Adobe Certified Associate: InDesign Examination/Certiport	54	54	11	11
Adobe Certified Associate: Photoshop Cloud 2013 Examination/Certiport	90	56	18	11
Adobe Certified Associate: Photoshop Cloud 2015 Examination/Certiport	559	300	112	60
Adobe Certified Associate: Photoshop CS5 Examination/Certiport	23	18	5	4
Adobe Certified Associate: Photoshop CS6 Examination/Certiport	684	362	137	72
Adobe Certified Associate: Premiere CS5 Examination/Certiport	47	40	9	8
Adobe Certified Associate: Dreamweaver CS6 Examination/Certiport	391	161	78	32
Adobe Certified Associate: Flash CS6 Examination/Certiport	189	97	38	19
Adobe Certified Associate: Illustrator Cloud 2015 Examination/Certiport	157	73	31	15
Adobe Certified Associate: Illustrator Cloud Examination/Certiport	35	15	7	3
Adobe Certified Associate: Illustrator CS6 Examination/Certiport	183	97	37	19
Adobe Certified Associate: InDesign Cloud 2015 Examination/Certiport	157	49	31	10
Adobe Certified Associate: InDesign Cloud Examination/Certiport	68	30	14	6
Adobe Certified Associate: InDesign CS6 Examination/Certiport	179	125	36	25
Adobe Certified Associate: Premiere Pro CC 2015 Examination/Certiport	17	15	3	3
Adobe Certified Associates: Photoshop 2018 Examination/Certiport	24	16	5	3
Advanced Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	686	389	137	78
Advertising and Design Assessment: National Occupational Competency Testing Institute (NOCTI)	50	29	10	6
Agriculture Mechanics Assessment: National Occupational Competency Testing Institute (NOCTI)	263	119	53	24
AHLA: Certified Guest Service Professional Examination: American Hotel and Lodging Association	84	77	17	15
American Medical Certification Association: AMCA	53	47	11	9
Architectural Drafting Assessment: National Occupational Competency Testing Institute (NOCTI)	17	7	3	1

ASE Auto Maintenance and Light Repair Examination (G1): National Institute for Automotive Service Excellence	374	227	75	45
ASE Automotive & Light Truck Certification Test-Automatic Transmission/Transaxle (A2): National Institute for Automotive Service Excellence	51	22	10	4
ASE Automotive & Light Truck Certification Test-Brakes (A5): National Institute for Automotive Service Excellence	208	116	42	23
ASE Automotive & Light Truck Certification Test-Electrical/Electronic Systems (A6): National Institute for Automotive Service Excellence	84	59	17	12
ASE Automotive & Light Truck Certification Test-Engine Performance (A8): National Institute for Automotive Service Excellence	64	32	13	6
ASE Automotive & Light Truck Certification Test-Engine Repair (A1): National Institute for Automotive Service Excellence	89	58	18	12
ASE Automotive & Light Truck Certification Test-Heating and Air Conditioning (A7): National Institute for Automotive Service Excellence	62	31	12	6
ASE Automotive & Light Truck Certification Test-Manual Drive Train and Axles (A3): National Institute for Automotive Service Excellence	58	39	12	8
ASE Automotive & Light Truck Certification Test-Suspension & Steering (A4): National Institute for Automotive Service Excellence	83	54	17	11
ASE Collision Repair and Refinish Certification Test - Painting & Refinishing (B2): National Institute for Automotive Service Excellence	21	15	4	3
ASE Student Certification Automotive: Electrical/Electronic Systems: National Institute for Automotive Service Excellence	322	162	64	32
ASE Student Certification Automotive: Engine Performance: National Institute for Automotive Service Excellence	166	105	33	21
ASE Student Certification Automotive: Engine Repair: National Institute for Automotive Service Excellence	162	118	32	24
ASE Student Certification Automotive: Heating and Air Conditioning: National Institute for Automotive Service Excellence	84	69	17	14
ASE Student Certification Automotive: Maintenance and Light Repair: National Institute for Automotive Service Excellence	868	529	174	106
ASE Student Certification Automotive: Manual Drive Train and Axles: National Institute for Automotive Service Excellence	40	30	8	6
ASE Student Certification Automotive: Automatic Transmission/Transaxle: National Institute for Automotive Service Excellence	30	20	6	4
ASE Student Certification Automotive: Automotive Service Technology National Institute for Automotive Service Excellence	148	100	30	20
ASE Student Certification Automotive: Brakes: National Institute for Automotive Service Excellence	756	395	151	79
ASE Student Certification Automotive: Suspension and Steering: National Institute for Automotive Service Excellence	244	169	49	34
ASE Student Certification Collision Repair & Refinish: Mechanical and Electrical: National Institute for Automotive Service Excellence	16	11	3	2
ASE Student Certification Collision Repair & Refinish: Non-structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	145	110	29	22
ASE Student Certification Collision Repair & Refinish: Painting and Refinishing: National Institute for Automotive Service Excellence	182	122	36	24
ASE Student Certification Collision Repair & Refinish: Structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	65	39	13	8
ASK Concepts of Entrepreneurship and Management Assessment: ASK Business Institute	118	32	24	6

ASK Fundamental Business Concepts Assessment: ASK Business Institute	129	59	26	12
ASK Fundamental Marketing Concepts Assessment: ASK Business Institute	82	31	16	6
AutoCAD Certified User: Autodesk	2,746	971	549	194
Autodesk Inventor Certified Professional Examination: Autodesk	159	129	32	26
Autodesk Inventor Certified User: Autodesk	1,794	946	359	189
Autodesk Revit Architecture Certified User Examination: Autodesk	121	38	24	8
Autodesk Revit Certified Professional Examination: Autodesk	359	175	72	35
Beef Quality Assurance Certification	421	320	84	64
BrainBench Network Administration Examinations	336	88	67	18
BrainBench Software Development Examinations	62	12	12	2
BrainBench Technical Support Examinations	45	19	9	4
Certification of Pharmacy Technicians (ExCPT) Examination: Virginia Board of Pharmacy	434	335	87	67
Certified Clinical Medical Assistant (CCMA) Examination: National Healthcareer Association (NHA)	660	341	132	68
Certified Dental Assistant and National Entry Level Assistant: Radiation Health & Safety (RHS) Examination: Dental Assisting National Board	225	118	45	24
Certified Emergency Telecommunicator Examination: International Academies of Emergency Dispatch (IAED)	73	73	15	15
Certified Medical Administrative Assistant (CMAA) Examination: National Healthcareer Association (NHA)	8	8	2	2
Certified Patient Care Technician (CPCT) Examination: American Allied Health (AAH)	16	11	3	2
Certified Patient Care Technician (CPCT/A) Examination: National Healthcareer Association (NHA)	3	3	1	1
Certified Pharmacy Technician (CPht) Examination: American Allied Health (AAH)	13	10	3	2
Certified Pharmacy Technician (ExCPT) Examination: National Healthcareer Association (NHA)	59	28	12	6
Certified Veterinary Assistant Examination: Texas Veterinary Medical Association	11	8	2	2
Cisco Certified Entry Network Technician (CCENT) Examination: Cisco Systems, Inc.	167	40	33	8
Cisco Certified Networking Associate (CCNA) Routing and Switching Examination: Cisco Systems, Inc.	614	564	123	113
Cisco Certified Networking Associate (CCNA) Security Examination: Cisco Systems, Inc.	3	3	1	1
Cisco Composite Exam for CCNA (640-802): Cisco Systems	16	6	3	1
Cisco Interconnecting Cisco Networking Devices Part 2 (640-816)	26	6	5	1
CIW (Certified Internet Webmaster) Professional Examinations: Certification Partners, LLC (Pass any one exam at this level or above)	1	1	0	0
CIW Internet Business Associate Examination: Certification Partners, LLC	186	176	37	35
CIW Network Technology Associate Examination: Certification Partners, LLC	4	4	1	1
CIW Site Development Associate Examination: Certification Partners, LLC	195	175	39	35
CompTIA IT Fundamentals Certification Examination: CompTIA	493	361	99	72

CompTIA A+ Certification Examination (must pass both exams): CompTIA	562	326	112	65
CompTIA Network+ Examination: CompTIA	201	75	40	15
CompTIA Security + Examination: CompTIA	138	61	28	12
CompTIA Server+ Examination: CompTIA	1	1	0	0
Computer Networking Fundamentals Assessment: National Occupational Competency Testing Institute (NOCTI)	135	84	27	17
Computer Programming Assessment: National Occupational Competency Testing Institute (NOCTI)	122	57	24	11
Computer Repair Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	277	153	55	31
CompTIA A+ 901 Examination	329	193	66	39
Construction Masonry-Block Assessment: National Occupational Competency Testing Institute (NOCTI)	5	5	1	1
Construction Masonry-Brick Assessment: National Occupational Competency Testing Institute (NOCTI)	11	11	2	2
Cosmetology Assessment: National Occupational Competency Testing Institute (NOCTI)	70	52	14	10
Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	830	583	166	117
Culinary Arts Prep Cook-Level 1 Assessment: National Occupational Competency Testing Institute (NOCTI)	341	199	68	40
Culinary Arts Prep Cook-Level 2 Assessment: National Occupational Competency Testing Institute (NOCTI)	83	44	17	9
Early Childhood Education and Care, Basic Assessment: National Occupational Competency Testing Institute (NOCTI)	481	407	96	81
Electrical Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	30	3	6	1
Electronic Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	37	20	7	4
Electronics Assessment: National Occupational Competency Testing Institute (NOCTI)	18	15	4	3
Emergency Medical First Responder Certification: Department of Health, Office of EMS	4	4	1	1
Emergency Medical Technician Examination: Department of Health, Office of Emergency Medical Services	131	125	26	25
EPA Universal Examination (pass all three types): Environmental Protection Agency (EPA)	56	49	11	10
Equine Science Examination – New York State Department of Education (Cornell University)	19	12	4	2
Firefighter II Certification Examination: Virginia Department of Fire Programs	64	62	13	12
Floriculture-Greenhouse Assessment: National Occupational Competency Testing Institute (NOCTI)	49	25	10	5
Fundamentals of Animal Science Certification Examination: Elanco (Exam is administered by iCEV)	50	16	10	3
Greenhouse Operators Certification Examination: Southeast Greenhouse Growers Association/Virginia Flower Growers Association	139	33	28	7
Health Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	36	6	7	1
Horticulture Landscaping Assessment: National Occupational Competency Testing Institute (NOCTI)	95	57	19	11
HTML 5 CSS 3 Specialist Examination: Certification Partners, LLC	1	1	0	0

HVAC (EPA) Technician Examinations (Levels: Core, I, II, or III): Environmental Protection Agency	2	2	0	0
IC3 Global Standard 5, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	125	102	25	20
IC3 Global Standard 4 Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	33	33	7	7
International Code Council Certificates of Achievement Examinations (Pass any one exam): International Code Council (ICC)	259	216	52	43
Internet and Computing Core Certification Examinations/Windows 7-- Office 2010: Certiport (student has passed all three examinations)	53	46	11	9
Intuit QuickBooks Certified User Certification Test: Certiport	3	3	1	1
Manufacturing Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	40	14	8	3
MCP - MCSA: SQL 2016 BI Development (must pass two required exams): Microsoft	12	12	2	2
Medical Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	61	37	12	7
MOS 2013 Master/Certiport (must pass four exams)	2	2	0	0
MOS 2016 Master/Certiport (must pass four exams)	12	12	2	2
MOS Examinations (Advanced level): Microsoft Office Specialist/Certiport (Pass any one exam at this level)	5	5	1	1
MOS Excel Expert Examination: Microsoft Office 2010/Certiport I	53	40	11	8
MOS Excel Expert Level: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	170	71	34	14
MOS Microsoft Office Expert 2013/Certiport (must pass both Word & Excel at expert levels)	3	3	1	1
MOS Microsoft Office Expert Excel 2016/Certiport (only one exam)	286	93	57	19
MOS Microsoft Office Master Level: 2010/Certiport	4	4	1	1
MOS Word Expert Examination: Microsoft Office 2010/Certiport	72	53	14	11
MOS Word Expert Examination: Microsoft Office 2016/Certiport	660	354	132	71
MOS Word Expert Level Examination: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	404	235	81	47
MTA Examination: Database Administration Fundamentals (98-364)	51	19	10	4
MTA Examination: Mobility and Device Fundamentals (98-368)	29	7	6	1
MTA Examination: Networking Fundamentals (98-366)	156	62	31	12
MTA Examination: Security Fundamentals (98-367)	597	202	119	40
MTA Examination: Software Development Fundamentals (98-361)	169	58	34	12
MTA Examination: Windows OS Fundamentals (98-349)	136	45	27	9
MTA Examination: Windows Server Administration Fundamentals (98- 365)	24	16	5	3
MTA Examination: Introduction to Programming using HTML & CSS (98-383)	88	34	18	7
MTA Examination: Introduction to Programming using Java (98-388)	60	18	12	4
MTA Examination: Introduction to Programming using JavaScript (98- 382)	15	13	3	3
MTA Examination: Introduction to Programming using Python (98-381)	600	155	120	31
MTA Examination: Introduction to Programming with Block-Based Languages (98-380)	60	23	12	5
National Nurse Aide Assessment Program (NNAAP) Examination: Virginia Board of Nursing	880	723	176	145

Network Cabling Specialist Certification Examination: C-Tech Associates	123	120	25	24
Network Pro Certification Examination: Test Out Corporation (TOC)	85	43	17	9
Oracle Certification Program Examination: PL SQL	20	4	4	1
Oracle Certification Program Examinations (Pass any one exam from this certification program): Oracle Corporation	89	11	18	2
ParaPro: Educational Testing Service (ETS)	995	876	199	175
PC Pro Certification Examination: Test Out Corporation (TOC)	135	69	27	14
Phlebotomy Technical Certification (PTC) Examination: American Medical Certification Association (AMCA)	23	21	5	4
Pork Quality Assurance Certification	81	76	16	15
Praxis Core Academic Skills for Educators Tests: Educational Testing Service (must pass all three tests)	2	2	0	0
Pre-Engineering/Engineering Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	117	67	23	13
Private Applicator Certification Examination: VA Dept. of Agriculture and Consumer Services	27	24	5	5
Production Agriculture Assessment: National Occupational Competency Testing Institute (NOCTI)	42	28	8	6
Registered Technician Certification Examination: VA Dept. of Agriculture and Consumer Services	1	1	0	0
Retail Management Certification Assessment: National Retail Federation (NRF) Foundation	29	25	6	5
Security Pro Certification Examination: Test Out Corporation (TOC)	73	31	15	6
ServSafe Manager Certification Examination: National Restaurant Association	1,092	560	218	112
Small Animal Care Examination New York Dept.. of Education (Cornell Univ.)	118	97	24	19
Small Animal Science and Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	338	165	68	33
Small Engine Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	95	43	19	9
Technical Drafting Assessment: National Occupational Competency Testing Institute	37	12	7	2
Television Production Assessment: National Occupational Competency Testing Institute (NOCTI)	99	76	20	15
Virginia Motor Vehicle Safety Inspection Program Examination: Virginia State Police	2	2	0	0
Visual Communications and Multimedia Design Assessment: National Occupational Competency Testing Institute (NOCTI)	158	98	32	20
Web Design Assessment: National Occupational Competency Testing Institute (NOCTI)	136	89	27	18
TOTAL	32,827	18,823	6,565	3,765

Because a full picture of the industry credentialing test data is needed to determine trends in the earning of industry certifications in Region Four, one must be aware of the data for those currently on their CTE pathway, as seen in Table 72. Students earning credentials in this table

are currently on a CTE program, as seen in the “certification,” “pre-apprentice,” or “other” pathway certifications, and non-CTE specific certifications. Although the data from this table is not included in the final calculation to determine economic impact, this does not negate their value or economic potential. This study focuses on completer students.

Table 72

“Other” industry credentials earned by Region Four CTE students, 2014-2019

“Other” Industry Credential Assessment & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
AAFCS: Broad Field Family and Consumer Sciences Examination	137	80	27	16
Advanced Placement (AP) Computer Science Principles Examination: The College Board	440	440	88	88
Advanced Placement Computer Science A Examination: The College Board	3,054	3,054	611	611
AHLA (START) Certification Examination: American Hotel and Lodging Association	33	33	7	7
AHLA: Certified Restaurant Server Examination: American Hotel and Lodging Association	11	11	2	2
Armed Services Vocational Aptitude Battery Examination: United States Military Entrance Processing Command	2,713	2,061	543	412
AutoCAD 2004 Certification Examination: BrainBench	3	3	1	1
Canine Care & Training - Level 1 Certification Examination: Continental Kennel Club, Inc.	18	18	4	4
College Level Examination Program (CLEP): Financial Accounting: The College Board	10	2	2	0
College Level Examination Program (CLEP): Introductory Business Law: The College Board	81	5	16	1
College Level Examination Program (CLEP): Principles of Marketing: The College Board	47	16	9	3
Core: Introductory Craft Skills Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	83	78	17	16
Criminal Justice Assessment: National Occupational Competency Testing Institute (NOCTI)	6	6	1	1
Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	6,087	5,546	1,217	1,109
Diagnostic Services Assessment	62	60	12	12
Education and Training Assessment: National Occupational Competency Testing Institute (NOCTI)	28	22	6	4
EPA Technician Examination (Core): Environmental Protection Agency (EPA)	90	88	18	18
EPA Technician Examination (Type I): Environmental Protection Agency (EPA)	77	73	15	15
EPA Technician Examination (Type II): Environmental Protection Agency (EPA)	76	70	15	14
EPA Technician Examination (Type III): Environmental Protection Agency (EPA)	66	60	13	12

Firefighter I Certification Examination: Virginia Department of Fire Programs	67	63	13	13
General Management Assessment: National Occupational Competency Testing Institute (NOCTI)	134	113	27	23
HBI/NAHB Basic Principles of Construction Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	10	10	2	2
HBI/NAHB Plumbing Basic Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	1	1	0	0
IC3 Spark, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	36	36	7	7
International Baccalaureate Computer Science (Higher Level) Examination: The International Baccalaureate Organization	29	29	6	6
International Baccalaureate Computer Science (Standard Level) Examination: The International Baccalaureate Organization	135	135	27	27
International Baccalaureate Design Technology (Standard Level) Examination: The International Baccalaureate Organization	372	362	74	72
International Baccalaureate for Business & Management (Standard Level) Examination: The International Baccalaureate Organization	2,992	2,927	598	585
Landscape Management Certification Examination: Green Industry Web Portal	35	3	7	1
MOS Access Examination: Microsoft Office 2007/Certiport	10	8	2	2
MOS Access Examination: Microsoft Office 2016/Certiport	484	193	97	39
MOS Access Examination: Microsoft Office 2010/Certiport	58	47	12	9
MOS Access Examination: Microsoft Office 2013/Certiport	716	459	143	92
MOS Excel Examination: Microsoft Office 2013/Certiport	2,844	1,666	569	333
MOS Excel Examination: Microsoft Office 2010/Certiport	466	365	93	73
MOS Excel Examination: Microsoft Office 2016/Certiport	2,660	1,314	532	263
MOS One Note Examination: Microsoft Office 2013/Certiport	19	10	4	2
MOS Outlook Examination: Microsoft Office 2010/Certiport	51	41	10	8
MOS Outlook Examination: Microsoft Office 2013/Certiport	422	276	84	55
MOS Outlook Examination: Microsoft Office 2016/Certiport	115	61	23	12
MOS PowerPoint Examination: Microsoft Office 2013/Certiport	4,871	3,848	974	770
MOS PowerPoint Examination: Microsoft Office 2007/Certiport	23	23	5	5
MOS PowerPoint Examination: Microsoft Office 2010/Certiport	1,373	1,179	275	236
MOS PowerPoint Examination: Microsoft Office 2016/Certiport	4,657	3,113	931	623
MOS PowerPoint Examination: Microsoft Office Specialist/Certiport	1	1	0	0
MOS SharePoint Examination: Microsoft Office 2010/Certiport	1	1	0	0
MOS SharePoint Examination: Microsoft Office 2013/Certiport	32	9	6	2
MOS Word Examination: Microsoft Office 2010/Certiport	1,748	1,179	350	236
MOS Word Examination: Microsoft Office 2013/Certiport	6,386	4,195	1,277	839
MOS Word Examination: Microsoft Office 2007/Certiport	27	27	5	5
MOS Word Examination: Microsoft Office 2016/Certiport	5,024	3,547	1,005	709
National Health Science Assessment: National Consortium for Health Science Education (Administered by Precision Exams)	40	21	8	4
Natural Resource Systems Assessment: National Occupational Competency Testing Institute (NOCTI)	139	116	28	23

NCCT Core: Introductory Craft Skills, National Construction Career Test: National Center for Construction Education & Research (NCCER)	5	5	1	1
Non-Structural Technician – Pro Level 1 Certification Test: ICAR	53	53	11	11
Pet Sitters Certification: National Association of Professional Pet Sitters	128	112	26	22
PLTW Examination: Aerospace Engineering: Project Lead the Way (PLTW)	13	13	3	3
PLTW Examination: Civil Engineering and Architecture: Project Lead the Way (PLTW)	456	266	91	53
PLTW Examination: Digital Electronics: Project Lead the Way (PLTW)	740	392	148	78
PLTW Examination: Engineering Design and Development: Project Lead the Way (PLTW)	27	23	5	5
PLTW Examination: Human Body Systems: Project Lead the Way (PLTW)	261	148	52	30
PLTW Examination: Introduction to Engineering Design: Project Lead the Way (PLTW)	3,077	1,913	615	383
PLTW Examination: Medical Interventions: Project Lead the Way (PLTW)	100	50	20	10
PLTW Examination: Principles of Biomedical Sciences: Project Lead the Way (PLTW)	740	455	148	91
PLTW Examination: Principles of Engineering: Project Lead the Way (PLTW)	1,260	871	252	174
PLTW Examination: Computer Science Principles: Project Lead the Way (PLTW)	72	68	14	14
ProStart Program End-of-Course Examination (Level 1): Education Foundation of the National Restaurant Association	18	17	4	3
Refinish Technician – Pro Level 1 Certification Test: ICAR	33	33	7	7
SENSE Training Program Certification Examination: American Welding Society (AWS)	185	172	37	34
SkillsUSA: Cabinetmaking Examination	13	10	3	2
SkillsUSA: Carpentry Examination	69	23	14	5
SkillsUSA: Criminal Justice and CSI Examination	21	14	4	3
SkillsUSA: Customer Service Examination	1	1	0	0
SkillsUSA: Digital File Preparation/Digital File Output (PrintED co-brand)	5	5	1	1
SkillsUSA: Electrical Construction (Residential) Wiring Examination	48	31	10	6
SkillsUSA: Nurse Assisting Examination	1	1	0	0
SkillsUSA: Photography Examination	73	27	15	5
SkillsUSA: Introduction to Graphic Communications Examination (PrintED co-brand)	54	45	11	9
TOTAL	56,553	41,852	11,311	8,370

As a final measure to determine the trend for the earning of CTE industry credentials at the high school level in Region Four, Table 73 presents the data specific to “Soft skills/College & Career Readiness” certifications. Because these certifications are included in the VDOE approved list of industry certifications, they are included in the industry credential test data

provided by the Virginia Department of Education, Office of Education Information Management (VDOE, 2019). The value of this data lies in its relationship to the overall earning of industry credentials by high school students in Region Four, and the bigger picture when determining any trend.

Table 73

Soft skills/College & Career Readiness industry credentials earned in Region Four: 2014-2019

Soft skills/College & Career Readiness” Assessments & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
College and Work Readiness Assessment (CWRA+): Council for Aid to Education	89	51	18	10
National Career Readiness Certificate (ACT)	632	582	126	116
Private Pilot Written Test: Federal Aviation Administration (FAA)	10	2	2	0
W!SE Financial Literacy Certification: Working in Support of Education (W!SE)	125,604	99,848	25,121	19,970
Workplace Readiness Skills for the Commonwealth Examination	122,551	93,527	24,510	18,705
TOTAL	248,886	194,010	31,111	38,802

To determine the trend for high school completer students earning industry credentials in Region Three over the past five years, a finalized set of summarized data can be seen in Table 74. These data present the number of students who have earned a CTE industry credential approved by Virginia’s Board of Education. The three categories of assessment type are represented in Table 66 and present the five year total, and five-year average number of earned (a) “technical” credentials (sufficient for a student to successfully end their completer program); (b) “other” assessments taken where students are on the CTE path, working towards certifications; and (c), the “Soft skills/College & Career Readiness” certifications.

Table 74

Total Number of Industry Certifications Earned in Region Four: 2014-2019

Industry Credential Assessment & Type	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
"Technical" Completer Certifications	32,827	18,823	6,565	3,765
"Other" CTE certifications - pathway/level one/PLTW/Skills USA	56,553	41,852	11,311	8,370
Soft skills/Career certifications	248,886	194,010	31,111	38,802
TOTAL	338,266	254,685	67,653	50,937

Research Question 3: What are the potential earnings for students gaining industry credentials in Virginia's (Region Four) labor market?

To determine the potential earning for students gaining industry credentials in Virginia's labor market, it is crucial to understand the labor market's occupational openings by educational attainment level. Through the review of these data, one can examine the extent to which Region Four students are entering a labor market saturated with similarly qualified candidates, or into the market with high-demand, high-salary openings. Data in Table 75, as extracted from the Bureau of Labor Statistics and the Virginia Employment Commission projection to 2026, show the probable occupational openings by education level attainment for Region Four as a whole.

Table 75

Occupational Openings by Education Attainment Level to 2026 – Region Four

Region 4 – Northern Virginia	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Associate's Degree	62,165	7,463	5,503	1,595
Bachelor's Degree	416,437	60,925	36,016	10,007
Doctoral or Professional Degree	47,311	7,063	3,165	1,140
High School Diploma or Equivalent	629,630	47,913	67,955	27,624
Less Than High School	440,967	47,670	66,787	28,497
Master's Degree	27,804	4,723	2,571	838
Not Applicable	3,917,011	439,579	429,535	162,746
Postsecondary Non-Degree Award	50,623	6,099	4,974	1,986
Some College, No Degree	3,612	711	541	226
	5,595,560	622,146	617,047	234,659

Source: May 2018 State Occupational Employment and Wage Estimates,
https://www.bls.gov/oes/current/oes_va.htm#00-0000

While data in Table 75 specify occupations in the “Not Applicable” category as the largest group to access to occupational openings, a precise definition of the education included in

that category is not available. The second largest estimated category in labor market openings is found in the “High School Diploma or Equivalent” category. However, when the “Not Applicable” category is removed from the data, along with “Less than High School” as in Table 76 numbers show that the two categories of education with greater access to projected employment are those with “High School Diploma or Equivalent” and “Bachelor’s Degree.”

Table 76

Occupational Openings by Education Attainment Level – Region 4 - "Less than High School" and "Not Applicable" removed

Region 4 – Northern Virginia	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Associate's Degree	62,165	7,463	5,503	1,595
Bachelor’s Degree	416,437	60,925	36,016	10,007
Doctoral or Professional Degree	47,311	7,063	3,165	1,140
High School Diploma or Equivalent	629,630	47,913	67,955	27,624
Master's Degree	27,804	4,723	2,571	838
Postsecondary Non-Degree Award	50,623	6,099	4,974	1,986
Some College, No Degree	3,612	711	541	226
TOTAL	1,237,582	134,897	120,725	43,416

Source: May 2018 State Occupational Employment and Wage Estimates,
https://www.bls.gov/oes/current/oes_va.htm#00-0000

Data presented in Table 77 show the occupations available to Region Four CTE completer students who have earned a series of industry credentials. These data present the estimated mean salary expected, the projected occupational openings to 2026 of that particular occupation, the number of annual openings, and annual exits. Data included in this table show completer data specifically and does not include those who are currently enrolled in a CTE pathway, or who have completed credentials with a career readiness focus. The data in Table 77 brings together data points from:

- a) *Region Four: Industry Credentials Taken and Passed: 2014-2019 – Completers* (see Table 71). Data from this source is seen in the columns “Assessment,” “Taken 5 Yr. Avg.” and “Pass 5 Yr. Avg”.

- b) Bureau of Labor Statistics *May 2019 State Occupational Employment and Wage Estimates: Virginia* (Bureau of Labor Statistics, 2020). Data from this source is seen in the columns “Occupation” and “Mean Annual Salary.”
- c) TrailBlazers: Career and Technical Education in Virginia (TrailBlazers, 2020). Labor market data for regions LWIA IV: Shenandoah Valley (TrailBlazers, 2020), LWIA VI: Piedmont Workforce Network (TrailBlazers, 2020), and the Combined Projections Area, LWIA XI and X11 (TrailBlazers, 2020) are seen in columns: “Occupation,” “Projected Employment,” “Numeric Change,” “Annual Openings,” and “Annual Exits.”

Table 77

CTE Industry Credential to Occupational Alignment and Projections – Region Four: LWIA IV, VI, XI AND XII

Assessment	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.	Occupation	Mean Annual Wage	Projected Employment	Numeric Change	Annual Openings	Annual Exits
AAFCS: Early Childhood Education Examination	135	87	Preschool Teachers, Except Special Education	\$37,880	5,313	398	533	220
AAFCS: Education Fundamentals Examination	92	83	Teacher Assistants	\$28,000	14,578	1,443	1,535	760
AAFCS: Food Science Fundamentals Examination	1	1	Dietetic Technicians	\$32,430	284	27	24	9
AAFCS: Housing and Furnishings Examination	0.2	0.2	Textile, Apparel, and Furnishings Workers	\$34,460	5,005	(348)	600	336
Accounting (Basic) Assessment: National Occupational Competency Testing Institute (NOCTI)	29	10	Financial Clerks	\$40,410	31,232	1,163	3,418	1,648
Adobe Certified Associate: Animate CC 2015/Certiport	4	1	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	38,627	4,575	3,976	1,440
Adobe Certified Associate: Dreamweaver Cloud 2015 Examination/Certiport	37	10	Web Developers	\$88,850	3,081	498	248	54
Adobe Certified Associate: Flash CC 2013 Examination/Certiport	9	4	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	38,627	4,575	3,976	1,440
Adobe Certified Associate: Illustrator Examination/Certiport	5	2	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	38,627	4,575	3,976	1,440
Adobe Certified Associate: InDesign Examination/Certiport	11	11	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	38,627	4,575	3,976	1,440
Adobe Certified Associate: Photoshop Cloud 2013 Examination/Certiport	18	11	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	38,627	4,575	3,976	1,440
Adobe Certified Associate: Photoshop Cloud 2015 Examination/Certiport	112	60	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	38,627	4,575	3,976	1,440
Adobe Certified Associate: Photoshop CS5 Examination/Certiport	5	4	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	38,627	4,575	3,976	1,440
Adobe Certified Associate: Photoshop CS6 Examination/Certiport	137	72	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	38,627	4,575	3,976	1,440
Adobe Certified Associate: Premiere CS5 Examination/Certiport	9	8	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	38,627	4,575	3,976	1,440
Adobe Certified Associate: Dreamweaver CS6 Examination/Certiport	78	32	Web Developers	\$88,850	3,081	498	248	54
Adobe Certified Associate: Flash CS6 Examination/Certiport	38	19	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	38,627	4,575	3,976	1,440

Adobe Certified Associate: Illustrator Cloud 2015 Examination/Certiport	31	15	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	38,627	4,575	3,976	1,440
Adobe Certified Associate: Illustrator Cloud Examination/Certiport	7	3	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	38,627	4,575	3,976	1,440
Adobe Certified Associate: Illustrator CS6 Examination/Certiport	37	19	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	38,627	4,575	3,976	1,440
Adobe Certified Associate: InDesign Cloud 2015 Examination/Certiport	31	10	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	38,627	4,575	3,976	1,440
Adobe Certified Associate: InDesign Cloud Examination/Certiport	14	6	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	38,627	4,575	3,976	1,440
Adobe Certified Associate: InDesign CS6 Examination/Certiport	36	25	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	38,627	4,575	3,976	1,440
Adobe Certified Associate: Premiere Pro CC 2015 Examination/Certiport	3	3	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	38,627	4,575	3,976	1,440
Adobe Certified Associates: Photoshop 2018 Examination/Certiport	5	3	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	38,627	4,575	3,976	1,440
Advanced Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	137	78	Sales and Related Occupations	\$41,140	180,463	9,047	24,823	10,418
Advertising and Design Assessment: National Occupational Competency Testing Institute (NOCTI)	10	6	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	38,627	4,575	3,976	1,440
Agriculture Mechanics Assessment: National Occupational Competency Testing Institute (NOCTI)	53	24	Transportation and Material Moving Occupations	\$38,200	92,364	7,714	11,189	4,436
AHLA: Certified Guest Service Professional Examination: American Hotel and Lodging Association	17	15	Hotel, Motel, and Resort Desk Clerks	\$22,300	2,955	124	459	160
American Medical Certification Association Examinations: AMCA	11	9	Medical Assistants	\$35,010	6,821	1,735	799	261
Architectural Drafting Assessment: National Occupational Competency Testing Institute (NOCTI)	3	1	Mechanical Drafters	\$59,000	293	25	25	8
ASE Auto Maintenance and Light Repair Examination (G1): National Institute for Automotive Service Excellence	75	45	Automotive Service Technicians and Mechanics	\$47,730	9,682	405	912	299
ASE Automotive & Light Truck Engine Repair (A1);- Automatic Transmission/Transaxle (A2); Manual Drive Train and Axles (A3); Suspension & Steering (A4); Brakes (A5); Electrical/Electronic Systems (A6); Heating and Air Conditioning (A7); Engine Performance (A8): National Institute for Automotive Service Excellence	6	3	Automotive Service Technicians and Mechanics	\$47,730	9,682	405	912	299

ASE Student Certification Automotive: Electrical/Electronic Systems; Engine Performance; Engine Repair; Heating and Air Conditioning; Maintenance and Light Repair; Manual Drive Train and Axles; Automatic Transmission/Transaxle; Automotive Service Technology; Brakes; Suspension and Steering; National Institute for Automotive Service Excellence	32	16	Automotive Service Technicians and Mechanics	\$47,730	9,682	405	912	299
ASE Student Certification Collision Repair & Refinish: Painting and Refinishing; Painting & Refinishing (B2); Non-structural Analysis and Damage Repair; Mechanical and Electrical; Structural Analysis and Damage Repair; National Institute for Automotive Service Excellence	4	3	Automotive Body and Related Repairers	\$53,060	1,857	183	186	61
ASK Concepts of Entrepreneurship and Management Assessment: ASK Business Institute	24	6	Sales and Related Occupations	\$41,140	180,463	9,047	24,823	10,418
ASK Fundamental Business Concepts Assessment: ASK Business Institute	26	12	Sales and Related Occupations	\$41,140	180,463	9,047	24,823	10,418
ASK Fundamental Marketing Concepts Assessment: ASK Business Institute	16	6	Sales and Related Occupations	\$41,140	180,463	9,047	24,823	10,418
AutoCAD Certified User: Autodesk	549	194	Mechanical Drafters	\$59,000	293	25	25	8
Autodesk Inventor Certified Professional Examination: Autodesk	32	26	Mechanical Drafters	\$59,000	293	25	25	8
Autodesk Inventor Certified User: Autodesk	359	189	Drafters, Engineering Technicians, and Mapping Technicians	\$60,320	7,972	680	731	240
Autodesk Revit Architecture Certified User Examination: Autodesk	24	8	Architects, Except Landscape and Naval	\$85,380	1,937	87	141	48
Autodesk Revit Certified Professional Examination: Autodesk	72	35	Architects, Except Landscape and Naval	\$85,380	1,937	87	141	48
Beef Quality Assurance Certification	84	64	Farming, Fishing, and Forestry Occupations	\$36,230	2,694	268	385	96
BrainBench Network Administration Examinations	67	18	Computer Operators	\$49,830	264	(61)	24	12
BrainBench Software Development Examinations	12	2	Computer Operators	\$49,830	264	(61)	24	12
BrainBench Technical Support Examinations	9	4	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
Certification of Pharmacy Technicians (ExCPT) Examination: Virginia Board of Pharmacy	87	67	Pharmacy Technicians	\$32,370	2,950	386	251	90
Certified Clinical Medical Assistant (CCMA) Examination: National Healthcareer Association (NHA)	132	68	Medical Assistants	\$35,010	6,821	1,735	799	261

Certified Dental Assistant and National Entry Level Assistant: Radiation Health & Safety (RHS) Examination: Dental Assisting National Board	45	24	Dental Assistants	\$44,640	5,055	1,081	596	230
Certified Emergency Telecommunicator Examination: International Academies of Emergency Dispatch (IAED)	15	15	Dispatchers, Except Police, Fire, and Ambulance	\$41,140	1,950	97	179	67
Certified Medical Administrative Assistant (CMAA) Examination: National Healthcareer Association (NHA)	2	2	Medical Records and Health Information Technicians	\$43,590	2,022	270	139	56
Certified Patient Care Technician (CPCT) Examination: American Allied Health (AAH)	3	2	Nursing Assistants	\$28,770	15,276	2,866	1,827	841
Certified Patient Care Technician (CPCT/A) Examination: National Healthcareer Association (NHA)	1	1	Nursing Assistants	\$28,770	15,276	2,866	1,827	841
Certified Pharmacy Technician (CPht) Examination: American Allied Health (AAH)	3	2	Pharmacy Technicians	\$32,370	2,950	386	251	90
Certified Pharmacy Technician (ExCPT) Examination: National Healthcareer Association (NHA)	12	6	Pharmacy Technicians	\$32,370	2,950	386	251	90
Certified Veterinary Assistant Examination: Texas Veterinary Medical Association	2	2	Veterinary Assistants and Laboratory Animal Caretakers	\$26,750	1,670	382	263	86
Cisco Certified Entry Network Technician (CCENT) Examination: Cisco Systems, Inc.	33	8	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
Cisco Certified Networking Associate (CCNA) Routing and Switching Examination: Cisco Systems, Inc.	123	113	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
Cisco Certified Networking Associate (CCNA) Security Examination: Cisco Systems, Inc.	1	1	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
Cisco Composite Exam for CCNA (640-802): Cisco Systems	3	1	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
Cisco Interconnecting Cisco Networking Devices Part 2 (640-816)	5	1	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
CIW (Certified Internet Webmaster) Professional Examinations: Certification Partners, LLC (Pass any one exam at this level or above)	0.2	0.2	Web Developers	\$88,850	3,081	498	248	54
CIW Internet Business Associate Examination: Certification Partners, LLC	37	35	Web Developers	\$88,850	3,081	498	248	54
CIW Network Technology Associate Examination: Certification Partners, LLC	1	1	Web Developers	\$88,850	3,081	498	248	54
CIW Site Development Associate Examination: Certification Partners, LLC	39	35	Web Developers	\$88,850	3,081	498	248	54
CompTIA IT Fundamentals Certification Examination: CompTIA	99	72	Computer User Support Specialists	\$58,290	12,368	1,637	992	234

CompTIA A+ Certification Examination (must pass both exams): CompTIA	112	65	Computer Hardware Engineers	\$119,500	925	99	64	17
CompTIA Network+ Examination: CompTIA	40	15	Computer Network Support Specialists	\$73,050	5,177	472	402	101
CompTIA Security + Examination: CompTIA	28	12	Computer Network Support Specialists	\$73,050	5,177	472	402	101
CompTIA Server+ Examination: CompTIA	0.2	0.2	Computer Network Support Specialists	\$73,050	5,177	472	402	101
Computer Networking Fundamentals Assessment: National Occupational Competency Testing Institute (NOCTI)	27	17	Computer Network Support Specialists	\$73,050	5,177	472	402	101
Computer Programming Assessment: National Occupational Competency Testing Institute (NOCTI)	24	11	Computer Programmers	\$94,470	5,517	(226)	326	98
Computer Repair Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	55	31	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
CompTIA A+ 901 Examination	66	39	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
Construction Masonry-Block Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	Helpers--Construction Trades	\$31,340	1,611	198	228	64
Construction Masonry-Brick Assessment: National Occupational Competency Testing Institute (NOCTI)	2	2	Helpers--Construction Trades	\$31,340	1,611	198	228	64
Cosmetology Assessment: National Occupational Competency Testing Institute (NOCTI)	14	10	Personal Care and Service Occupations	\$27,580	84,395	16,120	12,520	5,533
Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	166	117	Hairdressers, Hairstylists, and Cosmetologists	\$34,250	9,182	914	1,109	582
Culinary Arts Prep Cook-Level 1 Assessment: National Occupational Competency Testing Institute (NOCTI)	68	40	Food Preparation and Serving Related Occupations	\$24,280	156,268	19,468	26,923	11,135
Culinary Arts Prep Cook-Level 2 Assessment: National Occupational Competency Testing Institute (NOCTI)	17	9	Chefs and Head Cooks	\$54,760	1,484	188	190	44
Early Childhood Education and Care, Basic Assessment: National Occupational Competency Testing Institute (NOCTI)	96	81	Childcare Workers	\$24,620	12,452	721	1,808	986
Electrical Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	6	1	Helpers--Electricians	\$30,510	1,350	116	191	55
Electronic Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	7	4	Helpers--Electricians	\$30,510	1,350	116	191	55
Electronics Assessment: National Occupational Competency Testing Institute (NOCTI)	4	3	Electrical and Electronics Engineering Technicians	\$70,750	2,292	230	208	70
Emergency Medical First Responder Certification: Department of Health, Office of EMS	1	1	Emergency Medical Technicians and Paramedics	\$35,310	1,480	195	99	24

Emergency Medical Technician Examination: Department of Health, Office of Emergency Medical Services	26	25	Emergency Medical Technicians and Paramedics	\$35,310	1,480	195	99	24
EPA Universal Examination (pass all three types): Environmental Protection Agency (EPA)	11	10	Environmental Science and Protection Technicians, Including	\$47,150	160	14	18	6
Equine Science Examination – New York State Department of Education (Cornell University)	4	2	Farmworkers, Farm, Ranch, and Aquacultural Animals	\$28,020	281	10	43	10
Firefighter II Certification Examination: Virginia Department of Fire Programs	13	12	Fire Fighting and Prevention Workers	\$83,440	4,437	386	314	97
Floriculture-Greenhouse Assessment: National Occupational Competency Testing Institute (NOCTI)	10	5	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	\$27,910	368	20	55	13
Fundamentals of Animal Science Certification Examination: Elanco (Exam is administered by iCEV)	10	3	Veterinary Assistants and Laboratory Animal Caretakers	\$26,750	1,670	382	263	86
Greenhouse Operators Certification Examination: Southeast Greenhouse Growers Association/Virginia Flower Growers Association	28	7	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	\$27,910	368	20	55	13
Health Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	7	1	Healthcare Support Occupations	\$32,680	42,881	9,539	5,197	2,135
Horticulture Landscaping Assessment: National Occupational Competency Testing Institute (NOCTI)	19	11	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	\$27,910	368	20	55	13
HTML 5 CSS 3 Specialist Examination: Certification Partners, LLC	0.2	0.2	Web Developers	\$88,850	3,081	498	248	54
HVAC (EPA) Technician Examinations (Levels: Core, I, II, or III): Environmental Protection Agency	0.4	0.4	Heating, Air Conditioning, and Refrigeration Mechanics and I	\$50,210	5,780	771	589	150
IC3 Global Standard 5, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	25	20	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
IC3 Global Standard 4 Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	7	7	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
International Code Council Certificates of Achievement Examinations (Pass any one exam): International Code Council (ICC)	52	43	Construction and Building Inspectors	\$60,170	2,974	396	332	136
Internet and Computing Core Certification Examinations/Windows 7--Office 2010: Certiport (student has passed all three examinations)	11	9	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
Intuit QuickBooks Certified User Certification Test: Certiport	1	1	Accountants and Auditors	\$85,640	26,699	3,713	2,534	734
Manufacturing Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	8	3	Mechanical Drafters	\$59,000	293	25	25	8

MCP - MCSA: SQL 2016 BI Development (must pass two required exams): Microsoft	2	2	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
Medical Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	12	7	Medical Assistants	\$35,010	6,821	1,735	799	261
MOS 2013 Master/Certiport (must pass four exams)	0.4	0.4	Computer Operators	\$49,830	264	(61)	24	12
MOS 2016 Master/Certiport (must pass four exams)	2	2	Computer Operators	\$49,830	264	(61)	24	12
MOS Examinations (Advanced level): Microsoft Office Specialist/Certiport (Pass any one exam at this level)	1	1	Computer Operators	\$49,830	264	(61)	24	12
MOS Excel Expert Level: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	34	14	Computer Operators	\$49,830	264	(61)	24	12
MOS Microsoft Office Expert 2013/Certiport (must pass both Word & Excel at expert levels)	1	1	Computer Operators	\$49,830	264	(61)	24	12
MOS Microsoft Office Expert Excel 2016/Certiport (only one exam)	57	19	Computer Operators	\$49,830	264	(61)	24	12
MOS Microsoft Office Master Level: 2010/Certiport	1	1	Computer Operators	\$49,830	264	(61)	24	12
MOS Word Expert Level Examination: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	81	47	Word Processors and Typists	\$42,290	126	(52)	12	10
MTA Examination: Database Administration Fundamentals (98-364)	10	4	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
MTA Examination: Mobility and Device Fundamentals (98-368)	6	1	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
MTA Examination: Networking Fundamentals (98-366)	31	12	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
MTA Examination: Security Fundamentals (98-367)	119	40	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
MTA Examination: Software Development Fundamentals (98-361)	34	12	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
MTA Examination: Windows OS Fundamentals (98-349)	27	9	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
MTA Examination: Windows Server Administration Fundamentals (98-365)	5	3	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
MTA Examination: Introduction to Programming using HTML & CSS (98-383)	18	7	Computer Programmers	\$94,470	7,616	(412)	445	137
MTA Examination: Introduction to Programming using Java (98-388)	12	4	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
MTA Examination: Introduction to Programming using JavaScript (98-382)	3	3	Computer User Support Specialists	\$58,290	12,368	1,637	992	234

MTA Examination: Introduction to Programming using Python (98-381)	120	31	Computer Programmers	\$94,470	5,517	(226)	326	98
MTA Examination: Introduction to Programming with Block-Based Languages (98-380)	12	5	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
National Nurse Aide Assessment Program (NNAAP) Examination: Virginia Board of Nursing	176	145	Nursing Assistants	\$28,770	15,276	2,866	1,827	841
Network Cabling Specialist Certification Examination: C-Tech Associates	25	24	Telecommunications Line Installers and Repairers	\$61,070	2,368	(26)	233	59
Network Pro Certification Examination: Test Out Corporation (TOC)	17	9	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
Oracle Certification Program Examination: PL SQL	4	1	Computer Operators	\$49,830	264	(61)	24	12
Oracle Certification Program Examinations (Pass any one exam from this certification program): Oracle Corporation	18	2	Computer Operators	\$49,830	264	(61)	24	12
ParaPro: Educational Testing Service (ETS)	199	175	Teacher Assistants	\$28,000	14,578	1,443	1,535	760
PC Pro Certification Examination: Test Out Corporation (TOC)	27	14	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
Phlebotomy Technical Certification (PTC) Examination: American Medical Certification Association (AMCA)	5	4	Phlebotomists	\$35,960	1,294	259	143	50
Pork Quality Assurance Certification	16	15	Farming, Fishing, and Forestry Occupations	\$36,230	2,694	268	385	96
Praxis Core Academic Skills for Educators Tests: Educational Testing Service (must pass all three tests)	0.4	0.4	Teacher Assistants	\$28,000	14,578	1,443	1,535	760
Pre-Engineering/Engineering Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	23	13	Industrial Engineering Technicians	\$55,940	415	14	36	13
Private Applicator Certification Examination: VA Dept. of Agriculture and Consumer Services	5	5	Pest Control Workers	\$40,800	1,011	86	138	37
Production Agriculture Assessment: National Occupational Competency Testing Institute (NOCTI)	8	6	Farming, Fishing, and Forestry Occupations	\$36,230	2,694	268	385	96
Registered Technician Certification Examination: VA Dept. of Agriculture and Consumer Services	0.2	0.2	Pest Control Workers	\$40,800	1,011	86	138	37
Retail Management Certification Assessment: National Retail Federation (NRF) Foundation	6	5	Sales and Related Occupations	\$41,140	180,463	9,047	24,823	10,418
Security Pro Certification Examination: Test Out Corporation (TOC)	15	6	Computer User Support Specialists	\$58,290	12,368	1,637	992	234
ServSafe Manager Certification Examination: National Restaurant Association	218	112	Food Preparation and Serving Related Occupations	\$24,280	156,268	19,468	26,923	11,135
Small Animal Care Examination New York Dept.. of Education (Cornell Univ.)	24	19	Animal Care and Service Workers	\$27,720	5,497	1,164	833	328

Small Animal Science and Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	68	33	Animal Care and Service Workers	\$27,720	5,497	1,164	833	328
Small Engine Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	19	9	Outdoor Power Equipment and Other Small Engine Mechanics	\$37,810	280	32	30	11
Technical Drafting Assessment: National Occupational Competency Testing Institute	7	2	Mechanical Drafters	\$59,000	293	25	25	8
Television Production Assessment: National Occupational Competency Testing Institute (NOCTI)	20	15	Production Occupations	\$38,390	45,996	(1,172)	5,174	2,041
Virginia Motor Vehicle Safety Inspection Program Examination: Virginia State Police	0.4	0.4	Automotive Service Technicians and Mechanics	\$47,730	9,682	405	912	299
Visual Communications and Multimedia Design Assessment: National Occupational Competency Testing Institute (NOCTI)	32	20	Media and Communication Equipment Workers	\$93,390	3,308	529	310	106
Web Design Assessment: National Occupational Competency Testing Institute (NOCTI)	27	18	Web Developers	\$88,850	3,081	498	248	54

Research Question 4: What is the potential economic impact for the state if the number of CTE students earning industry credentials were to increase by 10% annually?

To determine the economic impact for the Commonwealth of Virginia if the number of CTE students earning industry credentials in Superintendent Region Four were to increase 10% annually, each of the 153 different industry credentials aligned with an occupation in Table 78, was calculated to determine its growth of 10% annually. These results were then used to determine the income tax associated with that credential and occupation. Table 78 provides a breakout, by year, of the potential income tax revenue the Commonwealth of Virginia could potentially see if the number of completer students earning industry credentials in Superintendent Region Four was to increase by 10% annually.

Table 78

Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually

Region Four	Credential *10%	Compound Credentials	Income Tax Due	Compound Income Tax
Year 1	331	3,636	\$ 9,225,795.55	\$ 11,294,839.93
Year 2	364	4,000	\$ 10,148,375.11	\$ 21,443,215.04
Year 3	400	4,400	\$ 11,163,212.62	\$ 32,606,427.66
Year 4	440	4,840	\$ 12,279,533.88	\$ 44,885,961.54
Year 5	484	5,324	\$ 13,507,487.27	\$ 58,393,448.80

Credential numbers are rounded

A component of this study was a survey distributed to 40 representatives of Virginia's economy to determine the value added to the earning of industry credentials. Eighteen respondents indicated a candidate applying for a position in their company/organization, as a holder of industry credentials, would enter the company at a larger starting salary than a non-credentialed candidate. The range of the increased starting salary was between 5% and 25%. Using the average of these numbers, 14% could be used as the value-added to the earning of

industry credentials, however, to ensure this study creates a floor rather than a ceiling of value, 10% will be used as the value-added to those earning industry credentials.

Table 79 presents the projected data of Superintendent Region Four completers if their number were to increase by 10% annually. Data in the table also shows the new potential income tax revenue available to Virginia's Treasury if the 10% value-added sum is applied to the projected economic impact of the earning of CTE industry credentials on Virginia's economy.

Table 79

Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually - AND Allows a 10% Increase in Beginning Salary

Region Four	Credential *10%	Compound Credentials	Income Tax Due	Compound Income Tax
Year 1	331	3,636	\$ 10,242,004.81	\$ 12,537,652.37
Year 2	364	4,000	\$ 11,266,205.29	\$ 23,803,857.67
Year 3	400	4,400	\$ 12,392,825.82	\$ 36,196,683.49
Year 4	440	4,840	\$ 13,632,108.40	\$ 49,828,791.89
Year 5	484	5,324	\$ 14,995,319.25	\$ 64,824,111.14

Credential numbers are rounded

Region Five: Valley

Valley, as Superintendent Region 5, consists of 20 school divisions, comprising among its number 37 high schools (including specialist technical centers). Of the 8 Superintendent regions, this region lists 6th in the number of high schools available to its students (VDOE, 2020).

Table 80

VDOE Superintendent Region 5: Valley

Albemarle County	Charlottesville	Lynchburg
Amherst County	Fluvanna County	Nelson County
Augusta County	Greene County	Rockbridge County
Bath County	Harrisonburg	Rockingham County
Bedford County	Highland County	Staunton
Buena Vista	Lexington	Waynesboro
Campbell County	Louisa County	

Source: Commonwealth of Virginia, Department of Education Superintendent's Regions, http://www.doe.virginia.gov/directories/va_region_map.pdf

Data in Table 81 presents the alignment of the school divisions in Superintendent Region Five to the Local Workforce Investment Area (LWIA) regions. These data were created by the Demographics group at the Weldon Cooper Center for Public Service at the University of Virginia to help administrators and teachers in completing the “Application for Career and Technical Education New Program/Course in 2019. The LWIA’s were designated by the Workforce Innovation and Opportunity Act (WIOA) State Plan for the Commonwealth of Virginia (TrailBlazers, 2019). The alignment of the superintendent region to the LWIA region undergirds the findings of this study.

Table 81

Local Workforce Investment Areas (LWIAs) in Virginia by VDOE Superintendent Region

Region 5: Valley	LWIA Region
Albemarle County	LWIA VI - Piedmont Workforce Network
Amherst County	LWIA VII - Region 2000/ Central Virginia
Augusta County	LWIA IV - Shenandoah Valley
Bath County	LWIA IV - Shenandoah Valley
Bedford County	LWIA VII - Region 2000/ Central Virginia
Buena Vista	LWIA IV - Shenandoah Valley
Campbell County	LWIA VII - Region 2000/ Central Virginia
Charlottesville	LWIA VI - Piedmont Workforce Network
Fluvanna County	LWIA VI - Piedmont Workforce Network
Greene County	LWIA VI - Piedmont Workforce Network
Harrisonburg	LWIA IV - Shenandoah Valley
Highland County	LWIA IV - Shenandoah Valley
Lexington	LWIA IV - Shenandoah Valley
Louisa County	LWIA VI - Piedmont Workforce Network
Lynchburg	LWIA VII - Region 2000/ Central Virginia
Nelson County	LWIA VI - Piedmont Workforce Network
Rockbridge County	LWIA IV - Shenandoah Valley
Rockingham County	LWIA IV - Shenandoah Valley
Staunton	LWIA IV - Shenandoah Valley
Waynesboro	LWIA IV - Shenandoah Valley

Source: School Report Card Data: Year 2016-2017

http://www.doe.virginia.gov/instruction/career_technical/path_industry_certification/index.shtml

Virginia Department Of Education, School Report Card Data for School Year: 2015 - 2016

Local Workforce Investment Areas (LWIAs) in Virginia

Research Question 1: What is the trend for high school participation in CTE programs in**Virginia (Region Five), over the past five years?**

In order to determine the average number of high school CTE completer students in Region Five, over the last five years, data retrieved from the VDOE's Office of Education Information Management (2019). Data in Table 82 presents the number of completers by year, then when averaged out over five years. By examining this table, it is possible to observe the

specific number of CTE completer students in this region, and whether the number has increased, decreased or remained the same.

Table 82

Number of CTE Completers in Region Five: 2014-2019

Year	Total Completers	5 Year Avg Completers
2014-2015	3,118	624
2015-2016	3,246	649
2016-2017	3,253	651
2017-2018	3,216	643
2018-2019	3,294	659
TOTAL	16,127	3,225

Source: Completer data by region retrieved from Virginia Department of Education, Office of Education Information Management, (2019).

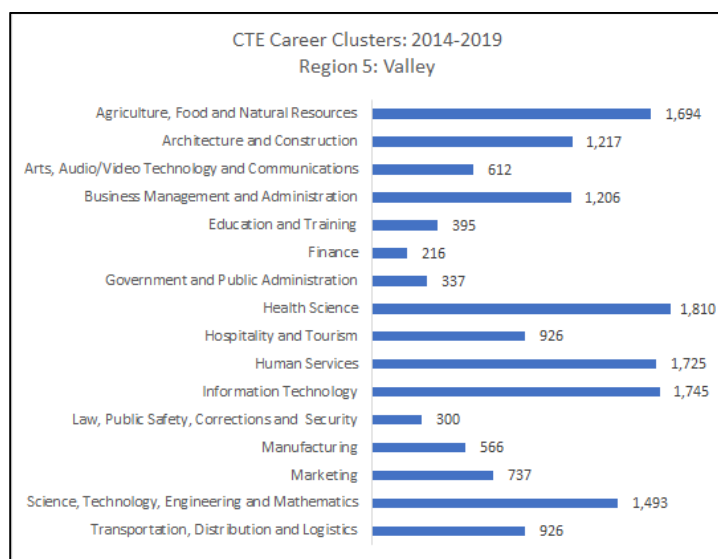
Research Question 2: What is the trend for high school completer students earning industry certifications in Virginia (Region Five), over the past five years?

To enable school administration to organize curriculum design, and career counselors to provide the necessary guidance to students, the Virginia Department of Education groups CTE programs and courses in a “Career Cluster.” According to the VDOE (2020), these career clusters help to:

- Organize academic and technical knowledge and skills into a coherent sequence
- Identify pathways from secondary to postsecondary education
- Provide a framework for seamless education
- Provide institutional support of rigorous academic teaching and learning
- Provide alignment of academic and technical skills with workplace readiness skills
- Provide opportunities to involve parents, business and industry, and the school community
- Provide the development of effective plans of study that are based on career assessments

Using data drawn from the Weldon-Cooper Center for Public Service: CTE Completer Data: 2014-2019, over five years, Region Five: Central Virginia CTE completer students are seen to favor the Health Science cluster (1,810), with the least numerous cluster of Finance reflecting 216 completer students.

Figure 13 CTE Career Clusters in Region Five: 2014-2019



Source: Weldon-Cooper Center for Public Service: CTE Completer Data: 2014-2019

Using industry credential test data provided by the *Virginia Department of Education, Office of Education Information Management, (2019)*, data were disaggregated using SPSS. Disaggregation was used to determine the credential type earned, the number of students taking and earning the credential, and what this looks like over a five-year average. Because this study aims to determine the relationship between the earning of Career and Technical industry credentials and the Virginia economy, the superintendent region in which these industry credentials were earned is the primary format of Table 83. Further, because the focus of this study is on CTE completers, the data was analyzed to determine which of the credentials earned would be the final steps in the completer process. The disaggregated data demonstrating the

“completer industry credentials earned by Region Five CTE students: 2014-2019” is presented in Table 83.

Table 83

Region Five: Industry Credentials Taken and Passed: 2014-2019- “Completers”

Industry Credential Assessments & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
AAFCS: Culinary Arts Examination	111	63	22	13
AAFCS: Education Fundamentals Examination	71	47	14	9
AAFCS: Family and Community Services Examination	71	47	14	9
AAFCS: Interior Design Fundamentals Examination	39	22	8	4
AAFCS: Nutrition, Food and Wellness Examination	61	21	12	4
Accounting (Basic) Assessment: National Occupational Competency Testing Institute (NOCTI)	85	54	17	11
ACF Culinary Arts Certification Assessment: American Culinary Federation, Inc. (Assessment is administered by NOCTI)	3	3	1	1
Adobe Certified Associate: Photoshop CS5 Examination/Certiport	1	1	0	0
Adobe Certified Associate: Photoshop CS6 Examination/Certiport	14	13	3	3
Advanced Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	30	26	6	5
Architectural Drafting Assessment: National Occupational Competency Testing Institute (NOCTI)	65	54	13	11
ASE Auto Maintenance and Light Repair Examination (G1): National Institute for Automotive Service Excellence	137	109	27	22
ASE Automotive & Light Truck Certification Test-Automatic Transmission/Transaxle (A2): National Institute for Automotive Service Excellence	25	14	5	3
ASE Automotive & Light Truck Certification Test-Brakes (A5): National Institute for Automotive Service Excellence	199	110	40	22
ASE Automotive & Light Truck Certification Test-Electrical/Electronic Systems (A6): National Institute for Automotive Service Excellence	130	86	26	17
ASE Automotive & Light Truck Certification Test-Engine Performance (A8): National Institute for Automotive Service Excellence	49	32	10	6
ASE Automotive & Light Truck Certification Test-Engine Repair (A1): National Institute for Automotive Service Excellence	99	53	20	11
ASE Automotive & Light Truck Certification Test-Heating and Air Conditioning (A7): National Institute for Automotive Service Excellence	24	24	5	5
ASE Automotive & Light Truck Certification Test-Light Vehicle Diesel Engines (A9): National Institute for Automotive Service Excellence	21	17	4	3
ASE Automotive & Light Truck Certification Test-Manual Drive Train and Axles (A3): National Institute for Automotive Service Excellence	28	13	6	3
ASE Automotive & Light Truck Certification Test-Suspension & Steering (A4): National Institute for Automotive Service Excellence	144	78	29	16
ASE Collision Repair and Refinish Certification Test - NonStructural Analysis & Damage Repair (B3): National Institute for Automotive Service Excellence	7	7	1	1

ASE Collision Repair and Refinish Certification Test - Painting & Refinishing (B2): National Institute for Automotive Service Excellence	52	30	10	6
ASE Student Certification Automotive: Electrical/Electronic Systems: National Institute for Automotive Service Excellence	232	122	46	24
ASE Student Certification Automotive: Engine Performance: National Institute for Automotive Service Excellence	213	81	43	16
ASE Student Certification Automotive: Engine Repair: National Institute for Automotive Service Excellence	238	108	48	22
ASE Student Certification Automotive: Heating and Air Conditioning: National Institute for Automotive Service Excellence	151	85	30	17
ASE Student Certification Automotive: Maintenance and Light Repair: National Institute for Automotive Service Excellence	318	184	64	37
ASE Student Certification Automotive: Manual Drive Train and Axles: National Institute for Automotive Service Excellence	112	52	22	10
ASE Student Certification Automotive: Automatic Transmission/Transaxle: National Institute for Automotive Service Excellence	74	29	15	6
ASE Student Certification Automotive: Automotive Service Technology National Institute for Automotive Service Excellence	33	25	7	5
ASE Student Certification Automotive: Brakes: National Institute for Automotive Service Excellence	355	170	71	34
ASE Student Certification Automotive: Suspension and Steering: National Institute for Automotive Service Excellence	230	102	46	20
ASE Student Certification Collision Repair & Refinish: Mechanical and Electrical: National Institute for Automotive Service Excellence	152	83	30	17
ASE Student Certification Collision Repair & Refinish: Non-structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	215	113	43	23
ASE Student Certification Collision Repair & Refinish: Painting and Refinishing: National Institute for Automotive Service Excellence	319	138	64	28
ASE Student Certification Collision Repair & Refinish: Structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	215	110	43	22
ASE Student Certification M/H Truck: Brakes: National Institute for Automotive Service Excellence	12	6	2	1
ASE Student Certification M/H Truck: Diesel Engines: National Institute for Automotive Service Excellence	11	4	2	1
ASE Student Certification M/H Truck: Electrical/Electronic: National Institute for Automotive Service Excellence	11	3	2	1
ASE Student Certification M/H Truck: Steering & Suspension: National Institute for Automotive Service Excellence	25	18	5	4
AutoCAD Certified User: Autodesk	2	2	0	0
Autodesk Inventor Certified User: Autodesk	19	18	4	4
Autodesk Revit Certified Professional Examination: Autodesk	16	11	3	2
Automotive Technician Core Assessment: National Occupational Competency Testing Institute (NOCTI)	18	17	4	3
Barbers Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	1	1	0	0
Basic Refrigeration & Charging Procedures Employment Ready Examination: HVAC Excellence	15	15	3	3
Beef Quality Assurance Certification	378	332	76	66
BrainBench Desktop Publishing Software Examinations:	76	66	15	13
BrainBench Technical Support Examinations	92	37	18	7

BrainBench Web Design and Development Examinations	15	15	3	3
Building Construction Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	19	3	4	1
Building Trades Maintenance Assessment: National Occupational Competency Testing Institute (NOCTI)	45	37	9	7
Cabinetmaking Assessment: National Occupational Competency Testing Institute (NOCTI)	101	33	20	7
CAD Assessment: National Occupational Competency Testing Institute (NOCTI)	241	168	48	34
CAD/CAM Assessment: National Occupational Competency Testing Institute (NOCTI)	57	33	11	7
Carpentry Assessment: National Occupational Competency Testing Institute (NOCTI)	18	12	4	2
Certification of Pharmacy Technicians (ExCPT) Examination: Virginia Board of Pharmacy	6	6	1	1
Certified Dental Assistant and National Entry Level Assistant: Infection Control (ICE) Examination: Dental Assisting National Board	15	13	3	3
Certified Dental Assistant and National Entry Level Assistant: Radiation Health & Safety (RHS) Examination: Dental Assisting National Board	42	33	8	7
Certified Emergency Telecommunicator Examination: International Academies of Emergency Dispatch (IAED)	8	8	2	2
Certified SolidWorks Associate (CSWA) Examination: SolidWorks Corporation	197	81	39	16
Certified Veterinary Assistant Examination: American Allied Health (AAH)	32	23	6	5
Cisco IT Essentials, PC Hardware and Software End-of-Course Examination: Cisco Systems	17	14	3	3
CIW (Certified Internet Webmaster) Professional Examinations: Certification Partners, LLC (Pass any one exam at this level or above)	1	1	0	0
CIW Site Development Associate Examination: Certification Partners, LLC	29	10	6	2
Collision Repair and Refinishing Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	75	46	15	9
Collision Repair Assessment: National Occupational Competency Testing Institute (NOCTI)	14	3	3	1
Commercial Foods Assessment: National Occupational Competency Testing Institute (NOCTI)	27	4	5	1
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	382	235	76	47
CompTIA IT Fundamentals Certification Examination: CompTIA	132	86	26	17
CompTIA A+ Certification Examination (must pass both exams): CompTIA	85	50	17	10
CompTIA Network+ Examination: CompTIA	10	5	2	1
CompTIA Security + Examination: CompTIA	1	1	0	0
CompTIA Server+ Examination: CompTIA	1	1	0	0
Computer Networking Fundamentals Assessment: National Occupational Competency Testing Institute (NOCTI)	74	40	15	8
Computer Programming Assessment: National Occupational Competency Testing Institute (NOCTI)	12	6	2	1
Computer Repair Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	71	60	14	12
CompTIA A+ 901 Examination	35	25	7	5

Construction Masonry-Brick Assessment: National Occupational Competency Testing Institute (NOCTI)	11	5	2	1
Cosmetology Assessment: National Occupational Competency Testing Institute (NOCTI)	162	125	32	25
Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	392	304	78	61
Culinary Arts Prep Cook-Level 1 Assessment: National Occupational Competency Testing Institute (NOCTI)	83	60	17	12
Culinary Arts Prep Cook-Level 2 Assessment: National Occupational Competency Testing Institute (NOCTI)	23	14	5	3
Dental Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	170	112	34	22
Diesel Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	70	50	14	10
Early Childhood Education and Care, Basic Assessment: National Occupational Competency Testing Institute (NOCTI)	67	65	13	13
Electrical Construction Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	44	30	9	6
Electrical Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	44	25	9	5
Emergency Medical First Responder Certification: Department of Health, Office of EMS	15	6	3	1
Emergency Medical Technician Examination: Department of Health, Office of Emergency Medical Services	115	73	23	15
EPA Universal Examination (pass all three types): Environmental Protection Agency (EPA)	79	77	16	15
Firefighter II Certification Examination: Virginia Department of Fire Programs	44	30	9	6
Fundamentals of Animal Science Certification Examination: Elanco (Exam is administered by iCEV)	10	10	2	2
Greenhouse Operators Certification Examination: Southeast Greenhouse Growers Association/Virginia Flower Growers Association	54	17	11	3
HBI/NAHB Carpentry Advanced Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	3	3	1	1
Health Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	16	7	3	1
Heating, Ventilation, Air Conditioning & Refrigeration (HVAC/R) Assessment: National Occupational Competency Testing Institute (NOCTI)	41	14	8	3
IC3 Global Standard 5, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	19	19	4	4
International Code Council Certificates of Achievement Examinations (Pass any one exam): International Code Council (ICC)	3	3	1	1
Manufacturing Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	10	7	2	1
MCP - MCSA: Cloud Platform (pass any two exams): Microsoft	2	2	0	0
MCP - MCSA: Machine Learning (must pass both exams): Microsoft	2	2	0	0
MCP - MCSA: SQL 2016 Database Administration (must pass two required exams): Microsoft	2	2	0	0
Mechanical Drafting and Design Assessment: National Competency Testing Institute (NOCTI)	57	33	11	7
Medical Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	0	0

MOS Excel Expert Level: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	1	1	0	0
MOS Microsoft Office Expert Excel 2016/Certiport (only one exam)	1	1	0	0
MOS Word Expert Examination: Microsoft Office 2010/Certiport	1	1	0	0
MOS Word Expert Examination: Microsoft Office 2016/Certiport	70	33	14	7
MOS Word Expert Level Examination: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	137	39	27	8
MTA Examination: Database Administration Fundamentals (98-364)	12	3	2	1
MTA Examination: HTML5 Application Development Fundamentals (98-375)	1	1	0	0
MTA Examination: Networking Fundamentals (98-366)	157	63	31	13
MTA Examination: Windows OS Fundamentals (98-349)	67	26	13	5
MTA Examination: Windows Server Administration Fundamentals (98-365)	12	1	2	0
MTA Examination: Introduction to Programming using HTML & CSS (98-383)	16	3	3	1
National Nurse Aide Assessment Program (NNAAP) Examination: Virginia Board of Nursing	976	833	195	167
Nursing Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	126	88	25	18
ParaPro: Educational Testing Service (ETS)	24	23	5	5
Pork Quality Assurance Certification	20	19	4	4
Precision Machining Assessment: National Occupational Competency Testing Institute (NOCTI)	8	8	2	2
Pre-Engineering/Engineering Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	13	7	3	1
Principles of Floral Design Certification Examination: Benz School of Floral Design (exam is adm. by iCEV)	2	2	0	0
Private Applicator Certification Examination: VA Dept. of Agriculture and Consumer Services	660	534	132	107
ProStart Program End-of-Course Examination (Level 2): Education Foundation of the National Restaurant Association	87	78	17	16
Retail Merchandising Assessment: National Occupational Competency Testing Institute (NOCTI)	17	3	3	1
ServSafe Manager Certification Examination: National Restaurant Association	521	337	104	67
Small Animal Care Examination New York Dept. of Education (Cornell Univ.)	123	104	25	21
Small Animal Science and Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	275	229	55	46
Small Engine Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	43	10	9	2
Technical Drafting Assessment: National Occupational Competency Testing Institute	95	81	19	16
Television Production Assessment: National Occupational Competency Testing Institute (NOCTI)	97	74	19	15
Visual Communications and Multimedia Design Assessment: National Occupational Competency Testing Institute (NOCTI)	18	14	4	3
Welding Assessment: National Occupational Competency Testing Institute (NOCTI)	77	39	15	8
TOTAL	11,957	7,659	2,391	1,532

Because a full picture of the industry credentialing test data is needed to determine trends in the earning of industry certifications in Region Five, one must be aware of the data for those currently on their CTE pathway, as seen in Table 84. Students earning credentials in this table are currently on a CTE program as seen in the “certification,” “pre-apprentice,” or “other” pathway certifications, and non-CTE specific certifications. Although the data from this table is not included in the final calculation to determine economic impact, this does not negate their value or economic potential. This study focuses on completer students.

Table 84

“Other” industry credentials earned by Region Five CTE students, 2014-2019

“Other” Industry Credential Assessment & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
AAFCS: Broad Field Family and Consumer Sciences Examination	318	124	64	25
AAFCS: Leadership Fundamentals Assessment	11	6	2	1
Agricultural Biotechnology Assessment: National Occupational Competency Testing Institute (NOCTI)	29	26	6	5
AHLA (START) Certification Examination: American Hotel and Lodging Association	37	32	7	6
Animal Systems Assessment: National Occupational Competency Testing Institute (NOCTI)	17	13	3	3
AutoCAD 2000 Certification Examination: BrainBench	2	2	0	0
AutoCAD 2004 Certification Examination: BrainBench	5	5	1	1
AutoCAD 2007 Certification Examination: BrainBench	23	13	5	3
Briggs & Stratton Master Service Technician Program Examination	75	33	15	7
Canine Care & Training - Level 1 Certification Examination: Continental Kennel Club, Inc.	41	20	8	4
Carpenter Level One - Entry Level Assessment: National Center for Construction Education & Research (NCCER)	52	38	10	8
Core: Introductory Craft Skills Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	265	230	53	46
Criminal Justice Assessment: National Occupational Competency Testing Institute (NOCTI)	238	174	48	35
Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	448	336	90	67
Design and Preconstruction Assessment: National Occupational Competency Testing Institute (NOCTI)	26	21	5	4
Education and Training Assessment: National Occupational Competency Testing Institute (NOCTI)	62	56	12	11
Electrician Level One - Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	27	27	5	5

Electronics Module: DC (EMI): Electronics Technicians Association (ETA), International	39	39	8	8
Emergency Medical Services Assessment: National Occupational Competency Testing Institute (NOCTI)	43	27	9	5
EPA Technician Examination (Core): Environmental Protection Agency (EPA)	49	48	10	10
EPA Technician Examination (Type I): Environmental Protection Agency (EPA)	39	39	8	8
EPA Technician Examination (Type II): Environmental Protection Agency (EPA)	29	29	6	6
EPA Technician Examination (Type III): Environmental Protection Agency (EPA)	28	28	6	6
Firefighter I Certification Examination: Virginia Department of Fire Programs	96	68	19	14
Human Resources Management Assessment: National Occupational Competency Testing Institute (NOCTI)	4	4	1	1
IC3 Spark, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	14	5	3	1
Manufacturing Specialist Certification: Manufacturing Skills Institute	30	26	6	5
Manufacturing Technician Level 1 Certification Examination: Manufacturing Skills Institute	30	23	6	5
MOS Access Examination: Microsoft Office 2016/Certiport	40	23	8	5
MOS Access Examination: Microsoft Office 2010/Certiport	4	4	1	1
MOS Access Examination: Microsoft Office 2013/Certiport	33	25	7	5
MOS Excel Examination: Microsoft Office 2013/Certiport	219	167	44	33
MOS Excel Examination: Microsoft Office 2010/Certiport	94	51	19	10
MOS Excel Examination: Microsoft Office 2016/Certiport	390	218	78	44
MOS Outlook Examination: Microsoft Office 2010/Certiport	11	9	2	2
MOS Outlook Examination: Microsoft Office 2013/Certiport	73	48	15	10
MOS Outlook Examination: Microsoft Office 2016/Certiport	5	5	1	1
MOS PowerPoint Examination: Microsoft Office 2013/Certiport	1,345	1,031	269	206
MOS PowerPoint Examination: Microsoft Office 2007/Certiport	19	19	4	4
MOS PowerPoint Examination: Microsoft Office 2010/Certiport	506	370	101	74
MOS PowerPoint Examination: Microsoft Office 2016/Certiport	1,458	1,049	292	210
MOS PowerPoint Examination: Microsoft Office Specialist/Certiport	35	34	7	7
MOS Word Examination: Microsoft Office 2010/Certiport	506	275	101	55
MOS Word Examination: Microsoft Office 2013/Certiport	621	438	124	88
MOS Word Examination: Microsoft Office 2007/Certiport	43	43	9	9
MOS Word Examination: Microsoft Office 2016/Certiport	1,090	875	218	175
MOS Word Examination: Microsoft Office Specialist/Certiport	121	97	24	19
Natural Resource Systems Assessment: National Occupational Competency Testing Institute (NOCTI)	53	52	11	10
NCCT Carpentry Level One, National Construction Career Test: National Center for Construction Education and Research (NCCER)	31	24	6	5
NCCT Core: Introductory Craft Skills, National Construction Career Test: National Center for Construction Education & Research (NCCER)	330	248	66	50
NCCT Electrical Examination, National Construction Career Test: National Center for Construction Education & Research (NCCER)	2	2	0	0

NCCT Welding Examination, National Construction Career Test: National Center for Construction Education & Research (NCCER)	16	15	3	3
PLTW Examination: Aerospace Engineering: Project Lead the Way (PLTW)	49	43	10	9
PLTW Examination: Computer Integrated Manufacturing: Project Lead the Way (PLTW)	35	31	7	6
PLTW Examination: Engineering Design and Development: Project Lead the Way (PLTW)	225	160	45	32
PLTW Examination: Principles of Engineering: Project Lead the Way (PLTW)	102	87	20	17
ProStart Program End-of-Course Examination (Level 1): Education Foundation of the National Restaurant Association	182	156	36	31
SENSE Training Program Certification Examination: American Welding Society (AWS)	2	2	0	0
SkillsUSA: 3D Visualization & Animation Examination	27	24	5	5
SkillsUSA: Cabinetmaking Examination	3	3	1	1
SkillsUSA: Carpentry Examination	115	69	23	14
SkillsUSA: Cosmetology Examination	32	21	6	4
SkillsUSA: Criminal Justice and CSI Examination	35	21	7	4
SkillsUSA: Culinary Arts Examination	11	2	2	0
SkillsUSA: Photography Examination	193	81	39	16
SkillsUSA: Technical Drafting Examination	28	20	6	4
Welding Level One Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	27	26	5	5
TOTAL	10,188	7,360	2,038	1,472

As a final measure to determine the trend for the earning of CTE industry credentials at the high school level in Region Five, Table 85 presents the data specific to “Soft skills/College & Career Readiness” certifications. Because these certifications are included in the VDOE approved list of industry certifications, they are included in the industry credential test data provided by the Virginia Department of Education, Office of Education Information Management (VDOE, 2019). The value of this data lies in its relationship to the overall earning of industry credentials by high school students in Region Five, and the bigger picture when determining any trend.

Table 85

Soft skills/College & Career Readiness industry credentials earned in Region Five: 2014-2019

“Soft skills/College & Career Readiness” Assessments & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
Armed Services Vocational Aptitude Battery Examination: United States Military Entrance Processing Command	457	259	91	52
College and Work Readiness Assessment (CWRA+): Council for Aid to Education	154	141	31	28
National Career Readiness Certificate (ACT)	500	460	100	92
W!SE Financial Literacy Certification: Working in Support of Education (W!SE)	30,349	24,754	6,070	4,951
Workplace Readiness Skills for the Commonwealth Examination	14,528	11,030	2,906	2,206
TOTAL	45,988	36,644	5,749	7,329

To determine the trend for high school completer students earning industry credentials in Region Five over the past five years, a finalized set of summarized data can be seen in Table 86. These data present the number of students who have earned a CTE industry credential approved by Virginia’s Board of Education. The three categories of assessment type are represented in Table 76 and present the five year total, and five-year average number of earned (a) “technical” credentials (sufficient for a student to successfully end their completer program); (b) “other” assessments taken where students are on the CTE path, working towards certifications; and (c), the “Soft skills/College & Career Readiness” certifications.

Table 86

Total Number of Industry Certifications Earned in Region Five: 2014-2019

Industry Credential Assessment & Type	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
"Technical" Completer Certifications	11,957	7,659	2,391	1,532
"Other" CTE certifications - pathway/level one/PLTW/Skills USA	10,188	7,360	2,038	1,472
“Soft skills/College & Career Readiness” certifications.	45,988	36,644	5,749	7,329
TOTAL	68,133	51,663	13,627	10,333

Research Question 3: What are the potential earnings for students gaining industry credentials in Virginia's (Region Five) labor market?

To determine the potential earning for students gaining industry credentials in Virginia's labor market, it is crucial to understand the labor market's occupational openings by educational attainment level. Through the review of these data, one can examine the extent to which Region Five students are entering a labor market saturated with similarly qualified candidates, or into the market with high-demand, high-salary openings. Data in Table 87, as extracted from the Bureau of Labor Statistics and the Virginia Employment Commission projection to 2026, show the probable occupational openings by education level attainment for Region Five as a whole.

Table 87

Occupational Openings by Education Attainment Level to 2026 – Region Five

Region 5 – Valley	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Associate's Degree	12,738	1,345	1,094	328
Bachelor's Degree	56,851	6,304	4,946	1,569
Doctoral or Professional Degree	16,493	2,477	1,234	471
High School Diploma or Equivalent	186,168	9,198	20,501	8,283
Less Than High School	15,452	16,958	23,451	9,987
Master's Degree	8,397	1,577	793	254
Not Applicable	1,122,950	98,900	127,823	49,473
Postsecondary Non-Degree Award	15,214	1,425	1,424	564
Some College, No Degree	451	62	75	28
TOTAL	1,434,714	138,246	181,341	70,957

Source: May 2018 State Occupational Employment and Wage Estimates,
https://www.bls.gov/oes/current/oes_va.htm#00-0000

While data in Table 87 specify occupations in the “Not Applicable” category as the largest group to access to occupational openings, a precise definition of the education included in that category is not available. The second-largest estimated category in labor market openings is found in the “High School Diploma or Equivalent” category. However, when the “Not

Applicable” category is removed from the data, along with “Less than High School” as in Table 88, numbers show that the two categories of education with greater access to projected employment are those with “High School Diploma or Equivalent” and “Bachelor’s Degree.”

Table 88

Occupational Openings by Education Attainment Level – Region 5 - "Less than High School" and "Not Applicable" removed

Region 5 – Valley	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Associate's Degree	12,738	1,345	1,094	328
Bachelor’s Degree	56,851	6,304	4,946	1,569
Doctoral or Professional Degree	16,493	2,477	1,234	471
High School Diploma or Equivalent	186,168	9,198	20,501	8,283
Master's Degree	8,397	1,577	793	254
Postsecondary Non-Degree Award	15,214	1,425	1,424	564
Some College, No Degree	451	62	75	28
	296,312	22,388	30,067	11,497

Source: May 2018 State Occupational Employment and Wage Estimates,
https://www.bls.gov/oes/current/oes_va.htm#00-0000

Data presented in Table 89 show the occupations available to Region Eight’s CTE completer students who have earned a series of industry credentials. These data present the estimated mean salary expected, the projected occupational openings to 2026 of that particular occupation, the number of annual openings, and annual exits. Data included in this table show completer data specifically and does not include those who are currently enrolled in a CTE pathway, or who have completed credentials with a career readiness focus. The data in Table 89 brings together data points from:

- a) *Region Five: Industry Credentials Taken and Passed: 2014-2019 – Completers* (see Table 83). Data from this source is seen in the columns “Assessment,” “Taken 5 Yr. Avg.” and “Pass 5 Yr. Avg”.

- b) Bureau of Labor Statistics *May 2019 State Occupational Employment and Wage Estimates: Virginia* (Bureau of Labor Statistics, 2020). Data from this source is seen in the columns “Occupation” and “Mean Annual Salary.”
- c) TrailBlazers: Career and Technical Education in Virginia (TrailBlazers, 2020). Labor market data for the LWIA IV: Shenandoah Valley (TrailBlazers, 2020) region, LWIA VI: Piedmont Workforce Network (TrailBlazers, 2020) region and the LWIA VII: Region 2000/Central VA (TrailBlazers, 2020) regions are seen in columns: “Occupation,” “Projected Employment,” “Numeric Change,” “Annual Openings,” and “Annual Exits.”

Table 89

CTE Industry Credential to Occupational Alignment and Projections – Region Five: LWIA IV, VI, VII

Assessment	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.	Occupation	Mean Annual Wage	Projected Employment	Numeric Change	Annual Openings	Annual Exits
AAFCS: Culinary Arts Examination	22	13	Food Preparation and Serving Related Occupations	\$24,280	51,115	6,013	8,776	3,632
AAFCS: Education Fundamentals Examination	14	9	Teacher Assistants	\$28,000	4,729	491	499	246
AAFCS: Family and Community Services Examination	14	9	Childcare Workers	\$24,620	3,629	195	527	288
AAFCS: Interior Design Fundamentals Examination	8	4	Interior Designers	\$52,670	1,111	59	102	37
AAFCS: Nutrition, Food and Wellness Examination	12	4	Dietetic Technicians	\$32,430	284	27	24	9
Accounting (Basic) Assessment: National Occupational Competency Testing Institute (NOCTI)	17	11	Financial Clerks	\$40,410	10,308	107	1,124	561
ACF Culinary Arts Certification Assessment: American Culinary Federation, Inc. (Assessment is administered by NOCTI)	1	1	Chefs and Head Cooks	\$54,760	583	72	74	17
Adobe Certified Associate: Photoshop CS5 Examination/Certiport	0.2	0.2	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	8,434	770	852	326
Adobe Certified Associate: Photoshop CS6 Examination/Certiport	3	3	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	8,434	770	852	326
Advanced Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	6	5	Sales and Related Occupations	\$41,140	56,022	2,159	7,878	1,496
Architectural Drafting Assessment: National Occupational Competency Testing Institute (NOCTI)	13	11	Mechanical Drafters	\$59,000	753	55	64	21
ASE Auto Maintenance and Light Repair Examination (G1): National Institute for Automotive Service Excellence	27	22	Automotive Service Technicians and Mechanics	\$47,730	9,682	405	912	299
ASE Automotive & Light Truck Certification Test-Engine Repair (A1); Automatic Transmission/Transaxle (A2); Manual Drive Train and Axles (A3); Suspension & Steering (A4); Brakes (A5); Electrical/Electronic Systems (A6); Heating and Air Conditioning (A7); Engine Performance (A8); Light Vehicle Diesel Engines (A9); National Institute for Automotive Service Excellence	80	47	Automotive Service Technicians and Mechanics	\$47,730	9,682	405	912	299
ASE Collision Repair and Refinish Certification Test - Painting & Refinishing (B2); Nonstructural Analysis & Damage Repair (B3): National Institute for Automotive Service Excellence	30	19	Automotive Body and Related Repairers	\$53,060	556	52	56	18

ASE Student Certification Automotive: Electrical/Electronic Systems; Engine Performance; Engine Repair; Heating and Air Conditioning; Maintenance and Light Repair; Manual Drive Train and Axles; Automatic Transmission/Transaxle; Automotive Service Technology; Brakes; Suspension and Steering; National Institute for Automotive Service Excellence	196	96	Automotive Service Technicians and Mechanics	\$47,730	9,682	405	912	299
ASE Student Certification Collision Repair & Refinish: Mechanical and Electrical; Non-structural Analysis and Damage Repair; Painting and Refinishing; Structural Analysis and Damage Repair; National Institute for Automotive Service Excellence	225	111	Automotive Service Technicians and Mechanics	\$47,730	9,682	405	912	299
ASE Student Certification M/H Truck: Brakes; Diesel Engines; Electrical/Electronic; Steering & Suspension; National Institute for Automotive Service Excellence	15	8	Bus and Truck Mechanics and Diesel Engine Specialists	\$48,470	1,282	137	120	37
AutoCAD Certified User: Autodesk	0.4	0.4	Mechanical Drafters	\$59,000	753	55	64	21
Autodesk Inventor Certified User: Autodesk	4	4	Drafters, Engineering Technicians, and Mapping Technicians	\$60,320	1,973	63	174	62
Autodesk Revit Certified Professional Examination: Autodesk	3	2	Architects, Except Landscape and Naval	\$85,380	166	7	12	4
Automotive Technician Core Assessment: National Occupational Competency Testing Institute (NOCTI)	4	3	Automotive Service Technicians and Mechanics	\$47,730	9,682	405	912	299
Barbers Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	0.2	0.2	Hairdressers, Hairstylists, and Cosmetologists	\$34,250	2,167	224	263	137
Basic Refrigeration & Charging Procedures Employment Ready Examination: HVAC Excellence	3	3	Heating, Air Conditioning, and Refrigeration Mechanics and I	\$50,210	2,115	216	212	56
Beef Quality Assurance Certification	76	66	Farming, Fishing, and Forestry Occupations	\$36,230	2,622	219	369	94
Brainbench Desktop Publishing Software Examinations	15	13	Computer Operators	\$49,830	548	(136)	50	25
Brainbench Technical Support Examinations	18	7	Computer User Support Specialists	\$58,290	1,948	166	150	37
Brainbench Web Design and Development Examinations	3	3	Web Developers	\$88,850	478	70	39	9
Building Construction Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	4	1	Helpers--Construction Trades	\$31,340	2,315	215	327	94
Building Trades Maintenance Assessment: National Occupational Competency Testing Institute (NOCTI)	9	7	Helpers--Construction Trades	\$31,340	2,315	215	327	94
Cabinetmaking Assessment: National Occupational Competency Testing Institute (NOCTI)	20	7	Woodworkers	\$41,300	2,009	32	216	86

CAD Assessment: National Occupational Competency Testing Institute (NOCTI)	48	34	Mechanical Drafters	\$59,000	753	55	64	21
CAD/CAM Assessment: National Occupational Competency Testing Institute (NOCTI)	11	7	Mechanical Drafters	\$59,000	753	55	64	21
Carpentry Assessment: National Occupational Competency Testing Institute (NOCTI)	4	2	Woodworkers	\$41,300	2,009	32	216	86
Certification of Pharmacy Technicians (ExCPT) Examination: Virginia Board of Pharmacy	1	1	Pharmacy Technicians	\$32,370	1,392	129	114	43
Certified Dental Assistant and National Entry Level Assistant: Infection Control (ICE) Examination: Dental Assisting National Board	3	3	Dental Assistants	\$44,640	1,170	234	137	53
Certified Dental Assistant and National Entry Level Assistant: Radiation Health & Safety (RHS) Examination: Dental Assisting National Board	8	7	Dental Assistants	\$44,640	1,170	234	137	53
Certified Emergency Telecommunicator Examination: International Academies of Emergency Dispatch (IAED)	2	2	Dispatchers, Except Police, Fire, and Ambulance	\$41,140	487	19	44	17
Certified SOLIDWORKS Associate (CSWA) Examination: SOLIDWORKS Corporation	39	16	Drafters, Engineering Technicians, and Mapping Technicians	\$60,320	1,973	63	174	62
Certified Veterinary Assistant Examination: American Allied Health (AAH)	6	5	Veterinary Assistants and Laboratory Animal Caretakers	\$26,750	720	169	114	37
Cisco IT Essentials, PC Hardware and Software End-of-Course Examination: Cisco Systems	3	3	Computer User Support Specialists	\$58,290	1,948	166	150	37
CIW (Certified Internet Webmaster) Professional Examinations: Certification Partners, LLC (Pass any one exam at this level or above)	0.2	0.2	Web Developers	\$88,850	478	70	39	9
CIW Site Development Associate Examination: Certification Partners, LLC	6	2	Web Developers	\$88,850	478	70	39	9
Collision Repair and Refinishing Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	15	9	Automotive Body and Related Repairers	\$53,060	556	52	56	18
Collision Repair Assessment: National Occupational Competency Testing Institute (NOCTI)	3	1	Automotive Body and Related Repairers	\$53,060	556	52	56	18
Commercial Foods Assessment: National Occupational Competency Testing Institute (NOCTI)	5	1	Food Preparation and Serving Related Occupations	\$24,280	51,115	6,013	8,776	3,632
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	76	47	Pest Control Workers	\$40,800	114	9	15	4
CompTIA IT Fundamentals Certification Examination: CompTIA	26	17	Computer User Support Specialists	\$58,290	1,948	166	150	37

CompTIA A+ Certification Examination (must pass both exams): CompTIA	17	10	Computer Hardware Engineers	\$119,500	1,384	140	96	26
CompTIA Network+ Examination: CompTIA	2	1	Computer Network Support Specialists	\$73,050	365	30	29	8
CompTIA Security + Examination: CompTIA	0.2	0.2	Computer Network Support Specialists	\$73,050	365	30	29	8
CompTIA Server+ Examination: CompTIA	0.2	0.2	Computer Network Support Specialists	\$73,050	365	30	29	8
Computer Networking Fundamentals Assessment: National Occupational Competency Testing Institute (NOCTI)	15	8	Computer Network Support Specialists	\$73,050	365	30	29	8
Computer Programming Assessment: National Occupational Competency Testing Institute (NOCTI)	2	1	Computer Programmers	\$94,470	299	(32)	15	5
Computer Repair Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	14	12	Computer User Support Specialists	\$58,290	1,948	166	150	37
CompTIA A+ 901 Examination	7	5	Computer User Support Specialists	\$58,290	1,948	166	150	37
Construction Masonry-Brick Assessment: National Occupational Competency Testing Institute (NOCTI)	2	1	Helpers--Construction Trades	\$31,340	2,315	215	327	94
Cosmetology Assessment: National Occupational Competency Testing Institute (NOCTI)	32	25	Personal Care and Service Occupations	\$27,580	28,592	6,735	4,331	1,891
Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	78	61	Hairdressers, Hairstylists, and Cosmetologists	\$34,250	2,167	224	263	137
Culinary Arts Prep Cook-Level 1 Assessment: National Occupational Competency Testing Institute (NOCTI)	17	12	Food Preparation and Serving Related Occupations	\$24,280	51,115	6,013	8,776	3,632
Culinary Arts Prep Cook-Level 2 Assessment: National Occupational Competency Testing Institute (NOCTI)	5	3	Chefs and Head Cooks	\$54,760	583	72	74	17
Dental Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	34	22	Dental Assistants	\$44,640	1,170	234	137	53
Diesel Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	14	10	Automotive Service Technicians and Mechanics	\$47,730	9,682	405	912	299
Early Childhood Education and Care, Basic Assessment: National Occupational Competency Testing Institute (NOCTI)	13	13	Childcare Workers	\$24,620	3,629	195	527	288
Electrical Construction Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	9	6	Helpers--Electricians	\$30,510	333	12	46	14
Electrical Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	9	5	Helpers--Electricians	\$30,510	333	12	46	14
Emergency Medical First Responder Certification: Department of Health, Office of EMS	3	1	Emergency Medical Technicians and Paramedics	\$35,310	816	104	54	13

Emergency Medical Technician Examination: Department of Health, Office of Emergency Medical Services	23	15	Emergency Medical Technicians and Paramedics	\$35,310	816	104	54	13
EPA Universal Examination (pass all three types): Environmental Protection Agency (EPA)	16	15	Environmental Science and Protection Technicians	\$47,150	336	28	39	13
Firefighter II Certification Examination: Virginia Department of Fire Programs	9	6	Fire Fighting and Prevention Workers	\$83,440	1,252	122	91	27
Fundamentals of Animal Science Certification Examination: Elanco (Exam is administered by iCEV)	2	2	Veterinary Assistants and Laboratory Animal Caretakers	\$26,750	720	169	114	37
Greenhouse Operators Certification Examination: Southeast Greenhouse Growers Association/Virginia Flower Growers Association	11	3	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	\$27,910	368	20	55	13
HBI/NAHB Carpentry Advanced Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	1	1	Helpers--Construction Trades	\$31,340	2,315	215	327	94
Health Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	3	1	Healthcare Support Occupations	\$32,680	17,325	3,389	2,092	892
Heating, Ventilation, Air Conditioning & Refrigeration (HVAC/R) Assessment: National Occupational Competency Testing Institute (NOCTI)	8	3	Heating, Air Conditioning, and Refrigeration Mechanics and I	\$50,210	2,115	216	212	56
IC3 Global Standard 5, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	4	4	Computer User Support Specialists	\$58,290	1,948	166	150	37
International Code Council Certificates of Achievement Examinations (Pass any one exam): International Code Council (ICC)	1	1	Construction and Building Inspectors	\$60,170	329	34	36	15
Manufacturing Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	2	1	Mechanical Drafters	\$59,000	753	55	64	21
MCP - MCSA: Cloud Platform (pass any two exams): Microsoft	0.4	0.4	Computer User Support Specialists	\$58,290	1,948	166	150	37
MCP - MCSA: Machine Learning (must pass both exams): Microsoft	0.4	0.4	Computer User Support Specialists	\$58,290	1,948	166	150	37
MCP - MCSA: SQL 2016 Database Administration (must pass two required exams): Microsoft	0.4	0.4	Computer Programmers	\$94,470	299	(32)	15	5
Mechanical Drafting and Design Assessment: National Competency Testing Institute (NOCTI)	11	7	Mechanical Drafters	\$59,000	753	55	64	21
Medical Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	0.2	0.2	Medical Assistants	\$35,010	1,884	473	220	72
MOS Excel Expert Level: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	0.2	0.2	Computer Operators	\$49,830	548	(136)	50	25

MOS Microsoft Office Expert Excel 2016/Certiport (only one exam)	0.2	0.2	Computer Operators	\$49,830	548	(136)	50	25
MOS Word Expert Level Examination: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	27	8	Word Processors and Typists	\$42,290	351	(148)	32	27
MTA Examination: Database Administration Fundamentals (98-364)	2	1	Computer User Support Specialists	\$58,290	1,948	166	150	37
MTA Examination: HTML5 Application Development Fundamentals (98-375)	0.2	0.2	Computer User Support Specialists	\$58,290	1,948	166	150	37
MTA Examination: Networking Fundamentals (98-366)	31	13	Computer User Support Specialists	\$58,290	1,948	166	150	37
MTA Examination: Windows OS Fundamentals (98-349)	13	5	Computer User Support Specialists	\$58,290	1,948	166	150	37
MTA Examination: Windows Server Administration Fundamentals (98-365)	2	0	Computer User Support Specialists	\$58,290	1,948	166	150	37
MTA Examination: Introduction to Programming using HTML & CSS (98-383)	3	1	Computer Programmers	\$94,470	299	(32)	15	5
National Nurse Aide Assessment Program (NNAAP) Examination: Virginia Board of Nursing	195	167	Nursing Assistants	\$28,770	8,338	1,377	988	464
Nursing Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	25	18	Nursing Assistants	\$28,770	8,338	1,377	988	464
ParaPro: Educational Testing Service (ETS)	5	5	Teacher Assistants	\$28,000	4,729	491	499	246
Pork Quality Assurance Certification	4	4	Farming, Fishing, and Forestry Occupations	\$36,230	2,622	219	369	94
Precision Machining Assessment: National Occupational Competency Testing Institute (NOCTI)	2	2	Production Occupations	\$38,390	35,053	(1,972)	3,839	1,500
Pre-Engineering/Engineering Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	3	1	Industrial Engineering Technicians	\$55,940	415	14	36	13
Principles of Floral Design Certification Examination: Benz School of Floral Design (exam is adm. by iCEV)	0.4	0.4	Floral Designers	\$29,760	665	(52)	58	25
Private Applicator Certification Examination: VA Dept. of Agriculture and Consumer Services	132	107	Pest Control Workers	\$40,800	114	9	15	4
ProStart Program End-of-Course Examination (Level 2): Education Foundation of the National Restaurant Association	17	16	Food Preparation and Serving Related Occupations	\$24,280	51,115	6,013	8,776	3,632
Retail Merchandising Assessment: National Occupational Competency Testing Institute (NOCTI)	3	1	Sales and Related Occupations	\$41,140	56,022	2,159	7,878	1,496
ServSafe Manager Certification Examination: National Restaurant Association	104	67	Food Preparation and Serving Related Occupations	\$24,280	51,115	6,013	8,776	3,632
Small Animal Care Examination New York Dept.. of Education (Cornell Univ.)	25	21	Animal Care and Service Workers	\$27,720	1,306	216	198	81

Small Animal Science and Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	55	46	Animal Care and Service Workers	\$27,720	1,306	216	198	81
Small Engine Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	9	2	Outdoor Power Equipment and Other Small Engine Mechanics	\$37,810	490	41	52	19
Technical Drafting Assessment: National Occupational Competency Testing Institute	19	16	Mechanical Drafters	\$59,000	753	55	64	21
Television Production Assessment: National Occupational Competency Testing Institute (NOCTI)	19	15	Production Occupations	\$38,390	35,053	(1,972)	3,839	1,500
Visual Communications and Multimedia Design Assessment: National Occupational Competency Testing Institute (NOCTI)	4	3	Media and Communication Equipment Workers	\$93,390	363	41	33	12
Welding Assessment: National Occupational Competency Testing Institute (NOCTI)	15	8	Welders, Cutters, Solderers, and Brazers	\$46,360	1,183	37	126	31

Research Question 4: What is the potential economic impact for the state if the number of CTE students earning industry credentials were to increase by 10% annually?

To determine the economic impact for the Commonwealth of Virginia if the number of CTE students earning industry credentials in Superintendent Region Five were to increase 10% annually, each of the 111 different industry credentials aligned with an occupation in Table 90, was calculated to determine its growth of 10% annually. These results were then used to determine the income tax associated with that credential and occupation. Table 90 provides a breakout, by year, of the potential income tax revenue the Commonwealth of Virginia could potentially see if the number of completer students earning industry credentials in Superintendent Region Five was to increase by 10% annually.

Table 90

Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually

Region Five	Credential *10%	Compound Credentials	Income Tax Due	Compound Income Tax
Year 1	143	1,576	\$ 3,334,706.01	\$ 4,738,135.26
Year 2	158	1,734	\$ 3,668,176.61	\$ 8,406,311.88
Year 3	173	1,907	\$ 4,034,994.28	\$ 12,441,306.15
Year 4	191	2,098	\$ 4,438,493.70	\$ 16,879,799.86
Year 5	210	2,308	\$ 4,882,343.07	\$ 21,762,142.93

Credential numbers are rounded

A component of this study was a survey distributed to 40 representatives of Virginia's economy to determine the value added to the earning of industry credentials. Eighteen respondents indicated a candidate applying for a position in their company/organization, as a holder of industry credentials, would enter the company at a larger starting salary than a non-credentialed candidate. The range of the increased starting salary was between 5% and 25%. Using the average of these numbers, 14% could be used as the value-added to the earning of

industry credentials, however, to ensure this study creates a floor rather than a ceiling of value, 10% will be used as the value-added to those earning industry credentials.

Table 91 presents the projected data of Superintendent Region Five completers if their number were to increase by 10% annually. Data in the table also shows the new potential income tax revenue available to Virginia's Treasury if the 10% value-added sum is applied to the projected economic impact of the earning of CTE industry credentials on Virginia's economy.

Table 91

Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually - AND Allows a 10% Increase in Beginning Salary

Region Five	Credential *10%	Compound Credentials	Income Tax Due	Compound Income Tax
Year 1	143	1,576	\$ 3,708,763.35	\$ 5,266,826.77
Year 2	158	1,734	\$ 4,079,639.68	\$ 9,346,466.46
Year 3	173	1,907	\$ 4,487,603.65	\$ 13,834,070.11
Year 4	191	2,098	\$ 4,936,364.02	\$ 18,770,434.13
Year 5	210	2,308	\$ 5,430,000.42	\$ 24,200,434.55

Credential numbers are rounded

Region Six: Western Virginia

Western Virginia, as Superintendent Region 6, consists of 15 school divisions, comprising among its number 38 high schools (including specialist technical centers). Of the 8 Superintendent regions, this region lists 5th in the number of high schools available to its students (VDOE, 2020).

Table 92

VDOE Superintendent Region 6: Western Virginia

Alleghany County	Floyd County	Patrick County
Botetourt County	Franklin County	Pittsylvania County
Covington	Henry County	Roanoke
Cumberland County	Martinsville	Roanoke County
Danville	Montgomery County	Salem

Source: Commonwealth of Virginia, Department of Education Superintendent's Regions, http://www.doe.virginia.gov/directories/va_region_map.pdf

Data in Table 93 presents the alignment of the school divisions in Superintendent Region Six to the Local Workforce Investment Area (LWIA) regions. This data was created by the Demographics group at the Weldon Cooper Center for Public Service at the University of Virginia to help administrators and teachers in completing the “Application for Career and Technical Education New Program/Course in 2019. The LWIA’s were designated by the Workforce Innovation and Opportunity Act (WIOA) State Plan for the Commonwealth of Virginia (TrailBlazers, 2019). The alignment of the superintendent region to the LWIA region undergirds the findings of this study.

Table 93

Local Workforce Investment Areas (LWIAs) in Virginia by VDOE Superintendent Region

Region 6: Western Virginia	LWIA Region
Alleghany County	LWIA III - Western Virginia
Botetourt County	LWIA III - Western Virginia

Covington	LWIA III - Western Virginia
Craig County	LWIA III - Western Virginia
Danville	LWIA XVII - West Piedmont
Floyd County	LWIA II - New River/Mt. Rogers
Franklin County	LWIA III - Western Virginia
Henry County	LWIA XVII - West Piedmont
Martinsville	LWIA XVII - West Piedmont
Montgomery County	LWIA II - New River/Mt. Rogers
Patrick County	LWIA XVII - West Piedmont
Pittsylvania County	LWIA XVII - West Piedmont
Roanoke	LWIA III - Western Virginia
Roanoke County	LWIA III - Western Virginia
Salem	LWIA III - Western Virginia

Source: School Report Card Data: Year 2016-2017

http://www.doe.virginia.gov/instruction/career_technical/path_industry_certification/index.shtml

Virginia Department Of Education, School Report Card Data for School Year: 2015 - 2016

Local Workforce Investment Areas (LWIAs) in Virginia

Research Question 1: What is the trend for high school participation in CTE programs in Virginia (Region Six), over the past five years?

In order to determine the average number of high school CTE completer students in Region Six, over the last five years, data retrieved from the VDOE's Office of Education Information Management (2019). Data in Table 94 presents the number of completers by year, then when averaged out over five years. By examining this table, it is possible to observe the specific number of CTE completer students in this region, and whether the number has increased, decreased or remained the same.

Table 94

Number of CTE Completers in Region Six: 2014-2019

Year	Total Completers	5 Year Avg Completers
2014-2015	3,494	699
2015-2016	3,537	707
2016-2017	3,287	657
2017-2018	3,331	666
2018-2019	3,465	693
TOTAL	17,114	3,423

Source: Completer data by region retrieved from Virginia Department of Education, Office of Education Information Management, (2019).

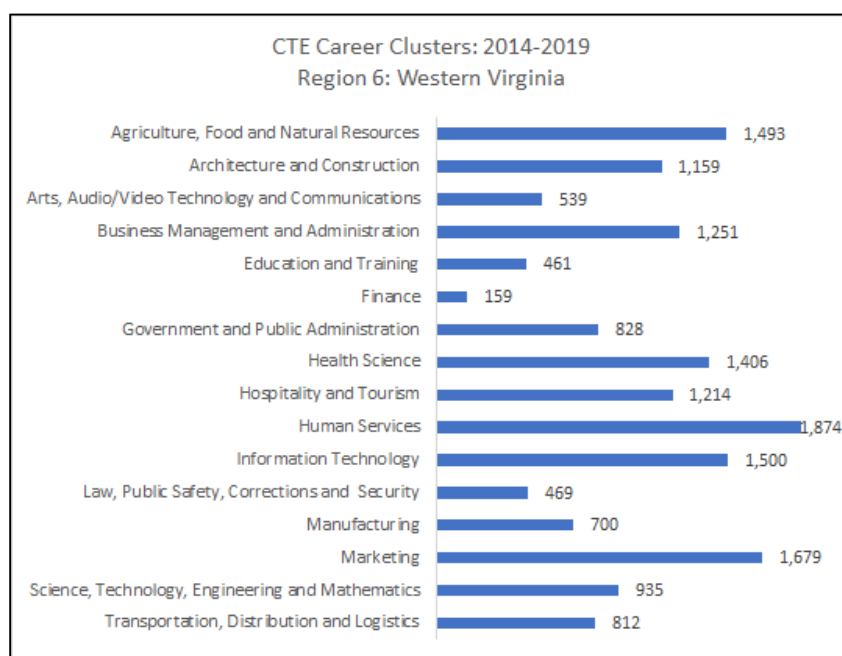
Research Question 2: What is the trend for high school completer students earning industry certifications in Virginia (Region Six), over the past five years?

To enable school administration to organize curriculum design, and career counselors to provide the necessary guidance to students, the Virginia Department of Education groups CTE programs and courses in a “Career Cluster.” According to the VDOE (2020), these career clusters help to:

- Organize academic and technical knowledge and skills into a coherent sequence
- Identify pathways from secondary to postsecondary education
- Provide a framework for seamless education
- Provide institutional support of rigorous academic teaching and learning
- Provide alignment of academic and technical skills with workplace readiness skills
- Provide opportunities to involve parents, business and industry, and the school community
- Provide the development of effective plans of study that are based on career assessments

Using data drawn from the Weldon-Cooper Center for Public Service: CTE Completer Data: 2014-2019, over five years, Region Six: Central Virginia CTE completer students are seen to favor the Human Services cluster (1,874), with the least numerous cluster of Finance reflecting 159 completer students.

Figure 14 CTE Career Clusters in Region Six: 2014-2019



Source: Weldon-Cooper Center for Public Service: CTE Completer Data: 2014-2019

Using industry credential test data provided by the *Virginia Department of Education, Office of Education Information Management, (2019)*, data were disaggregated using SPSS. Disaggregation was used to determine the credential type earned, the number of students taking and earning the credential, and what this looks like over a five-year average. Because this study aims to determine the relationship between the earning of Career and Technical industry credentials and the Virginia economy, the superintendent region in which these industry credentials were earned is the primary format of Table 95. Further, because the focus of this study is on CTE completers, the data was analyzed to determine which of the credentials earned would be the final steps in the completer process. The disaggregated data demonstrating the “completer industry credentials earned by Region Six CTE students: 2014-2019” is presented in Table 95.

Table 95

Region Six: Industry Credentials Taken and Passed: 2014-2019- "Completers"

Industry Credential Assessments & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
AAFCS: Culinary Arts Examination	39	20	8	4
AAFCS: Early Childhood Education Examination	42	38	8	8
AAFCS: Education Fundamentals Examination	18	10	4	2
AAFCS: Nutrition, Food and Wellness Examination	217	84	43	17
Accounting (Basic) Assessment: National Occupational Competency Testing Institute (NOCTI)	155	46	31	9
Accounting--Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	12	10	2	2
Administrative Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	33	20	7	4
Adobe Certified Associate: Dreamweaver CS5 Examination/Certiport	36	26	7	5
Adobe Certified Associate: Photoshop Cloud 2015 Examination/Certiport	12	1	2	0
Adobe Certified Associate: Photoshop CS3 Examination/Certiport	7	7	1	1
Adobe Certified Associate: Photoshop CS5 Examination/Certiport	26	8	5	2
Adobe Certified Associate: Photoshop CS6 Examination/Certiport	22	14	4	3
Adobe Certified Associate: Dreamweaver 2018 Examination/Certiport	1	1	0	0
Adobe Certified Associate: Dreamweaver CS6 Examination/Certiport	11	11	2	2
Adobe Certified Associate: Illustrator CS6 Examination/Certiport	8	8	2	2
Advanced Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	97	74	19	15
Advertising and Design Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	0	0
Architectural Certified Drafter Examination: American Design Drafting Association (ADDA)	18	17	4	3
ASE Auto Maintenance and Light Repair Examination (G1): National Institute for Automotive Service Excellence	137	86	27	17
ASE Automotive & Light Truck Certification Test-Automatic Transmission/Transaxle (A2): National Institute for Automotive Service Excellence	9	9	2	2
ASE Automotive & Light Truck Certification Test-Brakes (A5): National Institute for Automotive Service Excellence	223	102	45	20
ASE Automotive & Light Truck Certification Test-Electrical/Electronic Systems (A6): National Institute for Automotive Service Excellence	89	68	18	14
ASE Automotive & Light Truck Certification Test-Engine Performance (A8): National Institute for Automotive Service Excellence	74	51	15	10
ASE Automotive & Light Truck Certification Test-Engine Repair (A1): National Institute for Automotive Service Excellence	93	71	19	14
ASE Automotive & Light Truck Certification Test-Heating and Air Conditioning (A7): National Institute for Automotive Service Excellence	40	34	8	7
ASE Automotive & Light Truck Certification Test-Manual Drive Train and Axles (A3): National Institute for Automotive Service Excellence	26	24	5	5
ASE Automotive & Light Truck Certification Test-Suspension & Steering (A4): National Institute for Automotive Service Excellence	188	92	38	18

ASE Collision Repair & Refinish Certification Test - Structural Analysis & Damage Repair: National Institute for Automotive Service Excellence	10	5	2	1
ASE Collision Repair and Refinish Certification Test - NonStructural Analysis & Damage Repair (B3): National Institute for Automotive Service Excellence	49	24	10	5
ASE Collision Repair and Refinish Certification Test - Painting & Refinishing (B2): National Institute for Automotive Service Excellence	64	14	13	3
ASE Student Certification Automotive: Electrical/Electronic Systems: National Institute for Automotive Service Excellence	115	73	23	15
ASE Student Certification Automotive: Engine Performance: National Institute for Automotive Service Excellence	162	92	32	18
ASE Student Certification Automotive: Engine Repair: National Institute for Automotive Service Excellence	236	155	47	31
ASE Student Certification Automotive: Heating and Air Conditioning: National Institute for Automotive Service Excellence	115	82	23	16
ASE Student Certification Automotive: Maintenance and Light Repair: National Institute for Automotive Service Excellence	376	232	75	46
ASE Student Certification Automotive: Manual Drive Train and Axles: National Institute for Automotive Service Excellence	52	28	10	6
ASE Student Certification Automotive: Automatic Transmission/Transaxle: National Institute for Automotive Service Excellence	18	12	4	2
ASE Student Certification Automotive: Automotive Service Technology National Institute for Automotive Service Excellence	71	53	14	11
ASE Student Certification Automotive: Brakes: National Institute for Automotive Service Excellence	278	185	56	37
ASE Student Certification Automotive: Suspension and Steering: National Institute for Automotive Service Excellence	244	120	49	24
ASE Student Certification Collision Repair & Refinish: Non-structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	124	99	25	20
ASE Student Certification Collision Repair & Refinish: Painting and Refinishing: National Institute for Automotive Service Excellence	133	100	27	20
ASE Student Certification Collision Repair & Refinish: Structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	1	1	0	0
ASK Fundamental Marketing Concepts Assessment: ASK Business Institute	16	1	3	0
AutoCAD Certified User: Autodesk	65	41	13	8
Autodesk Inventor Certified Professional Examination: Autodesk	1	1	0	0
Autodesk Inventor Certified User: Autodesk	61	61	12	12
Autodesk Revit Certified Professional Examination: Autodesk	42	42	8	8
Beef Quality Assurance Certification	158	135	32	27
BrainBench Web Design and Development Examinations	81	70	16	14
CAD Assessment: National Occupational Competency Testing Institute (NOCTI)	18	2	4	0
Carpentry Assessment: National Occupational Competency Testing Institute (NOCTI)	52	17	10	3
Certified Dental Assistant and National Entry Level Assistant: Infection Control (ICE) Examination: Dental Assisting National Board	4	4	1	1
Certified Dental Assistant and National Entry Level Assistant: Radiation Health & Safety (RHS) Examination: Dental Assisting National Board	52	34	10	7

Certified Inpatient Coder (CIC) Examination: American Academy of Professional Coders (AAPC)	1	1	0	0
Certified SolidWorks Associate (CSWA) Examination: SolidWorks Corporation	36	19	7	4
Certified Veterinary Assistant Examination: Texas Veterinary Medical Association	3	3	1	1
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	247	219	49	44
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	63	58	13	12
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	50	49	10	10
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	18	12	4	2
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	14	11	3	2
CompTIA IT Fundamentals Certification Examination: CompTIA	56	39	11	8
CompTIA A+ Certification Examination (must pass both exams): CompTIA	39	30	8	6
CompTIA Network+ Examination: CompTIA	4	4	1	1
Computer Programming Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	0	0
Computer Repair Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	14	11	3	2
CompTIA A+ 901 Examination	15	11	3	2
Construction Masonry-Brick Assessment: National Occupational Competency Testing Institute (NOCTI)	63	43	13	9
Cosmetology Assessment: National Occupational Competency Testing Institute (NOCTI)	75	59	15	12
Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	333	236	67	47
Culinary Arts Prep Cook-Level 1 Assessment: National Occupational Competency Testing Institute (NOCTI)	231	210	46	42
Culinary Arts Prep Cook-Level 2 Assessment: National Occupational Competency Testing Institute (NOCTI)	66	57	13	11
Early Childhood Development and Services Assessment: National Occupational Competency Testing Institute (NOCTI)	6	6	1	1
Early Childhood Education and Care, Basic Assessment: National Occupational Competency Testing Institute (NOCTI)	139	135	28	27
Electrical Construction Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	27	8	5	2
Electronics Assessment: National Occupational Competency Testing Institute (NOCTI)	76	67	15	13
Emergency Medical Technician Examination: Department of Health, Office of Emergency Medical Services	75	26	15	5
EPA Universal Examination (pass all three types): Environmental Protection Agency (EPA)	123	87	25	17
Equine Science Examination – New York State Department of Education (Cornell University)	57	49	11	10
Floriculture Assessment: National Occupational Competency Testing Institute (NOCTI)	35	35	7	7
Graphic Production Technology Assessment: National Occupational Competency Testing Institute	20	20	4	4

Greenhouse Operators Certification Examination: Southeast Greenhouse Growers Association/Virginia Flower Growers Association	32	22	6	4
Health Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	171	134	34	27
Horticulture Landscaping Assessment: National Occupational Competency Testing Institute (NOCTI)	35	10	7	2
HVAC (EPA) Technician Examinations (Levels: Core, I, II, or III): Environmental Protection Agency	84	76	17	15
IC3 Global Standard 5, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	17	7	3	1
MCP - MCSA: Microsoft Dynamics 365 for Operations (must pass two required exams): Microsoft	1	1	0	0
Mechanical Certified Drafter Examination: American Design Drafting Association (ADDA)	48	44	10	9
MOS 2016 Master/Certiport (must pass four exams)	10	10	2	2
MOS Examinations (Advanced level): Microsoft Office Specialist/Certiport (Pass any one exam at this level)	14	14	3	3
MOS Excel Expert Examination: Microsoft Office 2007	95	78	19	16
MOS Excel Expert Examination: Microsoft Office 2010	12	11	2	2
MOS Excel Expert Level: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	3	3	1	1
MOS Microsoft Office Expert 2013/Certiport (must pass both Word & Excel at expert levels)	18	18	4	4
MOS Microsoft Office Expert Excel 2016/Certiport (only one exam)	14	8	3	2
MOS Word Expert Examination: Microsoft Office 2007/Certiport	169	163	34	33
MOS Word Expert Examination: Microsoft Office 2010/Certiport	29	21	6	4
MOS Word Expert Examination: Microsoft Office 2016/Certiport	105	61	21	12
MOS Word Expert Level Examination: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	112	41	22	8
MTA Examination: .NET Fundamentals (98-372)	1	1	0	0
MTA Examination: Database Administration Fundamentals (98-364)	13	11	3	2
MTA Examination: Mobility and Device Fundamentals (98-368)	16	2	3	0
MTA Examination: Networking Fundamentals (98-366)	121	92	24	18
MTA Examination: Security Fundamentals (98-367)	134	66	27	13
MTA Examination: Software Development Fundamentals (98-361)	79	10	16	2
MTA Examination: Windows OS Fundamentals (98-349)	78	66	16	13
MTA Examination: Introduction to Programming using HTML & CSS (98-383)	64	35	13	7
MTA Examination: Introduction to Programming using Java (98-388)	37	10	7	2
MTA Examination: Introduction to Programming using JavaScript (98-382)	10	5	2	1
MTA Examination: Introduction to Programming using Python (98-381)	34	13	7	3
MTA Examination: Introduction to Programming with Block-Based Languages (98-380)	54	22	11	4
National Nurse Aide Assessment Program (NNAAP) Examination: Virginia Board of Nursing	664	591	133	118
Network Pro Certification Examination: Test Out Corporation (TOC)	2	2	0	0
ParaPro: Educational Testing Service (ETS)	95	81	19	16
PC Pro Certification Examination: Test Out Corporation (TOC)	135	123	27	25

Precision Machining Assessment: National Occupational Competency Testing Institute (NOCTI)	30	22	6	4
Pre-Engineering/Engineering Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	185	102	37	20
Private Applicator Certification Examination: VA Dept. of Agriculture and Consumer Services	572	401	114	80
Production Agriculture Assessment: National Occupational Competency Testing Institute (NOCTI)	29	9	6	2
ProStart Program End-of-Course Examination (Level 2): Education Foundation of the National Restaurant Association	40	23	8	5
Retail Merchandising Assessment: National Occupational Competency Testing Institute (NOCTI)	58	37	12	7
Security Pro Certification Examination: Test Out Corporation (TOC)	41	41	8	8
ServSafe Manager Certification Examination: National Restaurant Association	1,116	970	223	194
Small Animal Care Examination New York Dept.. of Education (Cornell Univ.)	225	200	45	40
Small Animal Science and Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	150	98	30	20
Small Engine Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	202	67	40	13
Television Production Assessment: National Occupational Competency Testing Institute (NOCTI)	140	75	28	15
Veterinary Medical Applications Certification Examination: Elanco (exam is adm. by iCEV)	26	20	5	4
Welding Assessment: National Occupational Competency Testing Institute (NOCTI)	108	78	22	16
TOTAL	11,547	8,117	2,309	1,623

Because a full picture of the industry credentialing test data is needed to determine trends in the earning of industry certifications in Region Six, one must be aware of the data for those currently on their CTE pathway, as seen in Table 96. Students earning credentials in this table are currently on a CTE program, as seen in the as seen in the “certification,” “pre-apprentice,” or “other” pathway certifications, and non-CTE specific certifications. Although the data from this table is not included in the final calculation to determine economic impact, this does not negate their value or economic potential. This study focuses on completer students.

Table 96

“Other” industry credentials earned by Region Six CTE students, 2014-2019

“Other” Industry Credential Assessment & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
AAFCS: Broad Field Family and Consumer Sciences Examination	111	59	22	12
Animal Systems Assessment: National Occupational Competency Testing Institute (NOCTI)	199	79	40	16
Briggs & Stratton Master Service Technician Program Examination	26	17	5	3
Core: Introductory Craft Skills Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	140	122	28	24
Criminal Justice Assessment: National Occupational Competency Testing Institute (NOCTI)	339	297	68	59
Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	1,351	1,135	270	227
Education and Training Assessment: National Occupational Competency Testing Institute (NOCTI)	44	25	9	5
Electrician Level One - Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	17	17	3	3
EPA Technician Examination (Core): Environmental Protection Agency (EPA)	138	108	28	22
EPA Technician Examination (Type I): Environmental Protection Agency (EPA)	138	88	28	18
EPA Technician Examination (Type II): Environmental Protection Agency (EPA)	126	66	25	13
EPA Technician Examination (Type III): Environmental Protection Agency (EPA)	119	48	24	10
General Management Assessment: National Occupational Competency Testing Institute (NOCTI)	372	248	74	50
HBI/NAHB Carpentry Basic Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	28	8	6	2
IC3 Spark, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	32	10	6	2
Manufacturing Specialist Certification: Manufacturing Skills Institute	8	8	2	2
MOS Access Examination: Microsoft Office 2016/Certiport	114	72	23	14
MOS Access Examination: Microsoft Office 2010/Certiport	14	14	3	3
MOS Access Examination: Microsoft Office 2013/Certiport	200	137	40	27
MOS Excel Examination: Microsoft Office 2013/Certiport	903	651	181	130
MOS Excel Examination: Microsoft Office 2010/Certiport	177	105	35	21
MOS Excel Examination: Microsoft Office 2016/Certiport	498	277	100	55
MOS One Note Examination: Microsoft Office 2013/Certiport	300	176	60	35
MOS Outlook Examination: Microsoft Office 2013/Certiport	56	55	11	11
MOS Outlook Examination: Microsoft Office 2016/Certiport	41	36	8	7
MOS PowerPoint Examination: Microsoft Office 2013/Certiport	1,867	1,573	373	315
MOS PowerPoint Examination: Microsoft Office 2007/Certiport	65	57	13	11
MOS PowerPoint Examination: Microsoft Office 2010/Certiport	471	421	94	84

MOS PowerPoint Examination: Microsoft Office 2016/Certiport	1,156	766	231	153
MOS SharePoint Examination: Microsoft Office 2013/Certiport	1	1	0	0
MOS Word Examination: Microsoft Office 2010/Certiport	266	249	53	50
MOS Word Examination: Microsoft Office 2013/Certiport	1,657	1,377	331	275
MOS Word Examination: Microsoft Office 2007/Certiport	130	102	26	20
MOS Word Examination: Microsoft Office 2016/Certiport	1,339	892	268	178
MOS Word Examination: Microsoft Office Specialist/Certiport	1	1	0	0
National Health Science Assessment: National Consortium for Health Science Education (Administered by Precision Exams)	223	207	45	41
Natural Resource Systems Assessment: National Occupational Competency Testing Institute (NOCTI)	163	137	33	27
NCCT (HVAC), National Construction Career Test: National Center for Construction Education & Research (NCCER)	11	11	2	2
NCCT Carpentry Level One, National Construction Career Test: National Center for Construction Education and Research (NCCER)	6	6	1	1
NCCT Core: Introductory Craft Skills, National Construction Career Test: National Center for Construction Education & Research (NCCER)	172	162	34	32
NCCT Electrical Examination, National Construction Career Test: National Center for Construction Education & Research (NCCER)	18	18	4	4
NCCT Welding Examination, National Construction Career Test: National Center for Construction Education & Research (NCCER)	72	67	14	13
NIMS Machining - Level I - CNC Lathe Operations: National Institute for Metalworking Skills, Inc.	17	17	3	3
NIMS Machining - Level I - Milling I: National Institute for Metalworking Skills, Inc.	10	10	2	2
NIMS Machining - Level I - Turning I Between Centers: National Institute for Metalworking Skills, Inc.	32	20	6	4
NIMS Machining - Level I - Measurement, Materials, & Safety Skills: National Institute for Metalworking Skills, Inc.	101	91	20	18
PLTW Examination: Introduction to Engineering Design: Project Lead the Way (PLTW)	274	229	55	46
PLTW Examination: Principles of Engineering: Project Lead the Way (PLTW)	18	16	4	3
Pre-Engineering Industry Certification Examination: Robotics Education Competition Foundation (RECF)	23	1	5	0
ProStart Program End-of-Course Examination (Level 1): Education Foundation of the National Restaurant Association	29	27	6	5
Recreation, Amusements, and Attractions Assessment: National Occupational Competency Testing Institute (NOCTI)	403	252	81	50
SENSE Training Program Certification Examination: American Welding Society (AWS)	99	97	20	19
SkillsUSA: Carpentry Examination	62	39	12	8
SkillsUSA: Customer Service Examination	241	162	48	32
SkillsUSA: Photography Examination	26	12	5	2
SkillsUSA: Welding Examination	47	40	9	8
SkillsUSA: Introduction to Graphic Communications Examination (PrintED co-brand)	26	12	5	2
Welding Level One Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	43	42	9	8
TOTAL	14,560	10,972	2,912	2,194

As a final measure to determine the trend for the earning of CTE industry credentials at the high school level in Region Six, Table 97 presents the data specific to “Soft skills/College & Career Readiness” certifications. Because these certifications are included in the VDOE approved list of industry certifications, they are included in the industry credential test data provided by the Virginia Department of Education, Office of Education Information Management (VDOE, 2019). The value of this data lies in its relationship to the overall earning of industry credentials by high school students in Region Six, and the bigger picture when determining any trend.

Table 97

Soft skills/College & Career Readiness industry credentials earned in Region Six: 2014-2019

“Soft skills/College & Career Readiness” Assessments & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
Armed Services Vocational Aptitude Battery Examination: United States Military Entrance Processing Command	1,385	735	277	147
National Career Readiness Certificate (ACT)	1,752	1,527	350	305
W!SE Financial Literacy Certification: Working in Support of Education (W!SE)	23,890	19,036	4,778	3,807
Workplace Readiness Skills for the Commonwealth Examination	18,293	13,866	3,659	2,773
TOTAL	45,320	35,164	5,665	7,033

To determine the trend for high school completer students earning industry credentials in Region Six over the past five years, a finalized set of summarized data can be seen in Table 98. These data present the number of students who have earned a CTE industry credential approved by Virginia’s Board of Education. The three categories of assessment type are represented in Table 98 and present the five year total, and five-year average number of earned (a) “technical” credentials (sufficient for a student to successfully end their completer program); (b) “other”

assessments taken where students are on the CTE path, working towards certifications; and (c), the “Soft skills/College & Career Readiness” certifications.

Table 98

Total Number of Industry Certifications Earned in Region Six: 2014-2019

Industry Credential Assessment & Type	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
"Technical" Completer Certifications	11,547	8,117	2,309	1,623
"Other" CTE certifications - pathway/level one/PLTW/Skills USA	14,560	10,972	2,912	2,194
“Soft skills/College & Career Readiness” certifications.	45,320	35,164	5,665	7,033
TOTAL	71,427	54,253	14,285	10,851

Research Question 3: What are the potential earnings for students gaining industry credentials in Virginia’s (Region Six) labor market?

To determine the potential earning for students gaining industry credentials in Virginia’s labor market, it is crucial to understand the labor market’s occupational openings by educational attainment level. Through the review of these data, one can examine the extent to which Region Six students are entering a labor market saturated with similarly qualified candidates, or into the market with high-demand, high-salary openings. Data in Table 99, as extracted from the Bureau of Labor Statistics and the Virginia Employment Commission projection to 2026, show the probable occupational openings by education level attainment for Region Six as a whole.

Table 99

Occupational Openings by Education Attainment Level to 2026 – Region Six

Region 6 – Western Virginia	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Associate's Degree	6,118	616	537	165
Bachelor’s Degree	20,129	2,111	1,750	555
Doctoral or Professional Degree	3,272	364	204	83
High School Diploma or Equivalent	89,894	3,436	9,658	3,936
Less Than High School	68,962	9,029	10,398	4,447
Master's Degree	3,290	609	311	95
Not Applicable	522,325	40,220	59,333	23,971

Postsecondary Non-Degree Award	8,342	719	755	283
Some College, No Degree	123	17	21	8
TOTAL	722,455	57,121	82,967	33,543

Source: May 2018 State Occupational Employment and Wage Estimates,
https://www.bls.gov/oes/current/oes_va.htm#00-0000

While data in Table 99 specify occupations in the “Not Applicable” category as the largest group to access to occupational openings, a precise definition of the education included in that category is not available. The second-largest estimated category in labor market openings is found in the “High School Diploma or Equivalent” category. However, when the “Not Applicable” category is removed from the data, along with “Less than High School” as in Table 100, numbers show that the two categories of education with greater access to projected employment are those with “High School Diploma or Equivalent” and “Bachelor’s Degree.”

Table 100

Occupational Openings by Education Attainment Level – Region 6 - "Less than High School" and "Not Applicable" removed

Region 6 – Western Virginia	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Associate's Degree	6,118	616	537	165
Bachelor's Degree	20,129	2,111	1,750	555
Doctoral or Professional Degree	3,272	364	204	83
High School Diploma or Equivalent	89,894	3,436	9,658	3,936
Master's Degree	3,290	609	311	95
Postsecondary Non-Degree Award	8,342	719	755	283
Some College, No Degree	123	17	21	8
TOTAL	131,168	7,872	13,236	5,125

Source: May 2018 State Occupational Employment and Wage Estimates,
https://www.bls.gov/oes/current/oes_va.htm#00-0000

Data presented in Table 101 show the occupations available to Region Six CTE completer students who have earned a series of industry credentials. These data present the estimated mean salary expected, the projected occupational openings to 2026 of that particular occupation, the number of annual openings, and annual exits. Data included in this table show completer data specifically and does not include those who are currently enrolled in a CTE

pathway, or who have completed credentials with a career readiness focus. The data in Table 101 brings together data points from:

- a) *Region Six: Industry Credentials Taken and Passed: 2014-2019 – Completers* (see Table 95). Data from this source is seen in the columns “Assessment,” “Taken 5 Yr. Avg.” and “Pass 5 Yr. Avg.”
- b) Bureau of Labor Statistics *May 2019 State Occupational Employment and Wage Estimates: Virginia* (Bureau of Labor Statistics, 2020). Data from this source is seen in the columns “Occupation” and “Mean Annual Salary.”
- c) TrailBlazers: Career and Technical Education in Virginia (TrailBlazers, 2020). Labor market data for region LWIA III: Western Virginia (TrailBlazers, 2020), and for LWIA XVII: West Piedmont South Central (TrailBlazers, 2020), is seen in columns: “Occupation,” “Projected Employment,” “Numeric Change,” “Annual Openings,” and “Annual Exits.”

Table 101

CTE Industry Credential to Occupational Alignment and Projections – Region Six: LWIA III, XVII

Assessment	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.	Occupation	Mean Annual Wage	Projected Employment	Numeric Change	Annual Openings	Annual Exits
AAFCS: Culinary Arts Examination	8	4	Food Preparation and Serving Related Occupations	\$24,280	21,434	2,105	3,712	1,561
AAFCS: Early Childhood Education Examination	8	8	Preschool Teachers, Except Special Education	\$37,880	459	54	47	19
AAFCS: Education Fundamentals Examination	4	2	Teacher Assistants	\$28,000	2,132	228	226	111
AAFCS: Nutrition, Food and Wellness Examination	43	17	Dietetic Technicians	\$32,430	284	27	24	9
Accounting (Basic) Assessment: National Occupational Competency Testing Institute (NOCTI)	31	9	Financial Clerks	\$40,410	5,324	66	575	281
Accounting--Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	2	2	Accountants and Auditors	\$85,640	1,859	186	173	53
Administrative Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	7	4	Office and Administrative Support Occupations	\$39,030	37,530	1,284	4,246	1,879
Adobe Certified Associate: Dreamweaver CS5 Examination/Certiport	7	5	Web Developers	\$88,850	4,545	667	361	80
Adobe Certified Associate: Photoshop Cloud 2015 Examination/Certiport	2	0	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	2,788	159	275	105
Adobe Certified Associate: Photoshop CS3 Examination/Certiport	1	1	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	2,788	159	275	105
Adobe Certified Associate: Photoshop CS5 Examination/Certiport	5	2	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	2,788	159	275	105
Adobe Certified Associate: Photoshop CS6 Examination/Certiport	4	3	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	2,788	159	275	105
Adobe Certified Associate: Dreamweaver 2018 Examination/Certiport	0.2	0.2	Web Developers	\$88,850	4,545	667	361	80
Adobe Certified Associate: Dreamweaver CS6 Examination/Certiport	2	2	Web Developers	\$88,850	4,545	667	361	80
Adobe Certified Associate: Illustrator CS6 Examination/Certiport	2	2	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	2,788	159	275	105
Advanced Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	19	15	Sales and Related Occupations	\$41,140	25,779	740	3,588	1,537
Advertising and Design Assessment: National Occupational Competency Testing Institute (NOCTI)	0.2	0.2	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	2,788	159	275	105

Architectural Certified Drafter Examination: American Design Drafting Association (ADDA)	4	3	Mechanical Drafters	\$59,000	753	55	64	21
ASE Auto Maintenance and Light Repair Examination (G1): National Institute for Automotive Service Excellence	27	17	Automotive Service Technicians and Mechanics	\$47,730	9,682	405	912	299
ASE Automotive & Light Truck Certification Test-Engine Repair (A1); Automatic Transmission/Transaxle (A2); Manual Drive Train and Axles (A3); Suspension & Steering (A4); Brakes (A5); Electrical/Electronic Systems (A6); Heating and Air Conditioning (A7); Engine Performance (A8) National Institute for Automotive Service Excellence	93	56	Automotive Service Technicians and Mechanics	\$47,730	9,682	405	912	299
ASE Collision Repair & Refinish Certification Test - Structural Analysis & Damage Repair; Painting & Refinishing (B2); Nonstructural Analysis & Damage Repair (B3) National Institute for Automotive Service Excellence	41	14	Automotive Body and Related Repairers	\$53,060	292	24	27	9
ASE Student Certification Automotive: Electrical/Electronic Systems; Engine Performance; Engine Repair; Heating and Air Conditioning; Maintenance and Light Repair; Manual Drive Train and Axles; Automatic Transmission/Transaxle; Automotive Service Technology; Brakes; Suspension and Steering; National Institute for Automotive Service Excellence	167	103	Automotive Service Technicians and Mechanics	\$47,730	9,682	405	912	299
ASE Student Certification Collision Repair & Refinish: Non-structural Analysis and Damage Repair; Painting and Refinishing; Structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	86	67	Automotive Service Technicians and Mechanics	\$47,730	9,682	405	912	299
ASK Fundamental Marketing Concepts Assessment: ASK Business Institute	3	0	Sales and Related Occupations	\$41,140	25,779	740	3,588	1,537
AutoCAD Certified User: Autodesk	13	8	Mechanical Drafters	\$59,000	753	55	64	21
Autodesk Inventor Certified Professional Examination: Autodesk	0.2	0.2	Mechanical Drafters	\$59,000	753	55	64	21
Autodesk Inventor Certified User: Autodesk	12	12	Drafters, Engineering Technicians, and Mapping Technicians	\$60,320	689	32	61	21
Autodesk Revit Certified Professional Examination: Autodesk	8	8	Architects, Except Landscape and Naval	\$85,380	110	4	8	3
Beef Quality Assurance Certification	32	27	Farming, Fishing, and Forestry Occupations	\$36,230	678	18	92	24
BrainBench Web Design and Development Examinations	16	14	Web Developers	\$88,850	4,545	667	361	80
CAD Assessment: National Occupational Competency Testing Institute (NOCTI)	4	0	Mechanical Drafters	\$59,000	753	55	64	21

Carpentry Assessment: National Occupational Competency Testing Institute (NOCTI)	10	3	Woodworkers	\$41,300	1,458	45	159	63
Certified Dental Assistant and National Entry Level Assistant: Infection Control (ICE) Examination: Dental Assisting National Board	1	1	Dental Assistants	\$44,640	548	102	65	26
Certified Dental Assistant and National Entry Level Assistant: Radiation Health & Safety (RHS) Examination: Dental Assisting National Board	10	7	Dental Assistants	\$44,640	548	102	65	26
Certified Inpatient Coder (CIC) Examination: American Academy of Professional Coders (AAPC)	0.2	0.2	Medical Secretaries	\$37,940	265	57	31	13
Certified SolidWorks Associate (CSWA) Examination: SolidWorks Corporation	7	4	Drafters, Engineering Technicians, and Mapping Technicians	\$60,320	689	32	61	21
Certified Veterinary Assistant Examination: Texas Veterinary Medical Association	1	1	Veterinary Assistants and Laboratory Animal Caretakers	\$26,750	190	48	31	10
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	49	44	Pest Control Workers	\$40,800	1,523	123	208	56
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	13	12	Pest Control Workers	\$40,800	1,523	123	208	56
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	10	10	Pest Control Workers	\$40,800	1,523	123	208	56
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	4	2	Pest Control Workers	\$40,800	1,523	123	208	56
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	3	2	Pest Control Workers	\$40,800	1,523	123	208	56
CompTIA IT Fundamentals Certification Examination: CompTIA	11	8	Computer User Support Specialists	\$58,290	734	89	59	14
CompTIA A+ Certification Examination (must pass both exams): CompTIA	8	6	Computer Hardware Engineers	\$119,500	1,384	140	96	26
CompTIA Network+ Examination: CompTIA	1	1	Computer Network Support Specialists	\$73,050	293	27	23	6
Computer Programming Assessment: National Occupational Competency Testing Institute (NOCTI)	0.2	0.2	Computer Programmers	\$94,470	205	(22)	12	4
Computer Repair Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	3	2	Computer User Support Specialists	\$58,290	734	89	59	14
CompTIA A+ 901 Examination	3	2	Computer User Support Specialists	\$58,290	734	89	59	14
Construction Masonry-Brick Assessment: National Occupational Competency Testing Institute (NOCTI)	13	9	Helpers--Construction Trades	\$31,340	498	11	70	21

Cosmetology Assessment: National Occupational Competency Testing Institute (NOCTI)	15	12	Personal Care and Service Occupations	\$27,580	12,706	3,196	1,914	836
Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	67	47	Hairdressers, Hairstylists, and Cosmetologists	\$34,250	903	99	110	57
Culinary Arts Prep Cook-Level 1 Assessment: National Occupational Competency Testing Institute (NOCTI)	46	42	Food Preparation and Serving Related Occupations	\$24,280	21,434	2,105	3,712	1,561
Culinary Arts Prep Cook-Level 2 Assessment: National Occupational Competency Testing Institute (NOCTI)	13	11	Chefs and Head Cooks	\$54,760	122	15	16	4
Early Childhood Development and Services Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	Childcare Workers	\$24,620	1,383	104	201	108
Early Childhood Education and Care, Basic Assessment: National Occupational Competency Testing Institute (NOCTI)	28	27	Childcare Workers	\$24,620	1,383	104	201	108
Electrical Construction Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	5	2	Helpers--Electricians	\$30,510	222	1	30	9
Electronics Assessment: National Occupational Competency Testing Institute (NOCTI)	15	13	Electrical and Electronics Engineering Technicians	\$70,750	180	8	16	6
Emergency Medical Technician Examination: Department of Health, Office of Emergency Medical Services	15	5	Emergency Medical Technicians and Paramedics	\$35,310	698	149	52	11
EPA Universal Examination (pass all three types): Environmental Protection Agency (EPA)	25	17	Environmental Science and Protection Technicians	\$47,150	336	28	39	13
Equine Science Examination – New York State Department of Education (Cornell University)	11	10	Farmworkers, Farm, Ranch, and Aquacultural Animals	\$28,020	780	100	120	27
Floriculture Assessment: National Occupational Competency Testing Institute (NOCTI)	7	7	Floral Designers	\$28,060	665	(52)	58	25
Graphic Production Technology Assessment: National Occupational Competency Testing Institute	4	4	Printing Workers	\$38,790	579	(50)	62	28
Greenhouse Operators Certification Examination: Southeast Greenhouse Growers Association/Virginia Flower Growers Association	6	4	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	\$27,910	793	37	120	28
Health Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	34	27	Healthcare Support Occupations	\$32,680	10,052	1,985	1,212	517
Horticulture Landscaping Assessment: National Occupational Competency Testing Institute (NOCTI)	7	2	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	\$27,910	793	37	120	28
HVAC (EPA) Technician Examinations (Levels: Core, I, II, or III): Environmental Protection Agency	17	15	Heating, Air Conditioning, and Refrigeration Mechanics and I	\$50,210	899	60	89	24
IC3 Global Standard 5, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	3	1	Computer User Support Specialists	\$58,290	734	89	59	14

MCP - MCSA: Microsoft Dynamics 365 for Operations (must pass two required exams): Microsoft	0.2	0.2	Computer User Support Specialists	\$58,290	734	89	59	14
Mechanical Certified Drafter Examination: American Design Drafting Association (ADDA)	10	9	Mechanical Drafters	\$59,000	753	55	64	21
MOS 2016 Master/Certiport (must pass four exams)	2	2	Computer Operators	\$49,830	548	(136)	50	25
MOS Examinations (Advanced level): Microsoft Office Specialist/Certiport (Pass any one exam at this level)	3	3	Computer Operators	\$49,830	548	(136)	50	25
MOS Excel Expert Level: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	1	1	Computer Operators	\$49,830	548	(136)	50	25
MOS Microsoft Office Expert 2013/Certiport (must pass both Word & Excel at expert levels)	4	4	Computer Operators	\$49,830	548	(136)	50	25
MOS Microsoft Office Expert Excel 2016/Certiport (only one exam)	3	2	Computer Operators	\$49,830	548	(136)	50	25
MOS Word Expert Level Examination: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	22	8	Word Processors and Typists	\$42,290	351	(148)	32	27
MTA Examination: .NET Fundamentals (98-372)	0.2	0.2	Computer User Support Specialists	\$58,290	734	89	59	14
MTA Examination: Database Administration Fundamentals (98-364)	3	2	Computer User Support Specialists	\$58,290	734	89	59	14
MTA Examination: Mobility and Device Fundamentals (98-368)	3	0	Computer User Support Specialists	\$58,290	734	89	59	14
MTA Examination: Networking Fundamentals (98-366)	24	18	Computer User Support Specialists	\$58,290	734	89	59	14
MTA Examination: Security Fundamentals (98-367)	27	13	Computer User Support Specialists	\$58,290	734	89	59	14
MTA Examination: Software Development Fundamentals (98-361)	16	2	Computer User Support Specialists	\$58,290	734	89	59	14
MTA Examination: Windows OS Fundamentals (98-349)	16	13	Computer User Support Specialists	\$58,290	734	89	59	14
MTA Examination: Introduction to Programming using HTML & CSS (98-383)	13	7	Computer Programmers	\$94,470	205	(22)	12	4
MTA Examination: Introduction to Programming using Java (98-388)	7	2	Computer User Support Specialists	\$58,290	734	89	59	14
MTA Examination: Introduction to Programming using JavaScript (98-382)	2	1	Computer User Support Specialists	\$58,290	734	89	59	14
MTA Examination: Introduction to Programming using Python (98-381)	7	3	Computer Programmers	\$94,470	205	(22)	12	4
MTA Examination: Introduction to Programming with Block-Based Languages (98-380)	11	4	Computer User Support Specialists	\$58,290	734	89	59	14

National Nurse Aide Assessment Program (NNAAP) Examination: Virginia Board of Nursing	133	118	Nursing Assistants	\$28,770	5,052	774	596	283
Network Pro Certification Examination: Test Out Corporation (TOC)	0.4	0.4	Computer User Support Specialists	\$58,290	734	89	59	14
ParaPro: Educational Testing Service (ETS)	19	16	Teacher Assistants	\$28,000	2,132	228	226	111
PC Pro Certification Examination: Test Out Corporation (TOC)	27	25	Computer User Support Specialists	\$58,290	734	89	59	14
Precision Machining Assessment: National Occupational Competency Testing Institute (NOCTI)	6	4	Production Occupations	\$38,390	20,616	(1,280)	2,257	873
Pre-Engineering/Engineering Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	37	20	Industrial Engineering Technicians	\$55,940	103	(1)	9	3
Private Applicator Certification Examination: VA Dept. of Agriculture and Consumer Services	114	80	Pest Control Workers	\$40,800	1,523	123	208	56
Production Agriculture Assessment: National Occupational Competency Testing Institute (NOCTI)	6	2	Farming, Fishing, and Forestry Occupations	\$36,230	678	18	92	24
ProStart Program End-of-Course Examination (Level 2): Education Foundation of the National Restaurant Association	8	5	Food Preparation and Serving Related Occupations	\$24,280	21,434	2,105	3,712	1,561
Retail Merchandising Assessment: National Occupational Competency Testing Institute (NOCTI)	12	7	Sales and Related Occupations	\$41,140	25,779	740	3,588	1,537
Security Pro Certification Examination: Test Out Corporation (TOC)	8	8	Computer User Support Specialists	\$58,290	734	89	59	14
ServSafe Manager Certification Examination: National Restaurant Association	223	194	Food Preparation and Serving Related Occupations	\$24,280	21,434	2,105	3,712	1,561
Small Animal Care Examination New York Dept.. of Education (Cornell Univ.)	45	40	Animal Care and Service Workers	\$27,720	481	107	72	29
Small Animal Science and Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	30	20	Animal Care and Service Workers	\$27,720	481	107	72	29
Small Engine Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	40	13	Outdoor Power Equipment and Other Small Engine Mechanics	\$37,810	490	41	52	19
Television Production Assessment: National Occupational Competency Testing Institute (NOCTI)	28	15	Production Occupations	\$38,390	20,616	(1,280)	2,257	873
Veterinary Medical Applications Certification Examination: Elanco (exam is adm. by iCEV)	5	4	Veterinary Assistants and Laboratory Animal Caretakers	\$26,750	190	48	31	10
Welding Assessment: National Occupational Competency Testing Institute (NOCTI)	22	16	Welders, Cutters, Solderers, and Brazers	\$46,360	1,064	41	113	28

Research Question 4: What is the potential economic impact for the state if the number of CTE students earning industry credentials were to increase by 10% annually?

To determine the economic impact for the Commonwealth of Virginia if the number of CTE students earning industry credentials in Superintendent Region Six were to increase 10% annually, each of the 105 different industry credentials aligned with an occupation in Table 90, was calculated to determine its growth of 10% annually. These results were then used to determine the income tax associated with that credential and occupation. Table 102 provides a breakout, by year, of the potential income tax revenue the Commonwealth of Virginia could potentially see if the number of completer students earning industry credentials in Superintendent Region Six was to increase by 10% annually.

Table 102

Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually

Region Six	Credential *10%	Compound Credentials	Income Tax Due	Compound Income Tax
Year 1	145	1,597	\$ 3,329,679.27	\$ 4,701,998.02
Year 2	160	1,757	\$ 3,662,647.20	\$ 8,364,645.23
Year 3	176	1,933	\$ 4,028,911.92	\$ 12,393,557.15
Year 4	193	2,126	\$ 4,431,803.11	\$ 16,825,360.26
Year 5	213	2,338	\$ 4,874,983.43	\$ 21,700,343.69

Credential numbers are rounded

A component of this study was a survey distributed to 40 representatives of Virginia's economy to determine the value added to the earning of industry credentials. Eighteen respondents indicated a candidate applying for a position in their company/organization, as a holder of industry credentials, would enter the company at a larger starting salary than a non-credentialed candidate. The range of the increased starting salary was between 5% and 25%. Using the average of these numbers, 14% could be used as the value-added to the earning of

industry credentials, however, to ensure this study creates a floor rather than a ceiling of value, 10% will be used as the value-added to those earning industry credentials.

Table 103 presents the projected data of Superintendent Region Six completers if their number were to increase by 10% annually. Data in the table also shows the new potential income tax revenue available to Virginia's Treasury if the 10% value-added sum is applied to the projected economic impact of the earning of CTE industry credentials on Virginia's economy.

Table 103

Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually - AND Allows a 10% Increase in Beginning Salary

Region Six	Credential *10%	Compound Credentials	Income Tax Due	Compound Income Tax
Year 1	145	1,597	\$ 3,703,774.39	\$ 5,226,843.77
Year 2	160	1,757	\$ 4,074,151.83	\$ 9,300,995.60
Year 3	176	1,933	\$ 4,481,567.02	\$ 13,782,562.62
Year 4	193	2,126	\$ 4,929,723.72	\$ 18,712,286.34
Year 5	213	2,338	\$ 5,422,696.09	\$ 24,134,982.43

Credential numbers are rounded

Region Seven: Southwest

Southwest, as Superintendent Region 7, consists of 19 school divisions, comprising among its number 43 high schools (including specialist technical centers). Of the 8 Superintendent regions, this region has the third-largest number of high schools available to its students (VDOE, 2020).

Table 104

VDOE Superintendent Region 7: Southwest

Bland County	Grayson County	Smyth County
Bristol	Loudoun County	Tazewell County
Buchanan County	Norton	Washington County
Carroll County	Pulaski County	Wise County
Dickenson County	Radford	Wythe County
Galax	Russell County	
Giles County	Scott County	

Source: Commonwealth of Virginia, Department of Education Superintendent's Regions, http://www.doe.virginia.gov/directories/va_region_map.pdf

Data in Table 105 presents the alignment of the school divisions in Superintendent Region Seven to the Local Workforce Investment Area (LWIA) regions. This data was created by the Demographics group at the Weldon Cooper Center for Public Service at the University of Virginia to help administrators and teachers in completing the “Application for Career and Technical Education New Program/Course in 2019. The LWIA’s were designated by the Workforce Innovation and Opportunity Act (WIOA) State Plan for the Commonwealth of Virginia (TrailBlazers, 2019). The alignment of the superintendent region to the LWIA region undergirds the findings of this study.

Table 105

Local Workforce Investment Areas (LWIAs) in Virginia by VDOE Superintendent Region

Region 7: Southwest	LWIA Region
Bland County	LWIA II - New River/Mt. Rogers

Buchanan County	LWIA I - Southwestern Virginia
Bristol	LWIA II - New River/Mt. Rogers
Carroll County	LWIA II - New River/Mt. Rogers
Dickenson County	LWIA I - Southwestern Virginia
Galax	LWIA II - New River/Mt. Rogers
Giles County	LWIA II - New River/Mt. Rogers
Grayson County	LWIA II - New River/Mt. Rogers
Lee County	LWIA I - Southwestern Virginia
Norton	LWIA I - Southwestern Virginia
Pulaski County	LWIA II - New River/Mt. Rogers
Radford	LWIA II - New River/Mt. Rogers
Russell County	LWIA I - Southwestern Virginia
Scott County	LWIA I - Southwestern Virginia
Smyth County	LWIA II - New River/Mt. Rogers
Tazwell County	LWIA I - Southwestern Virginia
Washington County	LWIA II - New River/Mt. Rogers
Wise County	LWIA I - Southwestern Virginia
Wythe County	LWIA II - New River/Mt. Rogers

Source: School Report Card Data: Year 2016-2017

http://www.doe.virginia.gov/instruction/career_technical/path_industry_certification/index.shtml

Virginia Department Of Education, School Report Card Data for School Year: 2015 - 2016

Local Workforce Investment Areas (LWIAs) in Virginia

Research Question 1: What is the trend for high school participation in CTE programs in Virginia (Region Seven), over the past five years?

In order to determine the average number of high school CTE completer students in Region Seven, over the last five years, data retrieved from the VDOE's Office of Education Information Management (2019). Data in Table 106 presents the number of completers by year, then when averaged out over five years. By examining this table, it is possible to observe the specific number of CTE completer students in this region, and whether the number has increased, decreased or remained the same.

Table 106

Number of CTE Completers in Region Seven: 2014-2019

Year	Total Completers	5 Year Avg Completers
2014-2015	2,980	596
2015-2016	3,190	638
2016-2017	3,131	626
2017-2018	3,134	627
2018-2019	3,020	604
TOTAL	15,455	3,091

Source: Completer data by region retrieved from Virginia Department of Education, Office of Education Information Management, (2019).

Research Question 2: What is the trend for high school completer students earning industry certifications in Virginia (Region Seven), over the past five years?

To enable school administration to organize curriculum design, and career counselors to provide the necessary guidance to students, the Virginia Department of Education groups CTE programs and courses in a “Career Cluster.” According to the VDOE (2020), these career clusters help to:

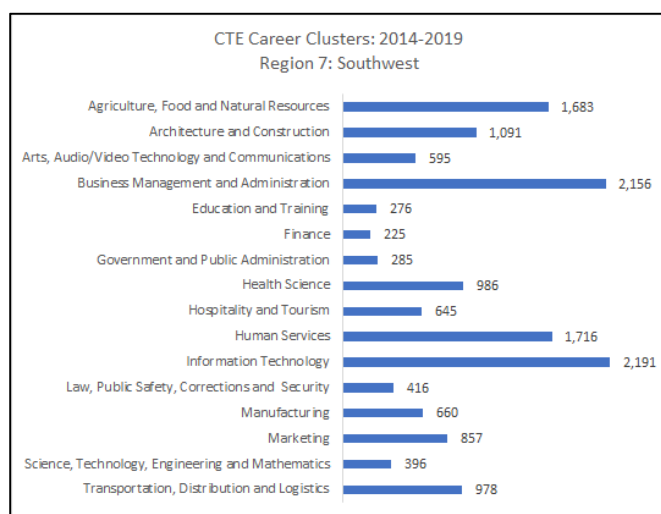
- Organize academic and technical knowledge and skills into a coherent sequence
- Identify pathways from secondary to postsecondary education
- Provide a framework for seamless education
- Provide institutional support of rigorous academic teaching and learning
- Provide alignment of academic and technical skills with workplace readiness skills
- Provide opportunities to involve parents, business and industry, and the school community
- Provide the development of effective plans of study that are based on career assessments

Using data drawn from the Weldon-Cooper Center for Public Service: CTE Completer Data:

2014-2019, over five years, Region Seven: Central Virginia CTE completer students are seen to

favor the Information Technology cluster (2,191), with the least numerous cluster of Finance reflecting 225 completer students.

Figure 15 CTE Career Clusters in Region Seven: 2014-2019



Source: Weldon-Cooper Center for Public Service: CTE Completer Data: 2014-2019

Using industry credential test data provided by the *Virginia Department of Education, Office of Education Information Management, (2019)*, data were disaggregated using SPSS. Disaggregation was used to determine the credential type earned, the number of students taking and earning the credential, and what this looks like over a five-year average. Because this study aims to determine the relationship between the earning of Career and Technical industry credentials and the Virginia economy, the superintendent region in which these industry credentials were earned is the primary format of Table 107. Further, because the focus of this study is on CTE completers, the data was analyzed to determine which of the credentials earned would be the final steps in the completer process. The disaggregated data demonstrating the “completer industry credentials earned by Region Seven CTE students: 2014-2019” is presented in Table 107.

Table 107

Region Seven: Industry Credentials Taken and Passed: 2014-2019- “Completers”

Industry Credential Assessment & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
Adobe Certified Associate: Premiere CS5 Examination/Certiport	1	1	0	0
Agriculture Mechanics Assessment: National Occupational Competency Testing Institute (NOCTI)	13	1	3	0
Architectural Apprentice Drafter Examination: American Design Drafting Association (ADDA)	1	1	0	0
ASE Medium-Heavy Truck Certification Test - Diesel Engines (T2): National Institute for Automotive Service Excellence	15	1	3	0
ASE Student Certification M/H Truck: Brakes: National Institute for Automotive Service Excellence	18	1	4	0
Autodesk AutoCAD Certified Professional Examination: Autodesk	1	1	0	0
Autodesk Revit Architecture Certified User Examination: Autodesk	1	1	0	0
Autodesk Revit Certified Professional Examination: Autodesk	1	1	0	0
Automotive Technician Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	0	0
Certified Clinical Medical Assistant (CCMA) Examination: National Healthcareer Association (NHA)	1	1	0	0
Cisco Certified Entry Network Technician (CCENT) Examination: Cisco Systems, Inc.	1	1	0	0
Clinical Medical Assistant Certification (CMAC) Examination: American Medical Certification Association (AMCA)	1	1	0	0
Electrical Construction Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	11	1	2	0
Internet and Computing Core Certification Examinations/2005 (IC3): Certiport (student has passed all three examinations)	1	1	0	0
Medical Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	0	0
MOS Microsoft Office Expert 2013/Certiport (must pass both Word & Excel at expert levels)	1	1	0	0
MOS Word Expert Examination: Microsoft Office 2007/Certiport	1	1	0	0
Oracle Certification Program Examination: PL SQL	1	1	0	0
ASE Medium-Heavy Truck Certification Test - Suspension & Steering (T5): National Institute for Automotive Service Excellence	15	2	3	0
ASK Fundamental Marketing Concepts Assessment: ASK Business Institute	11	2	2	0
Building Trades Maintenance Assessment: National Occupational Competency Testing Institute (NOCTI)	2	2	0	0
Computer Repair Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	10	2	2	0
Early Childhood Education and Care, Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	2	2	0	0
Emergency Medical Technician Examination: Department of Health, Office of Emergency Medical Services	2	2	0	0
Mechanical Apprentice Drafter Examination: American Design Drafting Association (ADDA)	2	2	0	0
MOS Excel Expert Examination: Microsoft Office 2010	2	2	0	0

Principles of Floral Design Certification Examination: Benz School of Floral Design (exam is adm. by iCEV)	11	2	2	0
Architectural Certified Drafter Examination: American Design Drafting Association (ADDA)	10	3	2	1
ASE Collision Repair & Refinish Certification Test - Mechanical & Electrical Components (B5): National Institute for Automotive Service Excellence	24	3	5	1
Computer Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	14	3	3	1
Culinary Arts Prep Cook-Level 2 Assessment: National Occupational Competency Testing Institute (NOCTI)	3	3	1	1
AAFCS: Culinary Arts Examination	4	4	1	1
Food Safety & Science Certification Examination: American Meat Science Association (Exam is administered by iCEV)	10	4	2	1
MOS 2013 Master/Certiport (must pass four exams)	4	4	1	1
Praxis Core Academic Skills for Educators Tests: Educational Testing Service (must pass all three tests)	4	4	1	1
ASE Collision Repair and Refinish Certification Test - NonStructural Analysis & Damage Repair (B3): National Institute for Automotive Service Excellence	23	5	5	1
ASE Student Certification M/H Truck: Steering & Suspension: National Institute for Automotive Service Excellence	16	5	3	1
Collision Repair Assessment: National Occupational Competency Testing Institute (NOCTI)	5	5	1	1
Diesel Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	16	5	3	1
Oracle Certification Program Examinations (Pass any one exam from this certification program): Oracle Corporation	5	5	1	1
ASE Medium-Heavy Truck Certification Test - Brakes (T4): National Institute for Automotive Service Excellence	34	6	7	1
ASE Student Certification M/H Truck: Diesel Engines: National Institute for Automotive Service Excellence	16	6	3	1
Automotive Technician Core Assessment: National Occupational Competency Testing Institute (NOCTI)	12	6	2	1
ASE Student Certification M/H Truck: Electrical/Electronic: National Institute for Automotive Service Excellence	17	7	3	1
Cisco IT Essentials, PC Hardware and Software End-of-Course Examination: Cisco Systems	10	7	2	1
Equine Science Examination – New York State Department of Education (Cornell University)	7	7	1	1
Certified Veterinary Assistant Examination: American Allied Health (AAH)	8	8	2	2
CompTIA A+ Certification Examination (must pass both exams): CompTIA	22	8	4	2
Culinary Arts Prep Cook-Level 1 Assessment: National Occupational Competency Testing Institute (NOCTI)	12	8	2	2
Gas Heat Employment Ready Examination: HVAC Excellence	8	8	2	2
Hospitality Management Lodging Option Assessment: National Occupational Competency Testing Institute (NOCTI)	11	8	2	2
MTA Examination: Windows OS Fundamentals (98-349)	18	8	4	2
Autodesk Inventor Certified Professional Examination: Autodesk	19	9	4	2
Nail Technician Examination: Virginia Board for Barbers and Cosmetology	12	9	2	2

Electrical Employment Ready Examination: HVAC Excellence	12	10	2	2
Early Childhood Education and Care, Basic Assessment: National Occupational Competency Testing Institute (NOCTI)	12	11	2	2
Heating, Electrical, Air Conditioning Technology Examination (HEAT): HVAC Excellence	11	11	2	2
MTA Examination: Networking Fundamentals (98-366)	32	11	6	2
Computer Networking Fundamentals Assessment: National Occupational Competency Testing Institute (NOCTI)	13	12	3	2
Mechanical Certified Drafter Examination: American Design Drafting Association (ADDA)	16	12	3	2
MOS 2016 Master/Certiport (must pass four exams)	12	12	2	2
Greenhouse Operators Certification Examination: Southeast Greenhouse Growers Association/Virginia Flower Growers Association	28	13	6	3
HTML 5 CSS 3 Specialist Examination: Certification Partners, LLC	13	13	3	3
AAFCS: Early Childhood Education Examination	19	14	4	3
Health Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	33	14	7	3
Electrical Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	15	15	3	3
Nationally Registered Certified Pharmacy Technician (NRCPhT) Examination: National Association for Health Professionals (NAHP)	16	15	3	3
Collision Repair and Refinishing Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	29	16	6	3
ProStart Program End-of-Course Examination (Level 2): Education Foundation of the National Restaurant Association	16	16	3	3
Autodesk Inventor Certified User: Autodesk	17	17	3	3
Mechanical Drafting and Design Assessment: National Competency Testing Institute (NOCTI)	22	17	4	3
Precision Machining Assessment: National Occupational Competency Testing Institute (NOCTI)	27	17	5	3
Cisco Certified Networking Associate (CCNA) Routing and Switching Examination: Cisco Systems, Inc.	18	18	4	4
Retail Management Certification Assessment: National Retail Federation (NRF) Foundation	18	18	4	4
Internet and Computing Core Certification Examinations/Windows 7--Office 2010: Certiport (student has passed all three examinations)	21	19	4	4
MOS Word Expert Examination: Microsoft Office 2010/Certiport	20	19	4	4
Advertising and Design Assessment: National Occupational Competency Testing Institute (NOCTI)	42	24	8	5
Certified Veterinary Assistant Examination: Texas Veterinary Medical Association	43	25	9	5
Conservation Assessment: National Occupational Competency Testing Institute (NOCTI)	32	25	6	5
EPA Universal Examination (pass all three types): Environmental Protection Agency (EPA)	25	25	5	5
Principles of Livestock Selection and Evaluation Certification Examination: National Collegiate Livestock Coaches Association (exam is adm. by iCEV)	44	25	9	5
Technical Drafting Assessment: National Occupational Competency Testing Institute	27	25	5	5
Fundamentals of Animal Science Certification Examination: Elanco (Exam is administered by iCEV)	79	26	16	5

Network Pro Certification Examination: Test Out Corporation (TOC)	31	29	6	6
CompTIA IT Fundamentals Certification Examination: CompTIA	36	30	7	6
Small Engine Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	30	30	6	6
CAD Assessment: National Occupational Competency Testing Institute (NOCTI)	67	31	13	6
Commercial Foods Assessment: National Occupational Competency Testing Institute (NOCTI)	33	32	7	6
ASE Automotive & Light Truck Certification Test-Automatic Transmission/Transaxle (A2): National Institute for Automotive Service Excellence	63	35	13	7
Production Agriculture Assessment: National Occupational Competency Testing Institute (NOCTI)	44	35	9	7
Veterinary Medical Applications Certification Examination: Elanco (exam is adm. by iCEV)	67	35	13	7
Carpentry Assessment: National Occupational Competency Testing Institute (NOCTI)	84	38	17	8
ASE Automotive & Light Truck Certification Test-Manual Drive Train and Axles (A3): National Institute for Automotive Service Excellence	66	39	13	8
ASE Collision Repair and Refinish Certification Test - Painting & Refinishing (B2): National Institute for Automotive Service Excellence	76	41	15	8
MOS Excel Expert Level: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	103	41	21	8
Plant Science Certification Examination: Bayer Crop Science (exam is adm. by iCEV)	81	41	16	8
ASE Automotive & Light Truck Certification Test-Heating and Air Conditioning (A7): National Institute for Automotive Service Excellence	58	42	12	8
Construction Masonry-Brick Assessment: National Occupational Competency Testing Institute (NOCTI)	68	42	14	8
Horticulture Landscaping Assessment: National Occupational Competency Testing Institute (NOCTI)	56	44	11	9
Adobe Certified Associate: Illustrator Cloud 2015 Examination/Certiport	50	45	10	9
PC Pro Certification Examination: Test Out Corporation (TOC)	48	47	10	9
ASE Automotive & Light Truck Certification Test-Electrical/Electronic Systems (A6): National Institute for Automotive Service Excellence	84	48	17	10
ASE Automotive & Light Truck Certification Test-Engine Performance (A8): National Institute for Automotive Service Excellence	76	48	15	10
Welding Assessment: National Occupational Competency Testing Institute (NOCTI)	139	49	28	10
Adobe Certified Associate: Photoshop Cloud 2015 Examination/Certiport	81	51	16	10
Building Construction Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	73	51	15	10
International Code Council Certificates of Achievement Examinations (Pass any one exam): International Code Council (ICC)	55	54	11	11
Administrative Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	63	55	13	11
Small Animal Science and Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	223	55	45	11
Small Animal Care Examination New York Dept. of Education (Cornell Univ.)	63	56	13	11
Floriculture Assessment: National Occupational Competency Testing Institute (NOCTI)	90	61	18	12

ASE Automotive & Light Truck Certification Test-Engine Repair (A1): National Institute for Automotive Service Excellence	100	62	20	12
HVAC Excellence Certification Program: HVAC Excellence	94	70	19	14
Advanced Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	121	71	24	14
ASE Student Certification Collision Repair & Refinish: Mechanical and Electrical: National Institute for Automotive Service Excellence	151	74	30	15
ASE Automotive & Light Truck Certification Test-Suspension & Steering (A4): National Institute for Automotive Service Excellence	139	76	28	15
MOS Microsoft Office Expert Excel 2016/Certiport (only one exam)	176	77	35	15
Certification of Pharmacy Technicians (ExCPT) Examination: Virginia Board of Pharmacy	94	84	19	17
IC3 Global Standard 5, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	172	86	34	17
ParaPro: Educational Testing Service (ETS)	93	89	19	18
ASE Student Certification Collision Repair & Refinish: Structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	151	90	30	18
ASE Student Certification Collision Repair & Refinish: Painting and Refinishing: National Institute for Automotive Service Excellence	188	93	38	19
Practical Nursing Assessment: National Occupational Competency Testing Institute	144	93	29	19
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	108	95	22	19
ASE Auto Maintenance and Light Repair Examination (G1): National Institute for Automotive Service Excellence	137	104	27	21
ASE Automotive & Light Truck Certification Test-Brakes (A5): National Institute for Automotive Service Excellence	182	122	36	24
ASE Student Certification Collision Repair & Refinish: Non-structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	204	122	41	24
ServSafe Manager Certification Examination: National Restaurant Association	177	123	35	25
MOS Examinations (Advanced level): Microsoft Office Specialist/Certiport (Pass any one exam at this level)	126	126	25	25
ASE Student Certification Automotive: Automatic Transmission/Transaxle: National Institute for Automotive Service Excellence	222	145	44	29
ASE Collision Repair & Refinish Certification Test - Structural Analysis & Damage Repair: National Institute for Automotive Service Excellence	221	146	44	29
ASE Student Certification Automotive: Manual Drive Train and Axles: National Institute for Automotive Service Excellence	231	146	46	29
MOS Word Expert Examination: Microsoft Office 2016/Certiport	244	156	49	31
ASE Student Certification Automotive: Heating and Air Conditioning: National Institute for Automotive Service Excellence	245	167	49	33
Nursing Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	204	168	41	34
ASE Student Certification Automotive: Engine Performance: National Institute for Automotive Service Excellence	288	178	58	36
ASE Student Certification Automotive: Automotive Service Technology National Institute for Automotive Service Excellence	279	182	56	36
ASE Student Certification Automotive: Electrical/Electronic Systems: National Institute for Automotive Service Excellence	294	200	59	40

ASE Student Certification Automotive: Engine Repair: National Institute for Automotive Service Excellence	324	216	65	43
ASE Student Certification Automotive: Suspension and Steering: National Institute for Automotive Service Excellence	399	223	80	45
ASE Student Certification Automotive: Maintenance and Light Repair: National Institute for Automotive Service Excellence	342	249	68	50
MOS Word Expert Level Examination: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	367	250	73	50
Private Applicator Certification Examination: VA Dept. of Agriculture and Consumer Services	392	252	78	50
Accounting (Basic) Assessment: National Occupational Competency Testing Institute (NOCTI)	435	261	87	52
ASE Student Certification Automotive: Brakes: National Institute for Automotive Service Excellence	441	273	88	55
IC3 Global Standard 4 Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	571	357	114	71
Cosmetology Assessment: National Occupational Competency Testing Institute (NOCTI)	453	364	91	73
Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	544	431	109	86
Beef Quality Assurance Certification	776	691	155	138
National Nurse Aide Assessment Program (NNAAP) Examination: Virginia Board of Nursing	763	695	153	139
TOTAL	13,784	9,301	2,757	1,860

Because a full picture of the industry credentialing test data is needed to determine trends in the earning of industry certifications in Region Seven, one must be aware of the data for those currently on their CTE pathway, as seen in Table 108. Students earning credentials in this table are currently on a CTE program as seen in the “certification,” “pre-apprentice,” or “other” pathway certifications, and non-CTE specific certifications. Although the data from this table is not included in the final calculation to determine economic impact, this does not negate their value or economic potential. This study focuses on completer students.

Table 108

“Other” industry credentials earned by Region Seven CTE students, 2014-2019

“Other” Industry Credential Assessment & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
AAFCS: Broad Field Family and Consumer Sciences Examination	625	534	125	107
Animal Systems Assessment: National Occupational Competency Testing Institute (NOCTI)	27	15	5	3

Armed Services Vocational Aptitude Battery Examination: United States Military Entrance Processing Command	411	290	82	58
Autodesk 2010 AutoCAD Associate Examination: Autodesk	5	5	1	1
Canine Care & Training - Level 1 Certification Examination: Continental Kennel Club, Inc.	29	28	6	6
Conservation Assessment: National Occupational Competency Testing Institute (NOCTI)	32	25	6	5
Core: Introductory Craft Skills Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	328	315	66	63
Criminal Justice Assessment: National Occupational Competency Testing Institute (NOCTI)	237	163	47	33
Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	838	765	168	153
EETC Four Stroke Engine Certification Test: Equipment and Engine Training Council (EETC)	20	20	4	4
EETC Two Stroke Engine Certification Test: Equipment and Engine Training Council (EETC)	1	1	0	0
Emergency Medical Services Assessment: National Occupational Competency Testing Institute (NOCTI)	11	11	2	2
EPA Technician Examination (Type I): Environmental Protection Agency (EPA)	5	5	1	1
EPA Technician Examination (Type II): Environmental Protection Agency (EPA)	1	1	0	0
Firefighter I Certification Examination: Virginia Department of Fire Programs	1	1	0	0
HBI/NAHB Carpentry Basic Assessment: Home Builders Institute-National Association of Home Builders (Assessment is administered by NOCTI)	3	3	1	1
IC3 Spark, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	141	77	28	15
Masonry Level One Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	8	8	2	2
MOS Access Examination: Microsoft Office 2016/Certiport	213	120	43	24
MOS Access Examination: Microsoft Office 2010/Certiport	4	4	1	1
MOS Access Examination: Microsoft Office 2013/Certiport	493	364	99	73
MOS Excel Examination: Microsoft Office 2013/Certiport	1,384	1,072	277	214
MOS Excel Examination: Microsoft Office 2010/Certiport	158	84	32	17
MOS Excel Examination: Microsoft Office 2016/Certiport	729	459	146	92
MOS One Note Examination: Microsoft Office 2013/Certiport	1	1	0	0
MOS Outlook Examination: Microsoft Office 2010/Certiport	8	8	2	2
MOS Outlook Examination: Microsoft Office 2013/Certiport	94	76	19	15
MOS Outlook Examination: Microsoft Office 2016/Certiport	99	87	20	17
MOS PowerPoint Examination: Microsoft Office 2013/Certiport	2,908	2,545	582	509
MOS PowerPoint Examination: Microsoft Office 2010/Certiport	552	430	110	86
MOS PowerPoint Examination: Microsoft Office 2016/Certiport	1,814	1,212	363	242
MOS PowerPoint Examination: Microsoft Office Specialist/Certiport	10	10	2	2
MOS Word Examination: Microsoft Office 2010/Certiport	539	367	108	73
MOS Word Examination: Microsoft Office 2013/Certiport	3,570	2,950	714	590
MOS Word Examination: Microsoft Office 2016/Certiport	1,187	924	237	185

MOS Word Examination: Microsoft Office Specialist/Certiport	7	7	1	1
National Health Science Assessment: National Consortium for Health Science Education (Administered by Precision Exams)	14	14	3	3
Natural Resource Systems Assessment: National Occupational Competency Testing Institute (NOCTI)	89	64	18	13
NCCT Core: Introductory Craft Skills, National Construction Career Test: National Center for Construction Education & Research (NCCER)	278	262	56	52
NIMS Machining - Level I - Milling I: National Institute for Metalworking Skills, Inc.	11	11	2	2
NIMS Machining - Level I - Turning I Between Centers: National Institute for Metalworking Skills, Inc.	26	26	5	5
NIMS Machining - Level I - Measurement, Materials, & Safety Skills: National Institute for Metalworking Skills, Inc.	41	41	8	8
PLTW Examination: Digital Electronics: Project Lead the Way (PLTW)	69	63	14	13
PLTW Examination: Introduction to Engineering Design: Project Lead the Way (PLTW)	136	133	27	27
PLTW Examination: Principles of Engineering: Project Lead the Way (PLTW)	79	79	16	16
Pre-Engineering Industry Certification Examination: Robotics Education Competition Foundation (RECF)	13	6	3	1
Professional Communications Certification Examination: Southwest Airlines (exam is adm. by iCEV)	7	7	1	1
ProStart Program End-of-Course Examination (Level 1): Education Foundation of the National Restaurant Association	150	110	30	22
Safety Examination: Manufacturing Skill Standards Council (MSSC)	12	8	2	2
SENSE Training Program Certification Examination: American Welding Society (AWS)	101	97	20	19
SkillsUSA: Architectural Drafting Examination	1	1	0	0
SkillsUSA: Audio-Radio Production Examination	1	1	0	0
SkillsUSA: Cabinetmaking Examination	1	1	0	0
SkillsUSA: Carpentry Examination	120	97	24	19
SkillsUSA: CNC Milling and Turning Technology Examination	1	1	0	0
SkillsUSA: Computer Maintenance Technology Examination	12	12	2	2
SkillsUSA: Cosmetology Examination	163	112	33	22
SkillsUSA: Criminal Justice and CSI Examination	82	78	16	16
SkillsUSA: Culinary Arts Examination	1	1	0	0
SkillsUSA: Customer Service Examination	1	1	0	0
SkillsUSA: Electrical Construction (Residential) Wiring Examination	11	5	2	1
SkillsUSA: Electronics Application/Technology Examination	1	1	0	0
SkillsUSA: Engineering Technology Examination	24	23	5	5
SkillsUSA: Internetworking Examination	1	1	0	0
SkillsUSA: Nail Care Examination	11	11	2	2
SkillsUSA: Nurse Assisting Examination	18	12	4	2
SkillsUSA: Robotics and Automation Technology Assessment	1	1	0	0
SkillsUSA: Technical Drafting Examination	22	22	4	4
SkillsUSA: Welding Examination	118	93	24	19
TOTAL	18,109	14,382	3,622	2,876

As a final measure to determine the trend for the earning of CTE industry credentials at the high school level in Region Seven, Table 109 presents the data specific to “Soft skills/College & Career Readiness” certifications. Because these certifications are included in the VDOE approved list of industry certifications, they are included in the industry credential test data provided by the Virginia Department of Education, Office of Education Information Management (VDOE, 2019). The value of this data lies in its relationship to the overall earning of industry credentials by high school students in Region Seven, and the bigger picture when determining any trend.

Table 109

Soft skills/College & Career Readiness industry credentials earned in Region Seven: 2014-2019

Soft skills/College & Career Readiness” Assessments & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
National Career Readiness Certificate (ACT)	790	723	158	145
W!SE Financial Literacy Certification: Working in Support of Education (W!SE)	14,435	12,975	2,887	2,595
Workplace Readiness Skills for the Commonwealth Examination	13,280	10,718	2,656	2,144
TOTAL	28,505	24,416	3,563	4,883

To determine the trend for high school completer students earning industry credentials in Region Seven over the past five years, a finalized set of summarized data can be seen in Table 110. These data present the number of students who have earned a CTE industry credential approved by Virginia’s Board of Education. The three categories of assessment type are represented in Table 96 and present the five year total, and five-year average number of earned (a) “technical” credentials (sufficient for a student to successfully end their completer program); (b) “other” assessments taken where students are on the CTE path, working towards certifications; and (c), the “Soft skills/College & Career Readiness” certifications.

Table 110

Total Number of Industry Certifications Earned in Region Seven: 2014-2019

Industry Credential Assessment & Type	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
"Technical" Completer Certifications	13,784	9,301	2,757	1,860
"Other" CTE certifications - pathway/level one/PLTW/Skills USA	18,109	14,382	3,622	2,876
"Soft skills/College & Career Readiness" certifications.	28,505	24,416	3,563	4,883
TOTAL	60,398	48,099	12,080	9,620

Research Question 3: What are the potential earnings for students gaining industry credentials in Virginia's (Region Seven) labor market?

To determine the potential earning for students gaining industry credentials in Virginia's labor market, it is crucial to understand the labor market's occupational openings by educational attainment level. Through the review of these data, one can examine the extent to which Region Seven students are entering a labor market saturated with similarly qualified candidates, or into the market with high-demand, high-salary openings. Data in Table 111, as extracted from the Bureau of Labor Statistics and the Virginia Employment Commission projection to 2026, show the probable occupational openings by education level attainment for Region Seven as a whole.

Table 111

Occupational Openings by Education Attainment Level to 2026 – Region Seven

Region 7 – Southwest	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Associate's Degree	4,932	431	429	134
Bachelor's Degree	16,844	1,881	1,437	472
Doctoral or Professional Degree	8,898	1,244	679	272
High School Diploma or Equivalent	78,202	2,696	8,519	3,445
Less Than High School	54,803	5,340	8,513	3,742
Master's Degree	2,662	386	247	83
Not Applicable	441,693	34,660	50,062	19,911
Postsecondary Non-Degree Award	6,379	684	559	212
TOTAL	614,413	47,322	70,445	28,271

Source: May 2018 State Occupational Employment and Wage Estimates,
https://www.bls.gov/oes/current/oes_va.htm#00-0000

While data in Table 111 specify occupations in the “Not Applicable” category as the largest group to access to occupational openings, a precise definition of the education included in that category is not available. The second largest estimated category in labor market openings is found in the “High School Diploma or Equivalent” category. However, when the “Not Applicable” category is removed from the data, along with “Less than High School” as in Table 112, numbers show that the two categories of education with greater access to projected employment are those with “High School Diploma or Equivalent” and “Bachelor’s Degree”.

Table 112

Occupational Openings by Education Attainment Level – Region 7 - "Less than High School" and "Not Applicable" removed

Region 7 – Southwest	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Associate's Degree	4,932	431	429	134
Bachelor’s Degree	16,844	1,881	1,437	472
Doctoral or Professional Degree	8,898	1,244	679	272
High School Diploma or Equivalent	78,202	2,696	8,519	3,445
Master's Degree	2,662	386	247	83
Postsecondary Non-Degree Award	6,379	684	559	212
TOTAL	117,917	7,322	11,870	4,618

Source: May 2018 State Occupational Employment and Wage Estimates,
https://www.bls.gov/oes/current/oes_va.htm#00-0000

Data presented in Table 113 show the occupations available to Region Seven CTE completer students who have earned a series of industry credentials. These data present the estimated mean salary expected, the projected occupational openings to 2026 of that particular occupation, the number of annual openings, and annual exits. Data included in this table show completer data specifically and does not include those who are currently enrolled in a CTE pathway, or who have completed credentials with a career readiness focus. The data in Table 113 brings together data points from:

- a) *Region Seven: Industry Credentials Taken and Passed: 2014-2019 – Completers* (see Table 107). Data from this source is seen in the columns “Assessment,” “Taken 5 Yr. Avg.” and “Pass 5 Yr. Avg.”.
- b) Bureau of Labor Statistics *May 2019 State Occupational Employment and Wage Estimates: Virginia* (Bureau of Labor Statistics, 2020). Data from this source is seen in the columns “Occupation” and “Mean Annual Salary.”
- c) TrailBlazers: Career and Technical Education in Virginia (TrailBlazers, 2020). Labor market data for the regions LWIA I: Southwestern Virginia (TrailBlazers, 2020), and LWIA II: New River/Mt. Rogers (TrailBlazers, 2020), is seen in columns: “Occupation,” “Projected Employment,” “Numeric Change,” “Annual Openings,” and “Annual Exits.”

Table 113

CTE Industry Credential to Occupational Alignment and Projections – Region Seven: LWIA I and II

Assessment	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.	Occupation	Mean Annual Wage	Projected Employment	Numeric Change	Annual Openings	Annual Exits
AAFCS: Culinary Arts Examination	1	1	Food Preparation and Serving Related Occupations	\$24,280	20,367	1,994	3,512	1,496
AAFCS: Early Childhood Education Examination	4	3	Preschool Teachers, Except Special Education	\$37,880	509	29	50	21
Accounting (Basic) Assessment: National Occupational Competency Testing Institute (NOCTI)	87	52	Financial Clerks	\$40,410	3,898	21	424	213
Administrative Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	13	11	Office and Administrative Support Occupations	\$39,030	30,578	1,390	3,520	1,551
Adobe Certified Associate: Photoshop Cloud 2015 Examination/Certiport	16	10	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	2,128	216	225	84
Adobe Certified Associate: Premiere CS5 Examination/Certiport	0.2	0.2	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	2,128	216	225	84
Adobe Certified Associate: Illustrator Cloud 2015 Examination/Certiport	10	9	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	2,128	216	225	84
Advanced Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	24	14	Sales and Related Occupations	\$41,140	22,599	692	3,287	1,445
Advertising and Design Assessment: National Occupational Competency Testing Institute (NOCTI)	8	5	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	2,128	216	225	84
Agriculture Mechanics Assessment: National Occupational Competency Testing Institute (NOCTI)	3	0	Transportation and Material Moving Occupations	\$38,200	14,128	697	1,683	206
Architectural Apprentice Drafter Examination: American Design Drafting Association (ADDA)	0.2	0.2	Mechanical Drafters	\$59,000	101	1	8	3
Architectural Certified Drafter Examination: American Design Drafting Association (ADDA)	2	1	Mechanical Drafters	\$59,000	101	1	8	3
ASE Auto Maintenance and Light Repair Examination (G1): National Institute for Automotive Service Excellence	27	21	Automotive Service Technicians and Mechanics	\$47,730	1,618	45	152	51
ASE Automotive & Light Truck Certification Test-Engine Repair (A1); Automatic Transmission/Transaxle (A2); Manual Drive Train and Axles (A3); Suspension & Steering (A4); Brakes (A5); Electrical/Electronic Systems (A6); Heating and Air Conditioning (A7); Engine Performance (A8): National Institute for Automotive Service Excellence	96	59	Automotive Service Technicians and Mechanics	\$47,730	1,618	45	152	51

ASE Collision Repair and Refinish Certification Test - Painting & Refinishing (B2); Nonstructural Analysis & Damage Repair (B3); Mechanical & Electrical Components (B5); Structural Analysis & Damage Repair: National Institute for Automotive Service Excellence	86	49	Automotive Body and Related Repairers	\$53,060	443	43	44	15
ASE Medium-Heavy Truck Certification Test - Diesel Engines (T2); Brakes (T4); Suspension & Steering (T5): National Institute for Automotive Service Excellence	21	3	Automotive Service Technicians and Mechanics	\$47,730	1,618	45	152	51
ASE Student Certification Automotive: Electrical/Electronic Systems; Engine Performance; Engine Repair; Heating and Air Conditioning; Maintenance and Light Repair; Manual Drive Train and Axles; Automatic Transmission/Transaxle; Automotive Service Technology; Brakes; Suspension and Steering National Institute for Automotive Service Excellence	307	198	Automotive Service Technicians and Mechanics	\$47,730	1,618	45	152	51
ASE Student Certification Collision Repair & Refinish: Mechanical and Electrical; Non-structural Analysis and Damage Repair; Painting and Refinishing; Structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	174	95	Automotive Service Technicians and Mechanics	\$47,730	1,618	45	152	51
ASE Student Certification M/H Truck: Brakes; Diesel Engines; Electrical/Electronic; Steering & Suspension: National Institute for Automotive Service Excellence	17	5	Bus and Truck Mechanics and Diesel Engine Specialists	\$48,470	553	49	51	16
ASK Fundamental Marketing Concepts Assessment: ASK Business Institute	2	0	Sales and Related Occupations	\$41,140	22,599	692	3,287	1,445
Autodesk AutoCAD Certified Professional Examination: Autodesk	0.2	0.2	Mechanical Drafters	\$59,000	101	1	8	3
Autodesk Inventor Certified Professional Examination: Autodesk	4	2	Mechanical Drafters	\$59,000	101	1	8	3
Autodesk Inventor Certified User: Autodesk	3	3	Drafters, Engineering Technicians, and Mapping Technicians	\$60,320	923	33	82	29
Autodesk Revit Architecture Certified User Examination: Autodesk	0.2	0.2	Architects, Except Landscape and Naval	\$85,380	3,198	144	234	80
Autodesk Revit Certified Professional Examination: Autodesk	0.2	0.2	Architects, Except Landscape and Naval	\$85,380	3,198	144	234	80
Automotive Technician Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	0.2	0.2	Automotive Service Technicians and Mechanics	\$47,730	1,618	45	152	51
Automotive Technician Core Assessment: National Occupational Competency Testing Institute (NOCTI)	2	1	Automotive Service Technicians and Mechanics	\$47,730	1,618	45	152	51

Beef Quality Assurance Certification	155	138	Farming, Fishing, and Forestry Occupations	\$36,230	798	68	114	28
Building Construction Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	15	10	Helpers--Construction Trades	\$31,340	7,974	528	1,123	327
Building Trades Maintenance Assessment: National Occupational Competency Testing Institute (NOCTI)	0.4	0.4	Helpers--Construction Trades	\$31,340	7,974	528	1,123	327
CAD Assessment: National Occupational Competency Testing Institute (NOCTI)	13	6	Mechanical Drafters	\$59,000	101	1	8	3
Carpentry Assessment: National Occupational Competency Testing Institute (NOCTI)	17	8	Woodworkers	\$41,300	833	(4)	91	35
Certification of Pharmacy Technicians (ExCPT) Examination: Virginia Board of Pharmacy	19	17	Pharmacy Technicians	\$32,370	964	88	80	30
Certified Clinical Medical Assistant (CCMA) Examination: National Healthcareer Association (NHA)	0.2	0.2	Medical Assistants	\$35,010	760	201	89	29
Certified Veterinary Assistant Examination: American Allied Health (AAH)	2	2	Veterinary Assistants and Laboratory Animal Caretakers	\$26,750	136	28	21	7
Certified Veterinary Assistant Examination: Texas Veterinary Medical Association	9	5	Veterinary Assistants and Laboratory Animal Caretakers	\$26,750	136	28	21	7
Cisco Certified Entry Network Technician (CCENT) Examination: Cisco Systems, Inc.	0.2	0.2	Computer User Support Specialists	\$58,290	871	95	69	16
Cisco Certified Networking Associate (CCNA) Routing and Switching Examination: Cisco Systems, Inc.	4	4	Computer User Support Specialists	\$58,290	871	95	69	16
Cisco IT Essentials, PC Hardware and Software End-of-Course Examination: Cisco Systems	2	1	Computer User Support Specialists	\$58,290	871	95	69	16
Clinical Medical Assistant Certification (CMAC) Examination: American Medical Certification Association (AMCA)	0.2	0.2	Medical Assistants	\$35,010	760	201	89	29
Collision Repair and Refinishing Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	6	3	Automotive Body and Related Repairers	\$53,060	443	43	44	15
Collision Repair Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	Automotive Body and Related Repairers	\$53,060	443	43	44	15
Commercial Foods Assessment: National Occupational Competency Testing Institute (NOCTI)	7	6	Food Preparation and Serving Related Occupations	\$24,280	20,367	1,994	3,512	1,496
Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	22	19	Pest Control Workers	\$40,800	1,523	123	208	56
CompTIA IT Fundamentals Certification Examination: CompTIA	7	6	Computer User Support Specialists	\$58,290	871	95	69	16
CompTIA A+ Certification Examination (must pass both exams): CompTIA	4	2	Computer Hardware Engineers	\$119,500	1,384	140	96	26

Computer Networking Fundamentals Assessment: National Occupational Competency Testing Institute (NOCTI)	3	2	Computer Network Support Specialists	\$73,050	155	18	13	3
Computer Repair Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	2	0	Computer User Support Specialists	\$58,290	871	95	69	16
Computer Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	3	1	Computer User Support Specialists	\$58,290	871	95	69	16
Conservation Assessment: National Occupational Competency Testing Institute (NOCTI)	6	5	Can't locate in NOCTI					
Construction Masonry-Brick Assessment: National Occupational Competency Testing Institute (NOCTI)	14	8	Helpers--Construction Trades	\$31,340	7,974	528	1,123	327
Cosmetology Assessment: National Occupational Competency Testing Institute (NOCTI)	91	73	Personal Care and Service Occupations	\$27,580	7,567	2,637	1,438	621
Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	109	86	Hairdressers, Hairstylists, and Cosmetologists	\$34,250	430	53	52	27
Culinary Arts Prep Cook-Level 1 Assessment: National Occupational Competency Testing Institute (NOCTI)	2	2	Food Preparation and Serving Related Occupations	\$24,280	20,367	1,994	3,512	1,496
Culinary Arts Prep Cook-Level 2 Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	Chefs and Head Cooks	\$54,760	135	15	18	4
Diesel Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	3	1	Automotive Service Technicians and Mechanics	\$47,730	1,618	45	152	51
Early Childhood Education and Care, Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	0.4	0.4	Teacher Assistants	\$28,000	1,843	160	194	97
Early Childhood Education and Care, Basic Assessment: National Occupational Competency Testing Institute (NOCTI)	2	2	Childcare Workers	\$24,620	743	44	108	59
Electrical Construction Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	2	0	Helpers--Electricians	\$30,510	3,353	179	468	138
Electrical Employment Ready Examination: HVAC Excellence	2	2	Helpers--Electricians	\$30,510	3,353	179	468	138
Electrical Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	3	3	Helpers--Electricians	\$30,510	3,353	179	468	138
Emergency Medical Technician Examination: Department of Health, Office of Emergency Medical Services	0.4	0.4	Emergency Medical Technicians and Paramedics	\$35,310	630	150	46	9
EPA Universal Examination (pass all three types): Environmental Protection Agency (EPA)	5	5	Environmental Science and Protection Technicians	\$47,150	336	28	39	13
Equine Science Examination – New York State Department of Education (Cornell University)	1	1	Farmworkers, Farm, Ranch, and Aquacultural Animals	\$28,020	333	64	51	11
Floriculture Assessment: National Occupational Competency Testing Institute (NOCTI)	18	12	Floral Designers	\$28,060	665	(52)	58	25

Food Safety & Science Certification Examination: American Meat Science Association (Exam is administered by iCEV)	2	1	Food Preparation and Serving Related Occupations	\$24,280	20,367	1,994	3,512	1,496
Fundamentals of Animal Science Certification Examination: Elanco (Exam is administered by iCEV)	16	5	Veterinary Assistants and Laboratory Animal Caretakers	\$26,750	136	28	21	7
Gas Heat Employment Ready Examination: HVAC Excellence	2	2	Heating, Air Conditioning, and Refrigeration Mechanics	\$50,210	300	18	30	8
Greenhouse Operators Certification Examination: Southeast Greenhouse Growers Association/Virginia Flower Growers Association	6	3	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	\$27,910	793	37	120	28
Health Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	7	3	Healthcare Support Occupations	\$32,680	6,122	1,144	737	313
Heating, Electrical, Air Conditioning Technology Examination (HEAT): HVAC Excellence	2	2	Heating, Air Conditioning, and Refrigeration Mechanics	\$50,210	300	18	30	8
Horticulture Landscaping Assessment: National Occupational Competency Testing Institute (NOCTI)	11	9	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	\$27,910	793	37	120	28
Hospitality Management Lodging Option Assessment: National Occupational Competency Testing Institute (NOCTI)	2	2	Hotel, Motel, and Resort Desk Clerks	\$22,300	524	26	81	28
HTML 5 CSS 3 Specialist Examination: Certification Partners, LLC	3	3	Web Developers	\$88,850	4,545	667	361	80
HVAC Excellence Certification Program: HVAC Excellence (Pass an one exam in this program)	19	14	Heating, Air Conditioning, and Refrigeration Mechanics	\$50,210	300	18	30	8
IC3 Global Standard 5, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	34	17	Computer User Support Specialists	\$58,290	871	95	69	16
IC3 Global Standard 4 Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	114	71	Computer User Support Specialists	\$58,290	871	95	69	16
International Code Council Certificates of Achievement Examinations (Pass any one exam): International Code Council (ICC)	11	11	Construction and Building Inspectors	\$60,170	106	7	12	5
Internet and Computing Core Certification Examinations/2005 (IC3): Certiport (student has passed all three examinations)	0.2	0.2	Computer User Support Specialists	\$58,290	871	95	69	16
Internet and Computing Core Certification Examinations/Windows 7--Office 2010: Certiport (student has passed all three examinations)	4	4	Computer User Support Specialists	\$58,290	871	95	69	16
Mechanical Apprentice Drafter Examination: American Design Drafting Association (ADDA)	0.4	0.4	Mechanical Drafters	\$59,000	101	1	8	3
Mechanical Certified Drafter Examination: American Design Drafting Association (ADDA)	3	2	Mechanical Drafters	\$59,000	101	1	8	3

Mechanical Drafting and Design Assessment: National Competency Testing Institute (NOCTI)	4	3	Mechanical Drafters	\$59,000	101	1	8	3
Medical Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	0.2	0.2	Medical Assistants	\$35,010	760	201	89	29
MOS 2013 Master/Certiport (must pass four exams)	1	1	Computer Operators	\$49,830	548	(136)	50	25
MOS 2016 Master/Certiport (must pass four exams)	2	2	Computer Operators	\$49,830	548	(136)	50	25
MOS Examinations (Advanced level): Microsoft Office Specialist/Certiport (Pass any one exam at this level)	25	25	Computer Operators	\$49,830	548	(136)	50	25
MOS Excel Expert Examination: Microsoft Office 2010	0.4	0.4	Pathway					
MOS Excel Expert Level: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	21	8	Computer Operators	\$49,830	548	(136)	50	25
MOS Microsoft Office Expert 2013/Certiport (must pass both Word & Excel at expert levels)	0.2	0.2	Computer Operators	\$49,830	548	(136)	50	25
MOS Microsoft Office Expert Excel 2016/Certiport (only one exam)	35	15	Computer Operators	\$49,830	548	(136)	50	25
MOS Word Expert Level Examination: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	73	50	Word Processors and Typists	\$42,290	351	(148)	32	27
MTA Examination: Networking Fundamentals (98-366)	6	2	Computer User Support Specialists	\$58,290	871	95	69	16
MTA Examination: Windows OS Fundamentals (98-349)	4	2	Computer User Support Specialists	\$58,290	871	95	69	16
Nail Technician Examination: Virginia Board for Barbers and Cosmetology	2	2	Hairdressers, Hairstylists, and Cosmetologists	\$34,250	430	53	52	27
National Nurse Aide Assessment Program (NNAAP) Examination: Virginia Board of Nursing	153	139	Nursing Assistants	\$28,770	2,547	352	299	144
Nationally Registered Certified Pharmacy Technician (NRCPhT) Examination: National Association for Health Professionals (NAHP)	3	3	Pharmacy Technicians	\$32,370	964	88	80	30
Network Pro Certification Examination: Test Out Corporation (TOC)	6	6	Computer User Support Specialists	\$58,290	871	95	69	16
Nursing Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	41	34	Nursing Assistants	\$28,770	2,547	352	299	144
Oracle Certification Program Examination: PL SQL	0.2	0.2	Computer Operators	\$49,830	548	(136)	50	25
Oracle Certification Program Examinations (Pass any one exam from this certification program): Oracle Corporation	1	1	Computer Operators	\$49,830	548	(136)	50	25
ParaPro: Educational Testing Service (ETS)	19	18	Teacher Assistants	\$28,000	1,843	160	194	97
PC Pro Certification Examination: Test Out Corporation (TOC)	10	9	Computer User Support Specialists	\$58,290	871	95	69	16

Plant Science Certification Examination: Bayer Crop Science (exam is adm. by iCEV)	16	8	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	\$27,910	793	37	120	28
Practical Nursing Assessment: National Occupational Competency Testing Institute	29	19	Nursing Assistants	\$28,770	2,547	352	299	144
Praxis Core Academic Skills for Educators Tests: Educational Testing Service (must pass all three tests)	1	1	Teacher Assistants	\$28,000	1,843	160	194	97
Precision Machining Assessment: National Occupational Competency Testing Institute (NOCTI)	5	3	Production Occupations	\$38,390	19,370	1,456	2,073	812
Principles of Floral Design Certification Examination: Benz School of Floral Design (exam is adm. by iCEV)	2	0	Floral Designers	\$29,760	665	(52)	58	25
Principles of Livestock Selection and Evaluation Certification Examination: National Collegiate Livestock Coaches Association (exam is adm. by iCEV)	9	5	Farming, Fishing, and Forestry Occupations	\$36,230	798	68	114	28
Private Applicator Certification Examination: VA Dept. of Agriculture and Consumer Services	78	50	Pest Control Workers	\$40,800	1,523	123	208	56
Production Agriculture Assessment: National Occupational Competency Testing Institute (NOCTI)	9	7	Farming, Fishing, and Forestry Occupations	\$36,230	798	68	114	28
ProStart Program End-of-Course Examination (Level 2): Education Foundation of the National Restaurant Association	3	3	Food Preparation and Serving Related Occupations	\$24,280	20,367	1,994	3,512	1,496
Retail Management Certification Assessment: National Retail Federation (NRF) Foundation	4	4	Sales and Related Occupations	\$41,140	22,599	692	3,287	1,445
ServSafe Manager Certification Examination: National Restaurant Association	35	25	Food Preparation and Serving Related Occupations	\$24,280	20,367	1,994	3,512	1,496
Small Animal Care Examination New York Dept. of Education (Cornell Univ.)	13	11	Animal Care and Service Workers	\$27,720	652	141	92	35
Small Animal Science and Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	45	11	Animal Care and Service Workers	\$27,720	652	141	92	35
Small Engine Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	6	6	Outdoor Power Equipment and Other Small Engine Mechanics	\$37,810	490	41	52	19
Technical Drafting Assessment: National Occupational Competency Testing Institute	5	5	Mechanical Drafters	\$59,000	101	1	8	3
Veterinary Medical Applications Certification Examination: Elanco (exam is adm. by iCEV)	13	7	Veterinary Assistants and Laboratory Animal Caretakers	\$26,750	136	28	21	7
Welding Assessment: National Occupational Competency Testing Institute (NOCTI)	28	10	Welders, Cutters, Solderers, and Brazers	\$46,360	686	19	74	19

Research Question 4: What is the potential economic impact for the state if the number of CTE students earning industry credentials were to increase by 10% annually?

To determine the economic impact for the Commonwealth of Virginia if the number of CTE students earning industry credentials in Superintendent Region Seven were to increase 10% annually, each of the 114 different industry credentials aligned with an occupation in Table 100, was calculated to determine its growth of 10% annually. These results were then used to determine the income tax associated with that credential and occupation. Table 114 provides a breakout, by year, of the potential income tax revenue the Commonwealth of Virginia could potentially see if the number of completer students earning industry credentials in Superintendent Region Seven was to increase by 10% annually.

Table 114

Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually

Region Seven	Credential *10%	Compound Credentials	Income Tax Due	Compound Income Tax
Year 1	162	1,779	\$ 3,766,464.66	\$ 5,135,377.29
Year 2	178	1,957	\$ 4,143,111.13	\$ 9,278,488.42
Year 3	196	2,152	\$ 4,557,422.24	\$ 13,835,910.66
Year 4	251	2,368	\$ 5,013,164.47	\$ 18,849,075.13
Year 5	237	2,604	\$ 5,514,480.91	\$ 24,363,556.04

Credential numbers are rounded

A component of this study was a survey distributed to 40 representatives of Virginia's economy to determine the value added to the earning of industry credentials. Eighteen respondents indicated a candidate applying for a position in their company/organization, as a holder of industry credentials, would enter the company at a more substantial starting salary than a non-credentialed candidate. The range of the increased starting salary was between 5% and 25%. Using the average of these numbers, 14% could be used as the value-added to the earning

of industry credentials, however, to ensure this study creates a floor rather than a ceiling of value, 10% will be used as the value-added to those earning industry credentials.

Table 115 presents the projected data of Superintendent Region Seven completers if their number were to increase by 10% annually. Data in the table also shows the new potential income tax revenue available to Virginia's Treasury if the 10% value-added sum is applied to the projected economic impact of the earning of CTE industry credentials on Virginia's economy.

Table 115

Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually - AND Allows a 10% Increase in Beginning Salary

Region Seven	Credential *10%	Compound Credentials	Income Tax Due	Compound Income Tax
Year 1	162	1,779	\$ 4,188,916.90	\$ 5,709,913.29
Year 2	178	1,957	\$ 4,607,808.59	\$ 10,317,721.89
Year 3	196	2,152	\$ 5,068,589.45	\$ 15,386,311.34
Year 4	251	2,368	\$ 5,575,448.40	\$ 20,961,759.74
Year 5	237	2,604	\$ 6,132,993.24	\$ 27,094,752.98

Credential numbers are rounded

Region Eight: Southside

Southside, as Superintendent Region 8, consists of 12 school divisions, comprising among its number 15 high schools (including specialist technical centers). Of the 8 Superintendent regions, this region has the smallest number of high schools available to its students (VDOE, 2020).

Table 116

VDOE Superintendent Region 8: Southside

Amherst County	Charlotte County	Lunenburg
Appomattox County	Cumberland County	Mecklenburg County
Brunswick County	Greensville County	Nottoway County
Buckingham County	Halifax County	Prince Edward County

Source: Commonwealth of Virginia, Department of Education Superintendent's Regions,
http://www.doe.virginia.gov/directories/va_region_map.pdf

Data in Table 117 presents the alignment of the school divisions in Superintendent Region Eight to the Local Workforce Investment Area (LWIA) regions. This data was created by the Demographics group at the Weldon Cooper Center for Public Service at the University of Virginia to help administrators and teachers in completing the “Application for Career and Technical Education New Program/Course in 2019. The LWIA’s were designated by the Workforce Innovation and Opportunity Act (WIOA) State Plan for the Commonwealth of Virginia (TrailBlazers, 2019). The alignment of the superintendent region to the LWIA region undergirds the findings of this study.

Table 117

Local Workforce Investment Areas (LWIAs) in Virginia by VDOE Superintendent Region

Region 8: Southwest	LWIA Region
Amelia County	LWIA VIII - South Central
Appomattox County	LWIA VII - Region 2000/ Central Virginia
Brunswick County	LWIA VIII - South Central
Buckingham County	LWIA VIII - South Central

Charlotte County	LWIA VIII - South Central
Cumberland County	LWIA VIII - South Central
Greensville County	LWIA XV - Crater Area
Halifax County	LWIA VIII - South Central
Lunenburg County	LWIA VIII - South Central
Mecklenburg County	LWIA VIII - South Central
Nottoway County	LWIA VIII - South Central
Prince Edward County	LWIA VIII - South Central

Source: School Report Card Data: Year 2016-2017

http://www.doe.virginia.gov/instruction/career_technical/path_industry_certification/index.shtml

Virginia Department of Education, School Report Card Data for School Year: 2015 - 2016

Local Workforce Investment Areas (LWIAs) in Virginia

http://ctetrailblazers.org/files/2019/08/Local-Workforce-Investment-Areas-Map_Virginia.pdf

Research Question 1: What is the trend for high school participation in CTE programs in Virginia (Region Eight), over the past five years?

In order to determine the average number of high school CTE completer students in Region Eight, over the last five years, data retrieved from the VDOE's Office of Education Information Management (2019). Data in Table 118 presents the number of completers by year, then when averaged out over five years. By examining this table, it is possible to observe the specific number of CTE completer students in this region, and whether the number has increased, decreased or remained the same.

Table 118

Number of CTE Completers in Region Eight: 2014-2019

Year	Total Completers	5 Year Avg Completers
2014-2015	1,290	258
2015-2016	1,363	273
2016-2017	1,218	244
2017-2018	1,257	251
2018-2019	1,278	256
TOTAL	6,406	1,281

Source: Completer data by region retrieved from Virginia Department of Education, Office of Education Information Management, (2019).

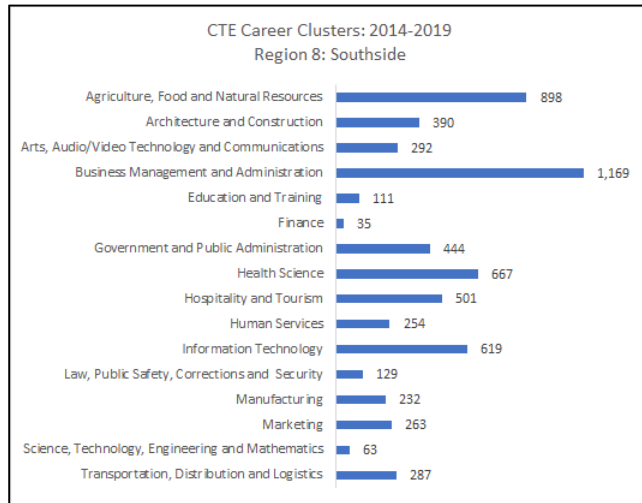
Research Question 2: What is the trend for high school completer students earning industry certifications in Virginia (Region Eight), over the past five years?

To enable school administration to organize curriculum design, and career counselors to provide the necessary guidance to students, the Virginia Department of Education groups CTE programs and courses in a “Career Cluster.” According to the VDOE (2020), these career clusters help to:

- Organize academic and technical knowledge and skills into a coherent sequence
- Identify pathways from secondary to postsecondary education
- Provide a framework for seamless education
- Provide institutional support of rigorous academic teaching and learning
- Provide alignment of academic and technical skills with workplace readiness skills
- Provide opportunities to involve parents, business and industry, and the school community
- Provide the development of effective plans of study that are based on career assessments

Using data drawn from the Weldon-Cooper Center for Public Service: CTE Completer Data: 2014-2019, over five years, Region Eight: Central Virginia CTE completer students are seen to favor the Business Management and Administration cluster (1,169), with the least numerous cluster of Finance reflecting 35 completer students.

Figure 16 CTE Career Clusters in Region Seven: 2014-2019



Source: Weldon-Cooper Center for Public Service: CTE Completer Data: 2014-2019

Using industry credential test data provided by the *Virginia Department of Education, Office of Education Information Management, (2019)*, data were disaggregated using SPSS. Disaggregation was used to determine the credential type earned, the number of students taking and earning the credential, and what this looks like over a five-year average. Because this study aims to determine the relationship between the earning of Career and Technical industry credentials and the Virginia economy, the superintendent region in which these industry credentials were earned is the primary format of Table 119. Further, because the focus of this study is on CTE completers, the data was analyzed to determine which of the credentials earned would be the final steps in the completer process. The disaggregated data demonstrating the “completer industry credentials earned by Region Eight CTE students: 2014-2019” is presented in Table 119.

Table 119

Region Eight: Industry Credentials Taken and Passed: 2014-2019- “Completers”

Industry Credential Assessment & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
--	-------	------	------------------	-----------------

AAFCS: Culinary Arts Examination	21	20	4	4
AAFCS: Early Childhood Education Examination	33	21	7	4
AAFCS: Education Fundamentals Examination	2	2	0	0
AAFCS: Nutrition, Food and Wellness Examination	93	21	19	4
Accounting (Basic) Assessment: National Occupational Competency Testing Institute (NOCTI)	29	2	6	0
Administrative Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	0	0
Adobe Certified Associate: Photoshop Cloud 2015 Examination/Certiport	25	4	5	1
Adobe Certified Associate: Photoshop CS6 Examination/Certiport	135	59	27	12
Agriculture Mechanics Assessment: National Occupational Competency Testing Institute (NOCTI)	44	33	9	7
ASE Student Certification Automotive: Electrical/Electronic Systems: National Institute for Automotive Service Excellence	2	2	0	0
ASE Student Certification Automotive: Engine Performance: National Institute for Automotive Service Excellence	28	27	6	5
ASE Student Certification Automotive: Engine Repair: National Institute for Automotive Service Excellence	75	56	15	11
ASE Student Certification Automotive: Maintenance and Light Repair: National Institute for Automotive Service Excellence	62	45	12	9
ASE Student Certification Automotive: Brakes: National Institute for Automotive Service Excellence	6	6	1	1
ASE Student Certification Automotive: Suspension and Steering: National Institute for Automotive Service Excellence	8	8	2	2
ASE Student Certification Collision Repair & Refinish: Non-structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	2	2	0	0
ASE Student Certification Collision Repair & Refinish: Painting and Refinishing: National Institute for Automotive Service Excellence	2	2	0	0
ASK Concepts of Entrepreneurship and Management Assessment: ASK Business Institute	13	13	3	3
Beef Quality Assurance Certification	52	47	10	9
CAD Assessment: National Occupational Competency Testing Institute (NOCTI)	19	2	4	0
Certification of Pharmacy Technicians (ExCPT) Examination: Virginia Board of Pharmacy	43	32	9	6
Certified Phlebotomy Technician (CPT) Examination: National Healthcareer Association (NHA)	5	5	1	1
CompTIA IT Fundamentals Certification Examination: CompTIA	17	11	3	2
CompTIA A+ Certification Examination (must pass both exams): CompTIA	21	4	4	1
Construction Masonry-Brick Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	0	0
Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	34	21	7	4
Early Childhood Education and Care, Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	19	8	4	2
Early Childhood Education and Care, Basic Assessment: National Occupational Competency Testing Institute (NOCTI)	95	43	19	9
Equine Science Examination – New York State Department of Education (Cornell University)	43	37	9	7

Forestry Products & Processing Assessment: National Occupational Competency Testing Institute (NOCTI)	3	3	1	1
Fundamentals of Animal Science Certification Examination: Elanco (Exam is administered by iCEV)	28	25	6	5
IC3 Global Standard 5, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	34	11	7	2
IC3 Global Standard 4 Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	61	27	12	5
Internet and Computing Core Certification Examinations/Windows 7--Office 2010: Certiport (student has passed all three examinations)	105	42	21	8
MOS 2013 Master/Certiport (must pass four exams)	4	4	1	1
MOS Examinations (Advanced level): Microsoft Office Specialist/Certiport (Pass any one exam at this level)	13	13	3	3
MOS Excel Expert Examination: Microsoft Office 2010	26	8	5	2
MOS Excel Expert Level: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	2	2	0	0
MOS Microsoft Office Expert 2013/Certiport (must pass both Word & Excel at expert levels)	1	1	0	0
MOS Microsoft Office Expert Excel 2016/Certiport (only one exam)	14	5	3	1
MOS Word Expert Examination: Microsoft Office 2010/Certiport	67	52	13	10
MOS Word Expert Examination: Microsoft Office 2016/Certiport	99	57	20	11
MOS Word Expert Level Examination: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	20	18	4	4
National Nurse Aide Assessment Program (NNAAP) Examination: Virginia Board of Nursing	524	382	105	76
Nursing Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	6	6	1	1
ParaPro: Educational Testing Service (ETS)	96	84	19	17
PC Pro Certification Examination: Test Out Corporation (TOC)	11	8	2	2
Private Applicator Certification Examination: VA Dept. of Agriculture and Consumer Services	451	241	90	48
ProStart Program End-of-Course Examination (Level 2): Education Foundation of the National Restaurant Association	20	20	4	4
Retail Merchandising Assessment: National Occupational Competency Testing Institute (NOCTI)	48	20	10	4
ServSafe Manager Certification Examination: National Restaurant Association	411	336	82	67
Small Animal Care Examination New York Dept. of Education (Cornell Univ.)	117	98	23	20
Virginia Motor Vehicle Safety Inspection Program Examination: Virginia State Police	3	3	1	1
Welding Assessment: National Occupational Competency Testing Institute (NOCTI)	7	7	1	1
TOTAL	3,101	2,008	620	402

Because a full picture of the industry credentialing test data is needed to determine trends in the earning of industry certifications in Region Eight, one must be aware of the data for those

currently on their CTE pathway, as seen in Table 120. Students earning credentials in this table are currently on a CTE program, as seen in the “certification,” “pre-apprentice,” or “other” pathway certifications, and non-CTE specific certifications. Although the data from this table is not included in the final calculation to determine economic impact, this does not negate their value or economic potential. This study focuses on completer students.

Table 120

“Other” industry credentials earned by Region Eight CTE students, 2014-2019

“Other” Industry Credential Assessment & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
AAFCS: Broad Field Family and Consumer Sciences Examination	96	42	19	8
Business Financial Management Assessment: National Occupational Competency Testing Institute (NOCTI)	3	3	1	1
Core: Introductory Craft Skills Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	80	31	16	6
Criminal Justice Assessment: National Occupational Competency Testing Institute (NOCTI)	21	1	4	0
Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	71	56	14	11
EPA Technician Examination (Type II): Environmental Protection Agency (EPA)	1	1	0	0
Firefighter I Certification Examination: Virginia Department of Fire Programs	1	1	0	0
General Management Assessment: National Occupational Competency Testing Institute (NOCTI)	20	7	4	1
Masonry Level One Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	1	1	0	0
MOS Access Examination: Microsoft Office 2010/Certiport	19	8	4	2
MOS Access Examination: Microsoft Office 2013/Certiport	1	1	0	0
MOS Excel Examination: Microsoft Office 2013/Certiport	388	326	78	65
MOS Excel Examination: Microsoft Office 2007/Certiport	82	66	16	13
MOS Excel Examination: Microsoft Office 2010/Certiport	193	112	39	22
MOS Excel Examination: Microsoft Office 2016/Certiport	457	253	91	51
MOS Outlook Examination: Microsoft Office 2007/Certiport	5	5	1	1
MOS Outlook Examination: Microsoft Office 2016/Certiport	1	1	0	0
MOS PowerPoint Examination: Microsoft Office 2013/Certiport	1,120	1,031	224	206
MOS PowerPoint Examination: Microsoft Office 2007/Certiport	119	106	24	21
MOS PowerPoint Examination: Microsoft Office 2010/Certiport	739	630	148	126
MOS PowerPoint Examination: Microsoft Office 2016/Certiport	1,090	793	218	159
MOS PowerPoint Examination: Microsoft Office Specialist/Certiport	11	11	2	2

MOS Word Examination: Microsoft Office 2010/Certiport	503	339	101	68
MOS Word Examination: Microsoft Office 2013/Certiport	868	779	174	156
MOS Word Examination: Microsoft Office 2007/Certiport	124	98	25	20
MOS Word Examination: Microsoft Office 2016/Certiport	965	798	193	160
MOS Word Examination: Microsoft Office Specialist/Certiport	11	11	2	2
NCCT Electrical Examination, National Construction Career Test: National Center for Construction Education & Research (NCCER)	2	2	0	0
NIMS Machining - Level I - Measurement, Materials, & Safety Skills: National Institute for Metalworking Skills, Inc.	5	5	1	1
ProStart Program End-of-Course Examination (Level 1): Education Foundation of the National Restaurant Association	27	27	5	5
SENSE Training Program Certification Examination: American Welding Society (AWS)	88	80	18	16
SkillsUSA: Carpentry Examination	17	10	3	2
SkillsUSA: Cosmetology Examination	11	3	2	1
SkillsUSA: Criminal Justice and CSI Examination	15	7	3	1
SkillsUSA: Culinary Arts Examination	65	14	13	3
SkillsUSA: Customer Service Examination	56	31	11	6
SkillsUSA: Masonry Examination	1	1	0	0
SkillsUSA: Nurse Assisting Examination	21	13	4	3
SkillsUSA: Technical Drafting Examination	46	38	9	8
SkillsUSA: Welding Examination	19	19	4	4
TOTAL	7,363	5,761	1,473	1,152

As a final measure to determine the trend for the earning of CTE industry credentials at the high school level in Region Eight, Table 121 presents the data specific to “Soft skills/College & Career Readiness” certifications. Because these certifications are included in the VDOE approved list of industry certifications, they are included in the industry credential test data provided by the Virginia Department of Education, Office of Education Information Management (VDOE, 2019). The value of this data lies in its relationship to the overall earning of industry credentials by high school students in Region Eight, and the bigger picture when determining any trend.

Table 121

Soft skills/College & Career Readiness industry credentials earned in Region Eight: 2014-2019

"Soft skills/College & Career Readiness" Assessments & Assessment Provider	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
Armed Services Vocational Aptitude Battery Examination: United States Military Entrance Processing Command	531	255	106	51
Avid Certified User for Media Composer Certification Examination: Avid	1	1	0	0
College and Work Readiness Assessment (CWRA+): Council for Aid to Education	351	223	70	45
National Career Readiness Certificate (ACT)	3,344	2,852	669	570
W!SE Financial Literacy Certification: Working in Support of Education (W!SE)	7,448	5,538	1,490	1,108
Workplace Readiness Skills for the Commonwealth Examination	2,071	1,424	414	285
TOTAL	13,746	10,293	1,718	2,059

To determine the trend for high school completer students earning industry credentials in Region Eight over the past five years, a finalized set of summarized data can be seen in Table 122. These data present the number of students who have earned a CTE industry credential approved by Virginia's Board of Education. The three categories of assessment type are represented in Table 122 and present the five year total, and five-year average number of earned (a) "technical" credentials (sufficient for a student to successfully end their completer program); (b) "other" assessments taken where students are on the CTE path, working towards certifications; and (c), the "Soft skills/College & Career Readiness" certifications.

Table 122

Total Number of Industry Certifications Earned in Region Eight: 2014-2019

Industry Credential Assessment & Type	Taken	Pass	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.
"Technical" Completer Certifications	3,101	2,008	620	402
"Other" CTE certifications - pathway/level one/PLTW/Skills USA	7,363	5,761	1,473	1,152

“Soft skills/College & Career Readiness” certifications.	13,746	10,293	1,718	2,059
TOTAL	24,210	18,062	4,842	3,612

Research Question 3: What are the potential earnings for students gaining industry credentials in Virginia’s (Region Eight) labor market?

To determine the potential earning for students gaining industry credentials in Virginia’s labor market, it is crucial to understand the labor market’s occupational openings by educational attainment level. Through the review of these data, one can examine the extent to which Region Eight students are entering a labor market saturated with similarly qualified candidates, or into the market with high-demand, high-salary openings. Data in Table 123, as extracted from the Bureau of Labor Statistics and the Virginia Employment Commission projection to 2026, show the probable occupational openings by education level attainment for Region Eight as a whole.

Table 123

Occupational Openings by Education Attainment Level to 2026 – Region Eight

Region 8: Southside	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Associate's Degree	903	59	81	25
Bachelor’s Degree	3,037	328	264	98
Doctoral or Professional Degree	1,281	159	95	38
High School Diploma or Equivalent	18,790	517	1,990	826
Less Than High School	16,169	2,340	2,419	1,023
Master's Degree	502	91	51	15
Not Applicable	123,563	9,768	14,060	5,818
Postsecondary Non-Degree Award	1,884	209	161	56
Some College, No Degree	157	23	26	10
TOTAL	166,286	13,494	19,147	7,909

Source: May 2018 State Occupational Employment and Wage Estimates,
https://www.bls.gov/oes/current/oes_va.htm#00-0000

While data in Table 123 specify occupations in the “Not Applicable” category as the largest group to access to occupational openings, a precise definition of the education included in that category is not available. The second-largest estimated category in labor market openings is

found in the “High School Diploma or Equivalent” category. However, when the “Not Applicable” category is removed from the data, along with “Less than High School” as in Table 124 numbers show that the two categories of education with greater access to projected employment are those with “High School Diploma or Equivalent” and “Bachelor’s Degree.”

Table 124

Occupational Openings by Education Attainment Level – Region 8 - "Less than High School" and "Not Applicable" removed

Region 8: Southside	Projected Employment	Numeric Change	Annual Openings	Annual Exits
Associate's Degree	903	59	81	25
Bachelor's Degree	3,037	328	264	98
Doctoral or Professional Degree	1,281	159	95	38
High School Diploma or Equivalent	18,790	517	1,990	826
Master's Degree	502	91	51	15
Postsecondary Non-Degree Award	1,884	209	161	56
Some College, No Degree	157	23	26	10
TOTAL	26,554	1,386	2,668	1,068

Source: May 2018 State Occupational Employment and Wage Estimates,
https://www.bls.gov/oes/current/oes_va.htm#00-0000

Data presented in Table 125 show the occupations available to Region Eight’s CTE completer students who have earned a series of industry credentials. These data present the estimated mean salary expected, the projected occupational openings to 2026 of that particular occupation, the number of annual openings, and annual exits. Data included in this table show completer data specifically and does not include those who are currently enrolled in a CTE pathway, or who have completed credentials with a career readiness focus. The data in Table 125 brings together data points from:

- a) *Virginia: Industry Credentials Taken and Passed: 2014-2019 – Completers* (see Table 119). Data from this source is seen in the columns “Assessment,” “Taken 5 Yr. Avg.” and “Pass 5 Yr. Avg”.

- b) Bureau of Labor Statistics *May 2019 State Occupational Employment and Wage Estimates: Virginia* (Bureau of Labor Statistics, 2020). Data from this source is seen in the columns “Occupation” and “Mean Annual Salary.”
- c) TrailBlazers: Career and Technical Education in Virginia (TrailBlazers, 2020). Labor market data for the LWIA VIII South Central region (TrailBlazers, 2020), is seen in columns: “Occupation,” “Projected Employment,” “Numeric Change,” “Annual Openings,” and “Annual Exits.”

Table 125

CTE Industry Credential to Occupational Alignment and Projections – Region Eight: Southside and LWIA VIII: South Central

Assessment	Taken 5 Yr. Avg.	Pass 5 Yr. Avg.	Occupation	Mean Annual Wage	Projected Employment	Numeric Change	Annual Openings	Annual Exits
AAFCS: Culinary Arts Examination	4	4	Food Preparation and Serving Related Occupations	\$24,280	4,787	445	807	343
AAFCS: Early Childhood Education Examination	7	4	Preschool Teachers, Except Special Education	\$37,880	117	7	12	5
AAFCS: Education Fundamentals Examination	0.4	0.4	Teacher Assistants	\$28,000	684	60	72	36
AAFCS: Nutrition, Food and Wellness Examination	19	4	Dietetic Technicians	\$32,430	284	27	24	9
Accounting (Basic) Assessment: National Occupational Competency Testing Institute (NOCTI)	6	0	Financial Clerks	\$40,410	1,168	11	129	65
Administrative Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	0.2	0.2	Office and Administrative Support Occupations	\$39,030	8,314	185	922	420
Adobe Certified Associate: Photoshop Cloud 2015 Examination/Certiport	5	1	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	522	45	56	21
Adobe Certified Associate: Photoshop CS6 Examination/Certiport	27	12	Arts, Design, Entertainment, Sports, and Media Occupations	\$59,950	522	45	56	21
Agriculture Mechanics Assessment: National Occupational Competency Testing Institute (NOCTI)	9	7	Transportation and Material Moving Occupations	\$38,200	4,804	354	576	231
ASE Student Certification Automotive: Electrical/Electronic Systems; Engine Performance; Engine Repair; Maintenance and Light Repair; Brakes; Suspension and Steering: National Institute for Automotive Service Excellence	30	24	Automotive Service Technicians and Mechanics	\$47,730	349	16	34	11
ASE Student Certification Collision Repair & Refinish: Non-structural Analysis and Damage Repair; Painting and Refinishing: National Institute for Automotive Service Excellence	2	2	Automotive Service Technicians and Mechanics	\$47,730	349	16	34	11
ASK Concepts of Entrepreneurship and Management Assessment: ASK Business Institute	3	3	Sales and Related Occupations	\$41,140	5,262	112	766	342
Beef Quality Assurance Certification	10	9	Farming, Fishing, and Forestry Occupations	\$36,230	1,079	56	142	37
CAD Assessment: National Occupational Competency Testing Institute (NOCTI)	4	0	Mechanical Drafters	\$59,000	753	55	64	21
Certification of Pharmacy Technicians (ExCPT) Examination: Virginia Board of Pharmacy	9	6	Pharmacy Technicians	\$32,370	158	15	14	5

Certified Phlebotomy Technician (CPT) Examination: National Healthcareer Association (NHA)	1	1	Phlebotomists	\$35,960	3,795	908	428	145
CompTIA IT Fundamentals Certification Examination: CompTIA	3	2	Computer User Support Specialists	\$58,290	137	8	11	3
CompTIA A+ Certification Examination (must pass both exams): CompTIA	4	1	Computer Hardware Engineers	\$119,500	1,384	140	96	26
Construction Masonry-Brick Assessment: National Occupational Competency Testing Institute (NOCTI)	0.2	0.2	Helpers--Construction Trades	\$31,340	285	11	40	12
Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	7	4	Hairdressers, Hairstylists, and Cosmetologists	\$34,250	18,711	1,881	2,263	1,187
Early Childhood Education and Care, Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	4	2	Teacher Assistants	\$28,000	684	60	72	36
Early Childhood Education and Care, Basic Assessment: National Occupational Competency Testing Institute (NOCTI)	19	9	Childcare Workers	\$24,620	102	(3)	14	8
Equine Science Examination – New York State Department of Education (Cornell University)	9	7	Farmworkers, Farm, Ranch, and Aquacultural Animals	\$28,020	780	100	120	27
Forestry Products & Processing Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	Forest, Conservation, and Logging Workers	\$41,130	860	25	110	30
Fundamentals of Animal Science Certification Examination: Elanco (Exam is administered by iCEV)	6	5	Veterinary Assistants and Laboratory Animal Caretakers	\$26,750	2,968	692	467	152
IC3 Global Standard 5, Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	7	2	Computer User Support Specialists	\$58,290	137	8	11	3
IC3 Global Standard 4 Internet and Computing Core Certification Examinations: Certiport (student has passed all three examinations)	12	5	Computer User Support Specialists	\$58,290	137	8	11	3
Internet and Computing Core Certification Examinations/Windows 7--Office 2010: Certiport (student has passed all three examinations)	21	8	Computer User Support Specialists	\$58,290	137	8	11	3
MOS 2013 Master/Certiport (must pass four exams)	1	1	Computer Operators	\$49,830	548	(136)	50	25
MOS Examinations (Advanced level): Microsoft Office Specialist/Certiport (Pass any one exam at this level)	3	3	Computer Operators	\$49,830	548	(136)	50	25
MOS Excel Expert Level: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	0.4	0.4	Computer Operators	\$49,830	548	(136)	50	25
MOS Microsoft Office Expert 2013/Certiport (must pass both Word & Excel at expert levels)	0.2	0.2	Computer Operators	\$49,830	548	(136)	50	25
MOS Microsoft Office Expert Excel 2016/Certiport (only one exam)	3	1	Computer Operators	\$49,830	548	(136)	50	25
MOS Word Expert Level Examination: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	4	4	Word Processors and Typists	\$42,290	351	(148)	32	27

National Nurse Aide Assessment Program (NNAAP) Examination: Virginia Board of Nursing	105	76	Nursing Assistants	\$28,770	1,522	218	179	86
Nursing Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	Nursing Assistants	\$28,770	1,522	218	179	86
ParaPro: Educational Testing Service (ETS)	19	17	Teacher Assistants	\$28,000	684	60	72	36
PC Pro Certification Examination: Test Out Corporation (TOC)	2	2	Computer User Support Specialists	\$58,290	137	8	11	3
Private Applicator Certification Examination: VA Dept. of Agriculture and Consumer Services	90	48	Pest Control Workers	\$40,800	1,523	123	208	56
ProStart Program End-of-Course Examination (Level 2): Education Foundation of the National Restaurant Association	4	4	Food Preparation and Serving Related Occupations	\$24,280	4,787	445	807	343
Retail Merchandising Assessment: National Occupational Competency Testing Institute (NOCTI)	10	4	Sales and Related Occupations	\$41,140	5,262	112	766	342
ServSafe Manager Certification Examination: National Restaurant Association	82	67	Food Preparation and Serving Related Occupations	\$24,280	4,787	445	807	343
Small Animal Care Examination New York Dept.. of Education (Cornell Univ.)	23	20	Animal Care and Service Workers	\$27,720	129	35	21	8
Virginia Motor Vehicle Safety Inspection Program Examination: Virginia State Police	1	1	Automotive Service Technicians and Mechanics	\$47,730	349	16	34	11
Welding Assessment: National Occupational Competency Testing Institute (NOCTI)	1	1	Welders, Cutters, Solderers, and Brazers	\$46,360	7,627	432	820	198

Research Question 4: What is the potential economic impact for the state if the number of CTE students earning industry credentials were to increase by 10% annually?

To determine the economic impact for the Commonwealth of Virginia if the number of CTE students earning industry credentials in Superintendent Region Eight were to increase 10% annually, each of the 45 different industry credentials aligned with an occupation in Table 110, was calculated to determine its growth of 10% annually. These results were then used to determine the income tax associated with that credential and occupation. Table 126 provides a breakout, by year, of the potential income tax revenue the Commonwealth of Virginia could potentially see if the number of completer students earning industry credentials in Superintendent Region Eight was to increase by 10% annually.

Table 126

Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually

Region Eight	Credential *10%	Compound Credentials	Income Tax Due	Compound Income Tax
Year 1	37	412	\$ 717,000.96	\$ 1,209,522.46
Year 2	41	452	\$ 788,701.05	\$ 1,998,223.51
Year 3	45	499	\$ 867,571.16	\$ 2,865,794.66
Year 4	50	548	\$ 954,328.27	\$ 3,820,122.93
Year 5	55	603	\$ 1,049,761.10	\$ 4,869,884.03

Credential numbers are rounded

A component of this study was a survey distributed to 40 representatives of Virginia's businesses and economy to determine the value added to the earning of industry credentials. Eighteen respondents indicated a candidate applying for a position in their company/organization, as a holder of industry credentials, would enter the company at a larger starting salary than a non-credentialed candidate. The range of the increased starting salary was between 5% and 25%. Using the average of these numbers, 14% could be used as the value-

added to the earning of industry credentials, however, to ensure this study creates a floor rather than a ceiling of value, 10% will be used as the value-added to those earning industry credentials since this figure was recommended by 6 of the respondents.

Table 127 presents the projected data of Superintendent Region Eight completers if their number were to increase by 10% annually. Data in the table also shows the new potential income tax revenue available to Virginia's Treasury if the 10% value-added sum is applied to the projected economic impact of the earning of CTE industry credentials on Virginia's economy.

Table 127

Estimated Annual Figures of Credentials and Income Tax Revenue when Increased by 10% Annually - AND Allows a 10% Increase in Beginning Salary

Region Eight	Credential *10%	Compound Credentials	Income Tax Due	Compound Income Tax
Year 1	37	412	\$ 799,311.60	\$ 1,346,879.00
Year 2	41	452	\$ 879,242.76	\$ 2,226,121.75
Year 3	45	499	\$ 967,167.03	\$ 3,193,288.78
Year 4	50	548	\$ 1,063,883.73	\$ 4,257,172.51
Year 5	55	603	\$ 1,170,272.11	\$ 5,427,444.62

Credential numbers are rounded

CHAPTER 5

FINDINGS, SUMMARY, AND CONCLUSIONS

In Chapter 5, a summary of the study, and conclusions drawn from the data submitted in Chapter 4 will be presented. To ensure that regional data are presented in a coherent manner, this chapter will be divided into two sections:

Section One will present a summary of the study and the research methodology along with the major findings of the research, the implications for action, recommendations for further research, and finally, the conclusion.

Section Two will present the findings of each superintendent region and concluding remarks.

Summary of the Study

Overview of the problem

In today's knowledge-based economy, the increasing importance of education cannot be overstated, particularly in the skill mastery learned and developed in secondary Career and Technical Education (CTE) programs. As industry skills and competencies are learned and mastered, external validation of the new skills can be sought in the earning of industry-recognized credentials. Approved by Virginia's Board of Education, these credentials are the currency through which competencies and employability are recognized, and the route through which a good salary can be earned. Whether these credentials serve as a "door opener" or a "signal," of talent to the employer, earning industry-recognized credentials serve as a stepping-stone to post-secondary education, to the workplace, or a four-year college." That regional economic development and its education system go hand-in-hand have not been missed by Virginia's legislature. In recent years, CTE has risen to the top of the education policy agenda for

governors and legislators (Zinth, 2013), as evident in 2012 General Assembly move to change the graduation requirements for all Virginia high school students taking a standard diploma. The legislation now requires standard diploma students to earn an industry certification as a requirement for graduation (VDOE, 2016). The contribution of CTE to the workforce and regional economic development has been seen at the legislative level; however, a perception problem of CTE perpetuated by dominant values of the enforcing organization, e.g., state, school, and society continue to relegate CTE and industry credentials to a place of limited worth.

Purpose statement and research questions

A significant gap in the literature reflects a critical economic incentive for the state, school, and student alike. By identifying the relationship of CTE and industry credentials with the filling of Virginia's labor market's "forgotten middle" jobs, one can estimate the potential earnings for those credentialed employees in the form of salary, and to the state's Treasury's revenue in terms of potentially taxable income, and hence the potential economic impact on Virginia's economy and regions. Further, if the number of completers in CTE programs was to increase by ten percent annually, the economic outcome to the state, school, and individual might go some way to changing the perception of CTE, while contributing to the economic development of Virginia's educational regions.

It is the purpose of the study to identify the relationship between the earning of CTE industry credentials at the high school level on Virginia's labor market and the State's economy.

Research questions

1. What is the trend for high school participation in CTE programs in Virginia?
2. What is the trend for high school completer students earning industry certifications in Virginia?

3. What is the potential income for students earning industry credentials in Virginia's labor market?
4. What is the potential economic impact for the state if the number of CTE students earning industry credentials were to increase by 10% annually?

Methodology

To determine the economic value of industry credentials for high school students earning CTE industry credentials, and for the State's Treasury potential income tax revenue, a non-experimental, quantitative study was carried out, employing the following:

Ex post facto data

Data retrieved from the *Industry Credential Assessment Data: 2012-2019*, obtained from the Virginia Department of Education, Office of Education Information Management, (2019), was used to identify the CTE industry credentials taken and passed in Virginia, by region, over five years. This data was then disaggregated into three categories (a) "Technical" assessments, e.g., those indicating completion of a CTE program of study, (b) "Other" assessments, e.g., assessments taken at the primary level, rather than advanced, indicating that students are still on their CTE career pathway, and (c) "Soft skills/College and Career Ready" assessments, e.g., assessments taken by high school students which compliment a general or specific course of study, approved by the VDOE as CTE industry credentials. The findings of this data were aligned with data gathered from the Bureau of Labor Statistics' *Occupational Outlook Handbook* (BLS, 2018) and Virginia's regional labor market data pulled from *Trailblazers: Career and Technical Education in Virginia* (CTAE, 2018). The subsequent results of this data collection led to the alignment of CTE industry credentials to occupational openings in each superintendent region in Virginia. With the occupation, mean salary, the number of annual openings projected to

2026, and the number of annual exits from these occupations identified, a potential income level for the student, and revenue for the State's Treasury was made.

Likert survey data

As means of a validation study into the alignment of the CTE industry credential to occupational alignment, ten CTE experts in two states were surveyed to indicate their level of agreement with alignment. Using a five-point Likert survey, where “one” indicated a low level of agreement, and “five” a high level of agreement, the respondents were asked to state their level of agreement, and potential other occupation for the alignment, if necessary. The data collected from this study was used as a means to reduce any researcher bias while validating the alignment of credentials to the occupation. Feedback provided by the respondents was used to ensure all the alignments presented were in full agreement with the respondent and the feedback provided. Further, this data was used to confirm the potential salary available to candidates with a particular credential entering a particular career, and thereby enabling the calculation, by state and region, of the economic impact the earnings could have on both student and state.

Closed-ended question survey

Because the substance of this research involves the human capital that earners of CTE industry credentials can bring to the labor market, feedback from representatives of Virginia's industries and the labor market was considered vital if one was to determine the value of CTE industry credentials to the workplace. Using the online platform *Survey Monkey*, a five-question, closed-answered survey was sent to participants to question their employment and salary, making decisions explicitly based on the potential employee's owning and earning of CTE industry credentials. The final question was open-ended, requiring participants to state that if the candidate with industry credentials were to begin employment with their company, with a higher

starting salary (as determined by the previous four answers), what would that percentage increase look like. The purpose of this survey was to determine a *minimum* percentage amount that a holder of industry credentials could earn. While the responses ranged from 5% to 25%, the final figure used in the final calculations of this research, was 10% since six of the 18 respondents indicated this preference.

Major Findings

Findings in this study show that for each Virginia CTE completer student earning industry credentials, they have the potential to earn an average salary of \$54,311 in Virginia's labor market. If the number of CTE completers were to increase by an average of four students in each Virginia high school annually, the State's Treasury could increase by \$52,647,744.83 annually or \$263,238,724.16 over five years. However, with an average annual increase rate in the number of Virginia's CTE completers standing at 0.2%, and 69% of CTE industry credentials taking the "soft skills/College and Career Readiness courses," the conclusion reached reveals the contradiction of the purpose and value of CTE in education in Virginia.

Annual Number of CTE Completer Students:

A surprising finding in this study is seen in the average percentage of annual CTE completers throughout Virginia as a whole. With an average growth rate of 0.2% as a Commonwealth, several questions are necessary:

1. Why is the number of CTE completers so low?
2. Could it be because of a lack of funding, as stated by Leachman & Mai (2014), where Virginia has reduced its educational spending by 11%, allocating \$679 for each student?

Because the CTE completer sequence requires two or more consecutive years in a CTE program, could it be that teaching faculty specializing in those areas are not being recruited, not being retained, not available in the applicant pool of teachers, or as the national trend shows, are retiring in large numbers (Leachman & Mai, 2014)? Moreover, these questions prompt further investigation regarding the allocation of teachers to CTE programs, particularly:

1. Does a shortage of CTE teachers result in the absence of CTE offerings at the completer level?
2. Does the absence of completer programs result in the allocation of non-CTE teachers to teach courses that are recognized by the VDOE as eligible to receive CTE industry credential, e.g., the soft skills/College and Career Readiness courses?
3. To what extent are CTE teacher recruitment, retainment, and retirement, related to the allocation of teachers to CTE courses?

Concerning prior research, this study supports the findings of Tucker (2018) and Passarella's (2018) conclusions into the OECD (2010) *Review of Vocational Education and Training report*, students in the US are receiving minimal exposure to CTE courses, particularly in Virginia. A limitation of the OECD report could be the dated nature of the report – all the way back to 2010. However, the limitation helps one maintain the point that the number of students in CTE completer programs was low in 2010 and remains so in 2020. This research can help to demonstrate the financial bottom line of the benefit of CTE and the earning of industry credentials on Virginia's students, and Virginia's Treasury. If over quarter of a billion dollars can be earned over five years, a calculation based on the small number of current completers, then with concerted effort, and a 10% increase in the number of completers each year, could see significantly greater revenue that could be allocated to recruiting, retaining, and incentivizing

those in the industry to become educators. Students need to learn the skills from those who have them. Earning industry credentials serves our students, educators, labor market, and economy well.

The Trend in Completer Credentials

A noteworthy finding in the identification of trends for high school completers students earning industry certifications in Virginia, over the past five years, is the extent to which “technical,” CTE program-specific industry credentials were not being taken or earned. When the VDOE Board validated industry credentials were disaggregated into the three categories of “technical,” “other” and “soft skills/College & Career Ready,” the largest number of students was in the “soft skills/College & Career Ready” category, 69% of students taking these assessments, and 72% earning them. In contrast with the “technical,” CTE completer specific programs, 14% of students took the assessment, and 11% earned them. To be sure, if the data for the “technical” and “other” assessments were combined, the results would show 31% of students taking these assessments and 28% passing them, compared with the “soft skills/College & Career Ready” assessments. This is a significant difference, and speaks to the contradiction of CTE in education, both in the purpose and value of CTE leads one to ask. Further, it leads one to ask: do the number of standard credits required for Virginia’s graduates (26 for Advanced Diploma students, 22 for Standard Diploma students) influence the preference for a softskills assessment that can be taken in one year, compared with the CTE completer courses which take longer? When Virginia’s General Assembly passed into law House Bill 895 and Senate Bill 336 legislation to strengthen post-secondary education and workplace requirements (VDOE, 2020), amending graduation requirements to include the *successful completion of a technical education credential*, it did look like VACTEA’s (2018) wish to retool and reskill the workforce had been

granted. However, with such a significant gap in the number of students completing a CTE program of study, in favor of College and Career Ready assessments, these findings align with Passarella's (2018) conclusions that increasing the on-time graduation rate, lest financial sanctions are imposed, could be responsible for this phenomenon. Such findings also make clear the contradiction in the value and purpose of CTE: the much-needed skills reflecting the changing needs of the labor market (ESG, Advance CTE; CCSSO, 2018), compared with the actual earning of those skills. While technical skills are recognized at the state level, at the division level, on-time graduation rates appear to supersede them, at the risk of financial sanctions. If 69% of students take College and Career Readiness assessments, over 14% of students earning technical credentials, where is the value of earning technical industry credentials at the school level?

Ultimately, one is compelled to ask: Aren't we creating a vicious cycle where the opportunity gap in school reinforces the skills gap in the labor market, cycling back on itself to create a post-secondary and labor opportunity gap?

Potential earnings for students gaining industry credentials in Virginia's labor market:

Findings from the business community survey show that 94.4% of the respondents would employ a candidate with industry credentials, over one without any. Additionally, 88.8% of respondents indicated that the earning of industry credentials would influence a starting salary, to a level of between 5 and 25%. For this study, 10% was used as the value-added salary increase, since six of the respondents stated this figure. In this first instance, one can see the labor market advantage of earning CTE credentials over those without industry validations.

When analyzing the CTE industry credential to occupational alignment and occupations for Virginia as a whole, data show that Virginia's students graduating high school with a

completer series of industry credentials, could expect to earn is \$49,374. Accounting for the 10% value-add pay that survey respondents stated they would offer students with industry credentials, the additional \$4,937 increases the potential earnings figure to an average annual salary of \$54,311. Therefore, the potential earnings for Virginia students gaining industry credentials in Virginia's labor market are \$54,311.

While this survey was submitted to 40 of Virginia's business representatives, with 18 of them responding, this could be considered a limitation because of the small size of the survey population. However, the representatives of these businesses are members of large companies and industries in Virginia. Although one cannot generalize on these findings, the 10% figure of a value-added starting salary is not impossible to imagine. It, therefore, increases the potential earnings for students gaining industry credentials in Virginia's labor market.

The potential economic impact for the state if CTE students earning industry credentials were to increase by 10% annually.

Findings in this study show that if each high school and technical center in Virginia added an average of 4 CTE students to its completer program each year, the potential annual income tax revenue available to the States' Treasury could increase by \$47,379,099.05 annually (or \$52,647,744.83 when accounting for the additional 10%). Over five years, \$236,895,495.25 would potentially be available to the Treasury. When accounting for the additional 10% value-added salary increase for students with industry credentials, the potential economic impact for the state if CTE students earning industry credentials were to increase by 10% annually could be \$263,238,724.16. While studies have been undertaken into assessing the relationship of the alignment between CTE programs and the labor market, such as that provided by the IES: Regional Educational Laboratory Program (Harris et al., 2020) investigation into West Virginia's

high school CTE programs and the labor market, the report is not as broad as this research. The economic findings of this research could be considered to be breaking new ground since little if any research exists in relation to the relationship between the earning of CTE industry credentials at the high school level, and its economic impact on both students and state, especially with a regional focus.

Conclusions

Implications for action

Policymakers

The economic potential that CTE and its related industry credentials have on Virginia's students, residents, and state are not insignificant. This research has shown an estimated dollar amount of revenue that can be earned by the state. With targeted funding towards CTE, the removal of Virginia's regressive funding formula, and increased Perkins funding, the economic potential for the increase in CTE completers is great. Not only can earned revenue be returned to the state in terms of finances, but also in terms of incentivizing CTE teacher recruitment, retainment, and professional development training. CTE teachers are needed if CTE is to meet its potential expectations.

Policymakers would also do well to consider the value of the industry credentials on the Virginia Board of Education's approved list. The success of Virginia's students, the community in which they live and work, are dependent on the value of the skills learned by students, and the recognized validity and value of the credentials earned by them. When a graduation requirement can be met through a "career" certification, and a CTE credential earned, in the space of a semester, policymakers need to ask themselves: what incentives do school leaders have to build their CTE departments? If school on-time graduation requirements can be met, and financial sanctions alleviated, why would schools build their CTE departments, employ more teachers, and create new courses, if they can meet the requirements with less?

School Leadership

If the education system is to ensure its students are ready for success, that they have acquired the skills, abilities, and character to grow into a healthy, contributing citizens to our

nation, enabling them to tread the path of their choice, equality of access to that success is imperative. While focusing on SOL pass rates and SOL preparation for students, as a means to demonstrate the abilities of the school's faculty, recognition and value should be given to the skills that students will need in the ever-changing local, national, and global labor market. This study has shown that industry certifications are highly valued in the labor market, while the labor market itself is increasingly changing due to demographics, technical abilities, and the growing skills gap.

School leaders should consider the value of the path they set out for their students. School counselors can help create effective plans of study for their students (as seen in Appendix 3), allowing them to earn valued credentials, as well as walk the Advanced Diploma trail. Awareness should be shared, about the value that CTE industry credentials have for students electing to enter the workforce, or for those taking the post-secondary route as many of the technical industry credentials also offer college credit. Both the American Council on Education's College Credit Recommendation Service (ACE, 2020), and the National College Credit Recommendation Service (NCCRS, 2020), have evaluated a significant number of credentials to align them with college-level courses, and the number of college credit hours available. Not everyone wants to go to college; therefore, schools should ensure students have the opportunity to earn the skills needed to take them down their chosen path. For those who do want to go to college, the earning of skills, and college credit should be made available to them. Ultimately, the implications for school leadership should be ensuring that all paths of success are open to students, not just those aiming for college, and not just for those passing SOLs, but the value and recognition that Virginia's students can have, whichever path they choose.

Recommendations for further research

Subsequent to the investigations taken to provide the findings of this research, several questions emerged that would be strongly recommended for further research:

1. Does a shortage of CTE teachers result in the absence of CTE offerings at the completer level?
2. Does the absence of completer programs result in the allocation of non-CTE teachers to teach courses that are recognized by the VDOE as eligible to receive CTE industry credential, e.g., the soft skills/College and Career Readiness courses?
3. To what extent are CTE teacher recruitment, retainment, and retirement, related to the allocation of teachers to CTE courses?
4. Is there a correlation between the choice of CTE industry credentials offered in Virginia's high schools and the school achieving its on-time graduation rate?
5. Is there a correlation between the accountability measures and increasing pressures on core academics and the number of CTE completer programs offered in Virginia's high schools?

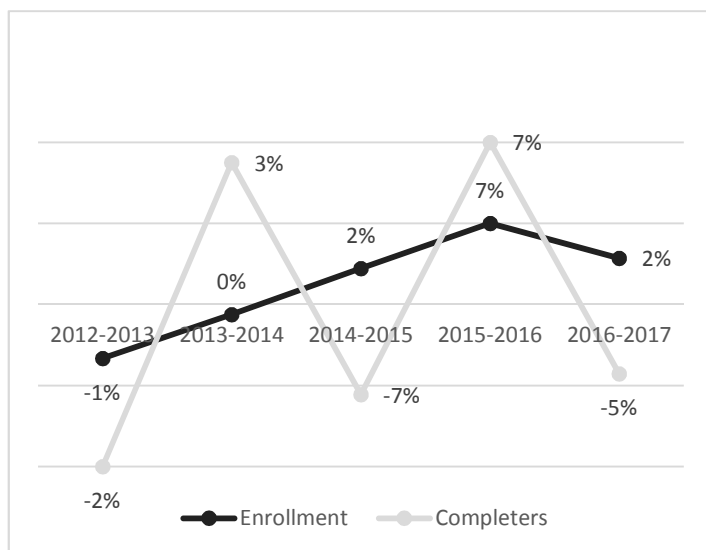
Commonwealth of Virginia

Research Question 1: What is the trend for high school participation in CTE programs in Virginia, over the past five years?

While CTE data available on the VDOE website is immediately accessible to the public, the data is limited and incomplete, in so far as the records end in the 2016-2017 academic years. Although completer data is available upon request from the VDOE, this issue reinforces the arguments made by Castellano et al., 2005; AIR, 2013; Bielick, et al., 2013; Jacob, 2017; ESG, Advance CTE; CCSSO, 2018; in section two, that access to CTE data remains elusive. For this study, this limited access to CTE enrollment data is recognized as a delimitation because although one can draw a broader picture from the findings presented, ultimately, a complete image of CTE program enrollment up to and including 2018-2019 cannot be provided. The extent to which this limitation is detrimental to the outcome of this study is minimal since the primary focus of the research is on completer students and their impact on the economy via the earning of industry certifications

Drawing on data provided from Table 19: Middle and High School CTE Program Enrollment, however, a picture emerges showing that while CTE program enrollment in the middle and high schools had grown steadily until years 2015-2016 to 2016-2017, where a decline 5% was experienced, the number of CTE completers has been erratic with reductions of -7% to growth measures of 7%. Common to both data sets is the increase in the number of CTE enrollees and CTE completers in 2015-2016 (7% increase in both instances), with a decline in the following years of 5% for CTE enrollees and a decline of 12% for CTE completers. This information is graphically presented in Figure: 17.

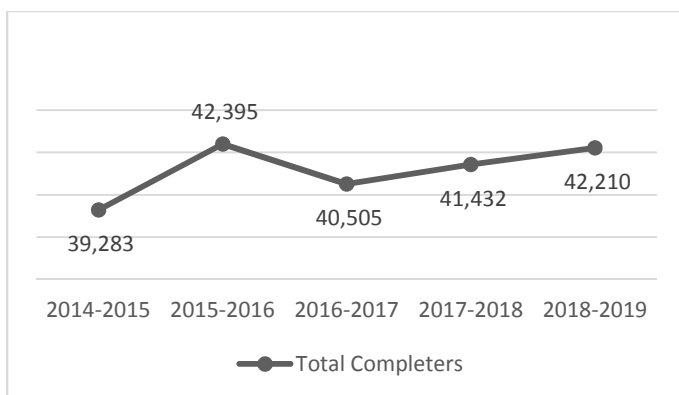
Figure 17 Virginia CTE Program Enrollment and CTE Completers: 2012-2017



Note: Figure 17 presents the number of Virginia's CTE completer students. Data is provided by the Virginia Department of Education, Office of Education Information Management (2019).

When examined from the years 2014-2019, the emergent trend, as seen in Figure 18, is the increase in the number of completers. The 7% growth measure from 2016 to 2019, and the rise of 9% from the lowest point of completers, indicates that the number of CTE completers is steadily increasing. Despite this growth, the largest growth measure of 7% in a single year occurred in the academic years 2014-2015 to 2015-2016. If Virginia is to increase its number of completers by 10%, it may take some time since the average level of growth generally, is 0.2%.

Figure 18 Virginia CTE Completers: 2014-2019



Note: Figure 18 presents the number of Virginia's CTE completer students. Data is provided by the Virginia Department of Education, Office of Education Information Management (2019).

Research Question 2: What is the trend for high school completer students earning industry certifications in Virginia over the past five years?

Virginia's industry certification data demonstrates that over the past five years, completer students taking "technical" certifications represent 14% of the total number of students taking industry certifications, with 11% of them earning that credential. In contrast, the number of credentials taken by students still on their pathway is 17%, with a passing rate of 17%. However, those earning industry credentials via soft-skill assessments such as WISE, Workplace Readiness Skills represent, CWRA+ and others, represent 69% of the students taking industry certifications, with 72% of them earning the certification. With a significant difference in the number of students taking soft skills assessments (544,325), and those earning them (448,663) these data show a trend in the preference for soft skill validation assessments, rather than the technical validation earned by CTE completer students.

Research Question 3: What are the potential earnings for students gaining industry credentials in Virginia's labor market?

The path one takes upon graduating high school has implications for one's career. For those CTE students electing to enter the labor market immediately upon graduation, a projected 159,662 annual employment openings are available to them. However, for those with credentials who choose the postsecondary route, primarily the postsecondary, non-degree route, the projected number of annual employment openings are 11,974. Ultimately, degree-seeking students who have industry credentials as a foundation to build upon, have projected annual openings of 11,532 (Associate's Degree) and 62,035 (Bachelor's Degree). For students gaining industry credentials, the potential earnings to be received in Virginia's labor market is estimated to be an average of \$49,374. Accounting for the 10% value-add pay that 6 of Virginia's

employer survey respondents stated they would offer students with industry credentials, the additional \$4,937 increases the potential earnings figure to an average annual salary of \$54,311. Therefore, for Virginia students graduating high school with a completer series of industry credentials, the minimum annual salary they could expect to earn is \$54,311.

Research Question 4: What is the potential economic impact for the state if the number of CTE students earning industry credentials were to increase by 10% annually?

1. If Virginia were to increase the number of successful completers by 1,408 annually for the next five years, the state income tax revenue could increase by \$47,379,099.05 annually.
2. If Virginia were to divide the 1,408 completer credentials annually by each of the 131 divisions in its region, then each division would need to increase its number of completers by 11 annually.
3. If Virginia were to divide the 1,408 completer credentials annually by each of the 361 high schools/technical centers in its region, then each school would need to increase its number of completers by four annually.
4. In Virginia, for every 4 CTE completer students (on average) who graduate and enter the workforce with their CTE credentials, the income tax revenue to be claimed by the state is estimated to be \$47,379,099.05. Over five years, the income tax revenue available to Virginia's State Treasury could increase by \$236,895,495.25.

Accounting for the 10% value-added to the earning of CTE industry credentials agreed upon by respondents from the Virginia economy survey, the projected economic impact for the Commonwealth of Virginia if the number of CTE completers was to increase by 10% annually is as follows:

1. If Virginia were to increase the number of successful completers by 1,852 annually for the next five years, the state income tax revenue could increase by \$52,647,744.83 annually.
2. If Virginia were to divide the 1,852 completer credentials annually by each of the 131 divisions in its region, then each division would need to increase its number of completers by 14 annually.
3. If Virginia were to divide the 1,852 completer credentials annually by each of the 361 high schools/technical centers in its region, then each school would need to increase its number of completers by five annually.
4. In Virginia, for every 4 CTE completer students (on average) who graduate and enter the workforce with their CTE credentials, the income tax revenue to be claimed by the state is estimated to be \$52,647,744.83. Over five years, the income tax revenue available to Virginia's State Treasury could increase by \$263,238,724.16.

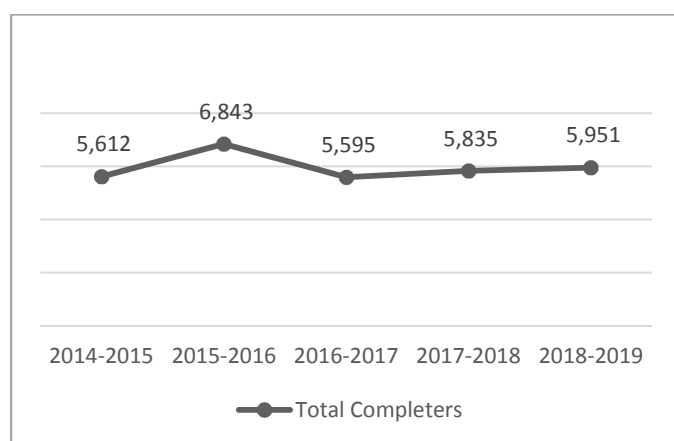
Region One: Central Virginia

Central Virginia, as Superintendent Region One, consists of 15 school divisions, comprising, among its number 38 high schools. Of the 8 Superintendent regions, this region lists 4th in the number of high schools available to its students (VDOE, 2020). The following data represent the findings of this study into the relationship between the earning of Career and Technical industry credentials and the Virginia economy, with specific reference to Region One: Central Virginia.

Research Question 1: What is the trend for high school participation in CTE programs in Virginia (Region One) over the past five years?

When examined from the years 2014-2019, the emergent trend in Region One is the steady increase in the number of completers. While data in Figure 19 shows completer numbers increasing by 1,231 in academic years 2014-2015 to 2015-2016, it was proceeded by a decline of 22%. The number of completers has risen slightly, yet, if Region One is to increase its number of completers by 10% annually, considerable effort will be required since its last two consecutive years saw a combined rise of 6%.

Figure 19 Region One CTE Completers: 2014-2019



Note: Figure 19 presents the number of Virginia's Region One CTE completer students. Data is provided by the Virginia Department of Education, Office of Education Information Management (2019).

Research Question 2: What is the trend for high school completer students earning industry certifications in Virginia (Region One) over the past five years?

The industry certification data for Region One demonstrates that over the past five years, completer students taking “technical” certifications represent 17% of the total number of students taking industry certifications, with 14% of them earning that credential. In contrast, the number of credentials taken by students still on their pathway is 13%, with a passing rate of 12%. However, those earning industry credentials via soft-skill assessments such as WISE, Workplace Readiness Skills represent, CWRA+ and others, represent 70% of the students taking industry certifications, with 74% of them earning the certification. With a significant difference in the number of students taking soft skills assessments (71,246), and those earning them (59,026) compared to those taking and earning technical certifications, these data show a significant trend in the preference for soft skill validation assessments, rather than the technical validation earned by CTE completer students.

Research Question 3: What are the potential earnings for students gaining industry credentials in Virginia’s (Region One) labor market?

Region One CTE students electing to enter the labor market immediately upon graduation, have a projected 28,301 annual employment openings available to them. However, for those with credentials who choose the postsecondary route, primarily the postsecondary, non-degree route, the projected number of annual employment openings are 2,216. Ultimately, degree-seeking students who have industry credentials as a foundation to build upon, have projected annual openings of 1,831 (Associate’s Degree) and 9,602 (Bachelor’s Degree). For students gaining industry credentials, the potential earnings to be received in the Region One labor market is estimated to be an average of \$50,869. Accounting for the 10% value-add pay

that six of Virginia's employer survey respondents stated they would offer students with industry credentials, the additional \$5,086 increases the potential earnings figure to an average annual salary of \$55,956. Therefore, for Region One students graduating high school with a completer series of industry credentials, the minimum annual salary they could expect to earn is \$55,956.

Research Question 4: What is the potential economic impact for the state if the number of CTE students earning industry credentials (in Region One) were to increase by 10% annually?

1. If Region One were to increase the number of successful completers by 279 annually for the next five years, the state income tax revenue could increase by \$7,712,008.82 annually.
2. If Region One were to divide the 279 completer credentials annually by each of the 15 divisions in its region, then each division would need to increase its number of completers by 19 annually.
3. If Region One were to divide the 279 completer credentials annually by each of the 38 high schools/technical centers in its region, then each school would need to increase its number of completers by seven annually.
4. In Region One, for every 7 CTE completer students who graduate and enter the workforce with their CTE credentials, the income tax revenue to be claimed by the state is estimated to be \$7,712,008.82. Over five years, the income tax revenue available to Virginia's State Treasury could increase by \$38,560,044.11.

Accounting for the 10% value-added to the earning of CTE industry credentials agreed upon by respondents from the Virginia economy survey, the projected economic impact for the

Commonwealth of Virginia if the number of Region One CTE completers was to increase by 10% annually is as follows:

1. If Region One were to increase the number of successful completers by 279 annually for the next five years, the state income tax revenue could increase by \$8,565,668.74 annually.
2. If Region One were to divide the 279 completer credentials annually by each of the 15 divisions in its region, then each division would need to increase its number of completers by 19 annually.
3. If Region One were to divide the 279 completer credentials annually by each of the 38 high schools/technical centers in its region, then each school would need to increase its number of completers by seven annually.
4. In Region One, for every 7 CTE completer students who graduate and enter the workforce with their CTE credentials, the income tax revenue to be claimed by the state is estimated to be \$8,565,668.74. Over five years, the income tax revenue available to Virginia's State Treasury could increase by \$42,828,343.72.

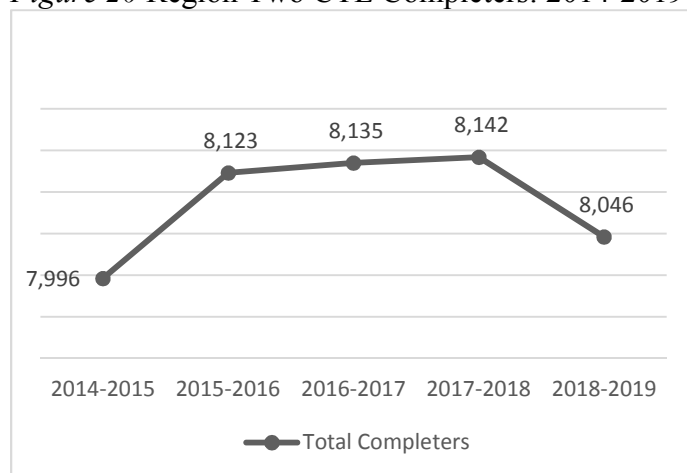
Region Two: Tidewater

Tidewater, as Superintendent Region 2, consists of 14 school divisions, comprising among its number 63 high schools (including specialist technical centers). Of the 8 Superintendent regions, this region lists 2nd in the number of high schools available to its students (VDOE, 2020). The following data represent the findings of this study into the relationship between the earning of Career and Technical industry credentials and the Virginia economy, with specific reference to Region Two: Tidewater.

Research Question 1: What is the trend for high school participation in CTE programs in Virginia (Region Two), over the past five years?

When examined from the years 2014-2019, the data collected for Region Two (see Figure 20 reflects an unusual pattern. Preceded by a sharp 10% increase in the number of completers for academic years 2014-2015, the three years of subsequent growth are met with a decline in the years 2018-2019. If Region Two is to increase its number of completers by 10% annually, considerable effort will be required since its last three years have reflected a 0.1% increase in the number of completers.

Figure 20 Region Two CTE Completers: 2014-2019



Note: Figure 20 presents the number of Virginia's Region Two CTE completer students. Data is provided by the Virginia Department of Education, Office of Education Information Management (2019).

Research Question 2: What is the trend for high school completer students earning industry certifications in Virginia (Region Two), over the past five years?

The industry certification data for Region Two demonstrates that over the past five years, completer students taking “technical” certifications represent 14% of the total number of students taking industry certifications, with 11% of them earning that credential. In contrast, the number of credentials taken by students still on their pathway is 18%, with a passing rate of 18%. However, those earning industry credentials via soft-skill assessments such as WISE, Workplace Readiness Skills represent, CWRA+ and others, represent 68% of the students taking industry certifications, with 71% of them earning the certification. With a difference in the number of students taking soft skills assessments (117,935), and those earning them (97,873), compared to those taking and earning technical certifications, these data show a significant trend in the preference for soft skill validation assessments, rather than the technical validation earned by CTE completer students.

Research Question 3: What are the potential earnings for students gaining industry credentials in Virginia’s (Region Two) labor market?

Region Two CTE students electing to enter the labor market immediately upon graduation, have a projected 31,586 annual employment openings available to them. However, for those with credentials who choose the postsecondary route, primarily the postsecondary, non-degree route, the projected number of annual employment openings are 2,607. Ultimately, degree-seeking students who have industry credentials as a foundation to build upon, have projected annual openings of 2,626 (Associate’s Degree) and 9,991 (Bachelor’s Degree). For students gaining industry credentials, the potential earnings to be received in the Region Two labor market is estimated to be an average of \$52,944. Accounting for the 10% value-add pay

that 6 of Virginia's employer survey respondents stated they would offer students with industry credentials, the additional \$5,294 increases the potential earnings figure to an average annual salary of \$58,238. Therefore, for Region Two students graduating high school with a completer series of industry credentials, the minimum annual salary they could expect to earn is \$58,238.

Research Question 4: What is the potential economic impact for the state if the number of CTE students earning industry credentials (in Region Two) were to increase by 10% annually?

1. If Region Two were to increase the number of successful completers by 407 annually for the next five years, the state income tax revenue could increase by \$11,033,111.07 annually.
2. If Region Two were to divide the 407 completer credentials annually by each of the 14 divisions in its region, then each division would need to increase its number of completers by 29 annually.
3. If Region Two were to divide the 279 completer credentials annually by each of the 63 high schools/technical centers in its region, then each school would need to increase its number of completers by six annually.
4. In Region Two, for every 6 CTE completer students who graduate and enter the workforce with their CTE credentials, the income tax revenue to be claimed by the state is estimated to be \$11,033,111.07. Over five years, the income tax revenue available to Virginia's State Treasury could increase by \$55,165,555.37.

Accounting for the 10% value-added to the earning of CTE industry credentials agreed upon by respondents from the Virginia economy survey, the projected economic impact for the

Commonwealth of Virginia if the number of Region Two CTE completers was to increase by 10% annually is as follows:

1. If Region Two were to increase the number of successful completers by 407 annually for the next five years, the state income tax revenue could increase by \$12,255,577.38 annually.
2. If Region Two were to divide the 407 completer credentials annually by each of the 14 divisions in its region, then each division would need to increase its number of completers by 29 annually.
3. If Region Two were to divide the 279 completer credentials annually by each of the 63 high schools/technical centers in its region, then each school would need to increase its number of completers by six annually.
4. In Region Two, for every 6 CTE completer students who graduate and enter the workforce with their CTE credentials, the income tax revenue to be claimed by the state is estimated to be \$12,255,577.38. Over five years, the income tax revenue available to Virginia's State Treasury could increase by \$61,277,886.90.

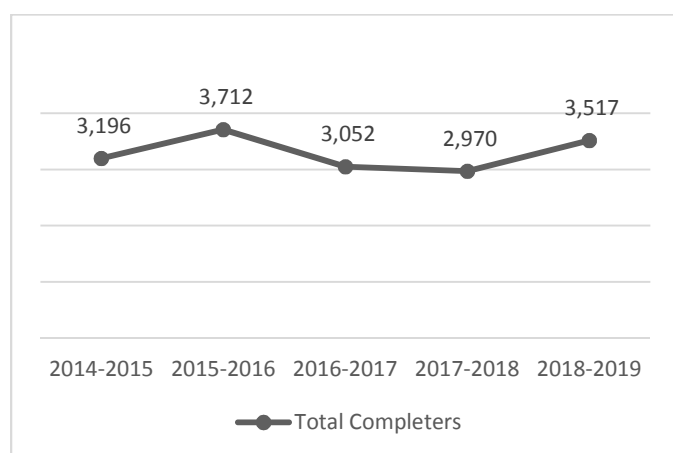
Region Three: Northern Neck

Northern Neck, as Superintendent Region 3, consists of 17 school divisions, comprising among its number 29 high schools (including specialist technical centers). Of the 8 Superintendent regions, this region lists 7th in the number of high schools available to its students (VDOE, 2020). The following data represent the findings of this study into the relationship between the earning of Career and Technical industry credentials and the Virginia economy, with specific reference to Region Three: Northern Neck.

Research Question 1: What is the trend for high school participation in CTE programs in Virginia (Region Three), over the past five years?

Data presented in Figure 21 reflects an ebb and flow in increases and decreases in the number of CTE completer students enrolled in Region Three's CTE programs. Proceeded by a 22% decline in the number of completers from academic years 2015-2016 to 2016-2017 Region Three data shows a 13% increase from the years 2017-2018 to 2018-2019. Region Three data shows its ability to increase its completer numbers by both 14% and 13%. This ability will be needed if an annual growth of 10% is to be achieved.

Figure 21 Region Three CTE Completers: 2014-2019



Note: Figure 21 presents the number of Virginia's Region Three CTE completer students. Data is provided by the Virginia Department of Education, Office of Education Information Management (2019).

Research Question 2: What is the trend for high school completer students earning industry certifications in Virginia (Region Three), over the past five years?

The industry certification data for Region Three demonstrates that over the past five years, completer students taking “technical” certifications represent 13% of the total number of students taking industry certifications, with 10% of them earning that credential. In contrast, the number of credentials taken by students still on their pathway is 15%, with a passing rate of 16%. However, those earning industry credentials via soft-skill assessments such as WISE, Workplace Readiness Skills represent, CWRA+ and others, represent 72% of the students taking industry certifications, with 74% of them earning the certification. With a difference in the number of students taking soft skills assessments (41,218), and those earning them (34,067), compared to those taking and earning technical certifications, these data show a significant trend in the preference for soft skill validation assessments, rather than the technical validation earned by CTE completer students.

Research Question 3: What are the potential earnings for students gaining industry credentials in Virginia’s (Region Three) labor market?

Region Three CTE students electing to enter the labor market immediately upon graduation, have a projected 6,313 annual employment openings available to them. However, for those with credentials who choose the postsecondary route, primarily the postsecondary, non-degree route, the projected number of annual employment openings are 404. Ultimately, degree-seeking students who have industry credentials as a foundation to build upon, have projected annual openings of 379 (Associate’s Degree) and 2,081 (Bachelor’s Degree). For students gaining industry credentials, the potential earnings to be received in the Region Three labor market is estimated to be an average of \$48,879. Accounting for the 10% value-add pay that 6 of

Virginia's employer survey respondents stated they would offer students with industry credentials, the additional \$4,887 increases the potential earnings figure to an average annual salary of \$53,767. Therefore, for Region Three students graduating high school with a completer series of industry credentials, the minimum annual salary they could expect to earn is \$53,767.

Research Question 4: What is the potential economic impact for the state if the number of CTE students earning industry credentials (in Region Three) were to increase by 10% annually?

1. If Region Three were to increase the number of successful completers by 113 annually for the next five years, the state income tax revenue could increase \$2,941,847.22 annually.
2. If Region Three were to divide the 113 completer credentials annually by each of the 17 divisions in its region, then each division would need to increase its number of completers by seven annually.
3. If Region Three were to divide the 113 completer credentials annually by each of the 29 high schools/technical centers in its region, then each school would need to increase its number of completers by four annually.
4. In Region Three, for every 4 CTE completer students who graduate and enter the workforce with their CTE credentials, the income tax revenue to be claimed by the state is estimated to be \$2,941,847.22. Over five years, the income tax revenue available to Virginia's State Treasury could increase by \$14,709,236.10.

Accounting for the 10% value-added to the earning of CTE industry credentials agreed upon by respondents from the Virginia economy survey, the projected economic impact for the

Commonwealth of Virginia if the number of Region Three CTE completers was to increase by 10% annually is as follows:

1. If Region Three were to increase the number of successful completers by 113 annually for the next five years, the state income tax revenue could increase by \$3,270,286.78 annually.
2. If Region Three were to divide the 113 completer credentials annually by each of the 17 divisions in its region, then each division would need to increase its number of completers by seven annually.
3. If Region Three were to divide the 113 completer credentials annually by each of the 29 high schools/technical centers in its region, then each school would need to increase its number of completers by four annually.
4. In Region Three, for every 4 CTE completer students who graduate and enter the workforce with their CTE credentials, the income tax revenue to be claimed by the state is estimated to be \$3,270,286.78. Over five years, the income tax revenue available to Virginia's State Treasury could increase by \$16,351,433.92.

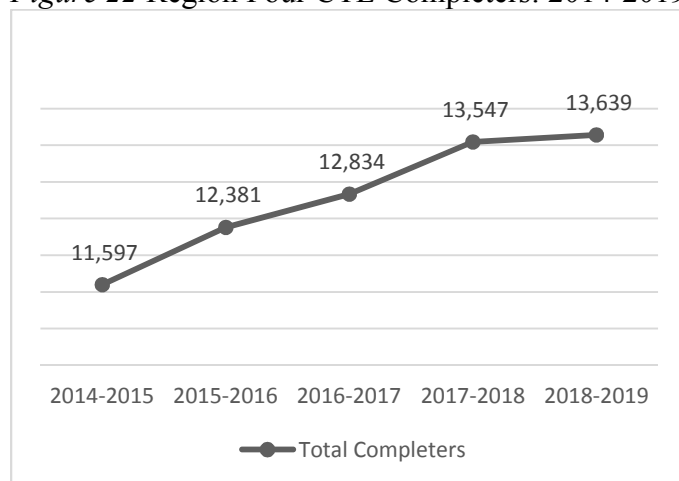
Region Four: Northern Virginia

Northern Virginia, as Superintendent Region 4, consists of 19 school divisions, comprising among its number, 98 high schools (including specialist technical centers). Of the 8 Superintendent regions, this region has the largest number of high schools available to its students in the Commonwealth of Virginia (VDOE, 2020). The following data represent the findings of this study into the relationship between the earning of Career and Technical industry credentials and the Virginia economy, with specific reference to Region Four: Northern Virginia.

Research Question 1: What is the trend for high school participation in CTE programs in Virginia (Region Four), over the past five years?

Consistent with data presented this far, Figure 22 for Region Four reflects an increase in the number of CTE completers in the years 2014-2015. However, unlike the other regions, this growth has continued for each of the past five years, rising from a low of 11,597 students in 2014-2015 to 13,639 in 2018-2019. With an average annual growth of 4%, a continued effort will be required by schools and divisions in Region Four, if it is to increase its number of completers by 10% annually.

Figure 22 Region Four CTE Completers: 2014-2019



Note: Figure 22 presents the number of Virginia's Region Four CTE completer students. Data is provided by the Virginia Department of Education, Office of Education Information Management (2019).

Research Question 2: What is the trend for high school completer students earning industry certifications in Virginia (Region Four), over the past five years?

The industry certification data for Region Four demonstrates that over the past five years, completer students taking “technical” certifications represent 10% of the total number of students taking industry certifications, with 7% of them earning that credential. In contrast, the number of credentials taken by students still on their pathway is 17%, with a passing rate of 17%. However, those earning industry credentials via soft-skill assessments such as WISE, Workplace Readiness Skills represent, CWRA+ and others, represent 73% of the students taking industry certifications, with 76% of them earning the certification. With a difference in the number of students taking soft skills assessments (216,059), and those earning them (175,187) compared to those taking and earning technical certifications, these data show a significant trend in the preference for soft skill validation assessments, rather than the technical validation earned by CTE completer students.

Research Question 3: What are the potential earnings for students gaining industry credentials in Virginia’s (Region Four) labor market?

Region Four CTE students electing to enter the labor market immediately upon graduation, have a projected 67,955 annual employment openings available to them. However, for those with credentials who choose the postsecondary route, primarily the postsecondary, non-degree route, the projected number of annual employment openings is 4,974. Ultimately, degree-seeking students who have industry credentials as a foundation to build upon, have projected annual openings of 5,503 (Associate’s Degree) and 36,016 (Bachelor’s Degree). For students gaining industry credentials, the potential earnings to be received in the Region Four labor market is estimated to be an average of \$52,546. Accounting for the 10% value-add pay that 6 of

Virginia's employer survey respondents stated they would offer students with industry credentials, the additional \$5,254 increases the potential earnings figure to an average annual salary of \$57,800. Therefore, for Region Four students graduating high school with a completer series of industry credentials, the minimum annual salary they could expect to earn is \$57,800.

Research Question 4: What is the potential economic impact for the state if the number of CTE students earning industry credentials (in Region Four) were to increase by 10% annually?

1. If Region Four were to increase the number of successful completers by 404 annually for the next five years, the state income tax revenue could increase by \$11,678,689.76 annually.
2. If Region Four were to divide the 404 completer credentials annually by each of the 19 divisions in its region, then each division would need to increase its number of completers by 21 annually.
3. If Region Four were to divide the 279 completer credentials annually by each of the 98 high schools/technical centers in its region, then each school would need to increase its number of completers by four annually.
4. In Region Four, for every 4 CTE completer students who graduate and enter the workforce with their CTE credentials, the income tax revenue to be claimed by the state is estimated to be \$11,678,689.76. Over five years, the income tax revenue available to Virginia's State Treasury could increase by \$58,393,448.80.

Accounting for the 10% value-added to the earning of CTE industry credentials agreed upon by respondents from the Virginia economy survey, the projected economic impact for the

Commonwealth of Virginia if the number of Region Four CTE completers was to increase by 10% annually is as follows:

1. If Region Four were to increase the number of successful completers by 404 annually for the next five years, the state income tax revenue could increase by \$12,964,822.23 annually.
2. If Region Four were to divide the 404 completer credentials annually by each of the 19 divisions in its region, then each division would need to increase its number of completers by 21 annually.
3. If Region Four were to divide the 279 completer credentials annually by each of the 98 high schools/technical centers in its region, then each school would need to increase its number of completers by four annually.
4. In Region Four, for every 4 CTE completer students who graduate and enter the workforce with their CTE credentials, the income tax revenue to be claimed by the state is estimated to be \$12,964,822.23. Over five years, the income tax revenue available to Virginia's State Treasury could increase by \$64,824,111.14.

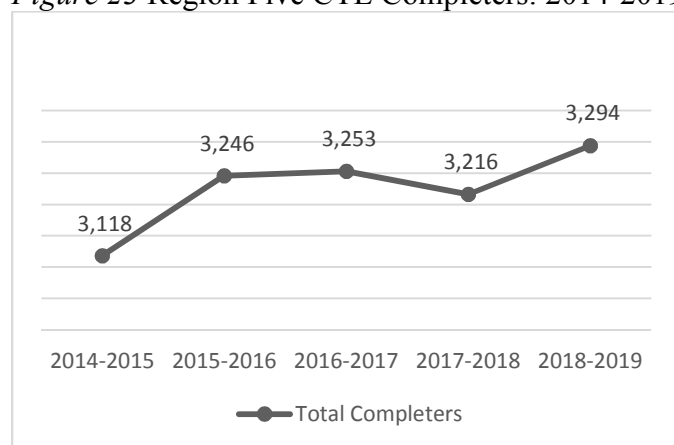
Region Five: Valley

Valley, as Superintendent Region 5, consists of 20 school divisions, comprising among its number 37 high schools (including specialist technical centers). Of the 8 Superintendent regions, this region lists 6th in the number of high schools available to its students (VDOE, 2020). The following data represent the findings of this study into the relationship between the earning of Career and Technical industry credentials and the Virginia economy, with specific reference to Region Five: Valley.

Research Question 1: What is the trend for high school participation in CTE programs in Virginia (Region Five), over the past five years?

Comparable to the regional data presented this far, Figure 23 for Region Five reflects an increase in the number of CTE completers in the years 2014-2015. However, with a difference of 176 completer students from the lowest point to the highest, and an average growth measure of - 0.4%, a 10% increase in the number of students may require a concerted effort.

Figure 23 Region Five CTE Completers: 2014-2019



Note: Figure 23 presents the number of Virginia's Region Five CTE completer students. Data is provided by the Virginia Department of Education, Office of Education Information Management (2019).

Research Question 2: What is the trend for high school completer students earning industry certifications in Virginia (Region Five), over the past five years?

The industry certification data for Region Five demonstrates that over the past five years, completer students taking “technical” certifications represent 18% of the total number of students taking industry certifications, with 15% of them earning that credential. In contrast, the number of credentials taken by students still on their pathway is 15%, with a passing rate of 14%. However, those earning industry credentials via soft-skill assessments such as WISE, Workplace Readiness Skills represent, CWRA+ and others, represent 67% of the students taking industry certifications, with 71% of them earning the certification. With a difference in the number of students taking soft skills assessments (34,031), and those earning them (28,985) compared to those taking and earning technical certifications these data show a trend in the preference for soft skill validation assessments, rather than the technical validation earned by CTE completer students.

Research Question 3: What are the potential earnings for students gaining industry credentials in Virginia’s (Region Five) labor market?

Region Five CTE students electing to enter the labor market immediately upon graduation, have a projected 20,501 annual employment openings available to them. However, for those with credentials who choose the postsecondary route, primarily the postsecondary, non-degree route, the projected number of annual employment openings are 1,424. Ultimately, degree-seeking students who have industry credentials as a foundation to build upon, have projected annual openings of 1,094 (Associate’s Degree) and 4,946 (Bachelor’s Degree). For students gaining industry credentials, the potential earnings to be received in the Region Five labor market is estimated to be an average of \$49,345. Accounting for the 10% value-add pay

that 6 of Virginia's employer survey respondents stated they would offer students with industry credentials, the additional \$4,934 increases the potential earnings figure to an average annual salary of \$54,279. Therefore, for Region Five students graduating high school with a completer series of industry credentials, the minimum annual salary they could expect to earn is \$54,279.

Research Question 4: What is the potential economic impact for the state if the number of CTE students earning industry credentials (in Region Five) were to increase by 10% annually?

1. If Region Five were to increase the number of successful completers by 175 annually for the next five years, the state income tax revenue could increase by \$4,352,428.59 annually.
2. If Region Five were to divide the 175 completer credentials annually by each of the 20 divisions in its region, then each division would need to increase its number of completers by nine annually.
3. If Region Five were to divide the 175 completer credentials annually by each of the 37 high schools/technical centers in its region, then each school would need to increase its number of completers by five annually.
4. In Region Five, for every 5 CTE completer students who graduate and enter the workforce with their CTE credentials, the income tax revenue to be claimed by the state is estimated to be \$4,352,428.59. Over five years, the income tax revenue available to Virginia's State Treasury could increase by \$21,762,142.93

Accounting for the 10% value-added to the earning of CTE industry credentials agreed upon by respondents from the Virginia economy survey, the projected economic impact for the

Commonwealth of Virginia if the number of Region Five CTE completers was to increase by 10% annually is as follows:

1. If Region Five were to increase the number of successful completers by 175 annually for the next five years, the state income tax revenue could increase by \$4,840,086.91 annually.
2. If Region Five were to divide the 175 completer credentials annually by each of the 20 divisions in its region, then each division would need to increase its number of completers by nine annually.
3. If Region Five were to divide the 175 completer credentials annually by each of the 37 high schools/technical centers in its region, then each school would need to increase its number of completers by five annually.
4. In Region Five, for every 5 CTE completer students who graduate and enter the workforce with their CTE credentials, the income tax revenue to be claimed by the state is estimated to be \$4,840,086.91. Over five years, the income tax revenue available to Virginia's State Treasury could increase by \$24,200,434.55.

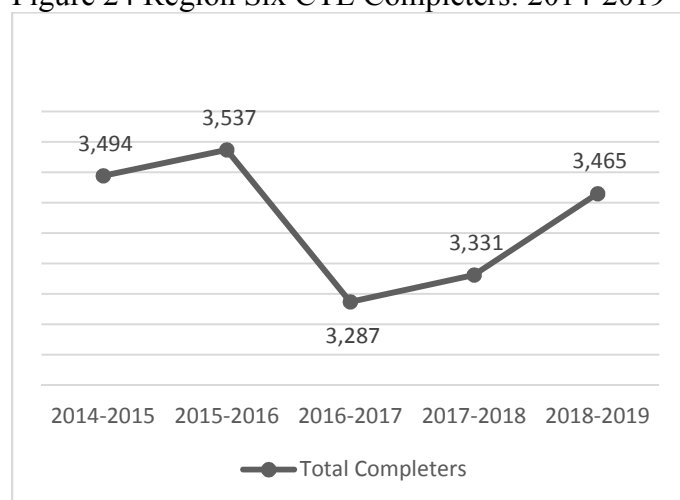
Region Six: Western Virginia

Western Virginia, as Superintendent Region 6, consists of 15 school divisions, comprising among its number 38 high schools (including specialist technical centers). Of the 8 Superintendent regions, this region lists 5th in the number of high schools available to its students (VDOE, 2020). The following data represent the findings of this study into the relationship between the earning of Career and Technical industry credentials and the Virginia economy, with specific reference to Region Six: Western Virginia.

Research Question 1: What is the trend for high school participation in CTE programs in Virginia (Region Six), over the past five years?

While data in Figure 24 shows that Region Six has increased over two consecutive years, the highpoint of 3,537 completers reached in 2015-2016 has not yet been paralleled. Following the decline of 250 completer students in 2016-2017, growth has been slow. Attempts to increase the number of completers by 10% will require perseverance.

Figure 24 Region Six CTE Completers: 2014-2019



Note: Figure 24 presents the number of Virginia's Region Six CTE completer students. Data is provided by the Virginia Department of Education, Office of Education Information Management (2019).

Research Question 2: What is the trend for high school completer students earning industry certifications in Virginia (Region Six), over the past five years?

The industry certification data for Region Six demonstrates that over the past five years, completers students taking “technical” certifications represent 16% of the total number of students taking industry certifications, with 15% of them earning that credential. In contrast, the number of credentials taken by students still on their pathway is 20%, with a passing rate of 20%. However, those earning industry credentials via soft-skill assessments such as WISE, Workplace Readiness Skills represent, CWRA+ and others, represent 6% of the students taking industry certifications, with 65% of them earning the certification. With a difference in the number of students taking soft skills assessments (33,773), and those earning them (27,047) compared to those taking and earning technical certifications, these data show a trend in the preference for soft skill validation assessments, rather than the technical validation earned by CTE completer students.

Research Question 3: What are the potential earnings for students gaining industry credentials in Virginia’s (Region Six) labor market?

Region Six CTE students electing to enter the labor market immediately upon graduation, have a projected 9,658 annual employment openings available to them. However, for those with credentials who choose the postsecondary route, primarily the postsecondary, non-degree route, the projected number of annual employment openings are 755. Ultimately, degree-seeking students who have industry credentials as a foundation to build upon, have projected annual openings of 537 (Associate’s Degree) and 1,750 (Bachelor’s Degree). For students gaining industry credentials, the potential earnings to be received in the Region Six labor market is estimated to be an average of \$49,937. Accounting for the 10% value-add pay that 6 of Virginia’s employer survey respondents stated they would offer students with industry credentials, the additional \$4,993 increases the potential earnings figure to an average annual

salary of \$54,931. Therefore, for Region Six students graduating high school with a completer series of industry credentials, the minimum annual salary they could expect to earn is \$54,931.

Research Question 4: What is the potential economic impact for the state if the number of CTE students earning industry credentials (in Region Six) were to increase by 10% annually?

1. If Region Six were to increase the number of successful completers by 177 annually for the next five years, the state income tax revenue could increase by \$4,340,068.74 annually.
2. If Region Six were to divide the 177 completer credentials annually by each of the 15 divisions in its region, then each division would need to increase its number of completers by 15 annually.
3. If Region Six were to divide the 175 completer credentials annually by each of the 38 high schools/technical centers in its region, then each school would need to increase its number of completers by five annually.
4. In Region Six, for every 5 CTE completer students who graduate and enter the workforce with their CTE credentials, the income tax revenue to be claimed by the state is estimated to be \$4,340,068.74. Over five years, the income tax revenue available to Virginia's State Treasury could increase by \$21,700,343.69

Accounting for the 10% value-added to the earning of CTE industry credentials agreed upon by respondents from the Virginia economy survey, the projected economic impact for the Commonwealth of Virginia if the number of Region Six CTE completers was to increase by 10% annually is as follows:

1. If Region Six were to increase the number of successful completers by 177 annually for the next five years, the state income tax revenue could increase by \$4,826,996.49.74 annually.
2. If Region Six were to divide the 177 completer credentials annually by each of the 15 divisions in its region, then each division would need to increase its number of completers by 12 annually.
3. If Region Six were to divide the 175 completer credentials annually by each of the 38 high schools/technical centers in its region, then each school would need to increase its number of completers by five annually.
4. In Region Six, for every 55 CTE completer students who graduate and enter the workforce with their CTE credentials, the income tax revenue to be claimed by the state is estimated to be \$4,826,996.49 Over five years, the income tax revenue available to Virginia's State Treasury could increase by \$24,134,982.43

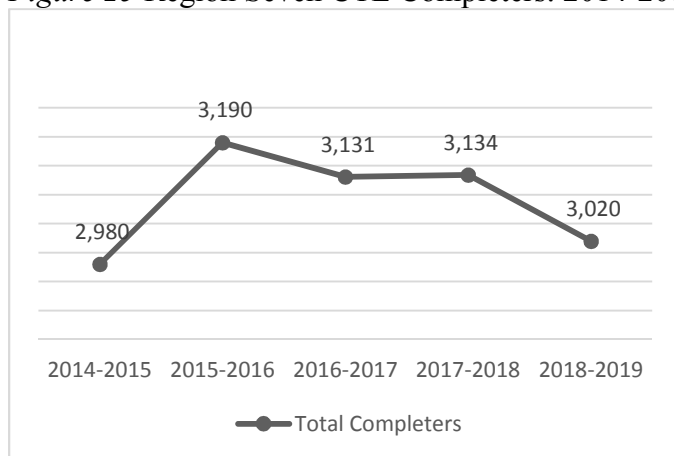
Region Seven: Southwest

Southwest, as Superintendent Region 7, consists of 19 school divisions, comprising among its number 43 high schools (including specialist technical centers). Of the 8 Superintendent regions, this region has the third-largest number of high schools available to its students (VDOE, 2020). The following data represent the findings of this study into the relationship between the earning of Career and Technical industry credentials and the Virginia economy, with specific reference to Region Seven: Southwest.

Research Question 1: What is the trend for high school participation in CTE programs in Virginia (Region Seven), over the past five years?

Evident in Figure 25 is the continued decline in the number of completer students in Region Seven. While increasing 7% from 2014-2015 to 2015-2016, the following years have met with decline measures of between 2% and 4%. Increasing the number of completers by 10% will most definitely shift this trend.

Figure 25 Region Seven CTE Completers: 2014-2019



Note: Figure 25 presents the number of Virginia's Region Seven CTE completer students. Data is provided by the Virginia Department of Education, Office of Education Information Management (2019).

Research Question 2: What is the trend for high school completer students earning industry certifications in Virginia (Region Seven), over the past five years?

The industry certification data for Region Seven demonstrates that over the past five years, completer students taking “technical” certifications represent 23% of the total number of students taking industry certifications, with 19% of them earning that credential. In contrast, the number of credentials taken by students still on their pathway is 30%, with a passing rate of 30%. However, those earning industry credentials via soft-skill assessments such as WISE, Workplace Readiness Skills represent, CWRA+ and others, represent 47% of the students taking industry certifications, with 51% of them earning the certification. With a difference in the number of students taking soft skills assessments (14,721), and those earning them (15,115) compared to those taking and earning technical certifications, these data reflect a growing number of CTE students on their pathway to completer status in the earning of technical certifications.

Research Question 3: What are the potential earnings for students gaining industry credentials in Virginia’s (Region Seven) labor market?

Region Seven CTE students electing to enter the labor market immediately upon graduation, have a projected 9,658 annual employment openings available to them. However, for those with credentials who choose the postsecondary route, primarily the postsecondary, non-degree route, the projected number of annual employment openings are 755. Ultimately, degree-seeking students who have industry credentials as a foundation to build upon, have projected annual openings of 537 (Associate’s Degree) and 1,750 (Bachelor’s Degree). For students gaining industry credentials, the potential earnings to be received in the Region Seven labor market is estimated to be an average of \$44,829. Accounting for the 10% value-add pay that 6 of

Virginia's employer survey respondents stated they would offer students with industry credentials, the additional \$4,482 increases the potential earnings figure to an average annual salary of \$49,312. Therefore, for Region Seven students graduating high school with a completer series of industry credentials, the minimum annual salary they could expect to earn is \$49,312.

Research Question 4: What is the potential economic impact for the state if the number of CTE students earning industry credentials (in Region Seven) were to increase by 10% annually?

1. If Region Seven were to increase the number of successful completers by 197 annually for the next five years, the state income tax revenue could increase by \$4,872,711.21 annually.
2. If Region Seven were to divide the 197 completer credentials annually by each of the 19 divisions in its region, then each division would need to increase its number of completers by ten annually.
3. If Region Seven were to divide the 197 completer credentials annually by each of the 43 high schools/technical centers in its region, then each school would need to increase its number of completers by five annually.
4. In Region Seven, for every 5 CTE completer students who graduate and enter the workforce with their CTE credentials, the income tax revenue to be claimed by the state is estimated to be \$4,872,711.21. Over five years, the income tax revenue available to Virginia's State Treasury could increase by \$24,363,556.04.

Accounting for the 10% value-added to the earning of CTE industry credentials agreed upon by respondents from the Virginia economy survey, the projected economic impact for the

Commonwealth of Virginia if the number of Region Seven CTE completers was to increase by 10% annually is as follows:

1. If Region Seven were to increase the number of successful completers by 197 annually for the next five years, the state income tax revenue could increase by \$5,418,950.60 annually.
2. If Region Seven were to divide the 197 completer credentials annually by each of the 19 divisions in its region, then each division would need to increase its number of completers by ten annually.
3. If Region Seven were to divide the 197 completer credentials annually by each of the 43 high schools/technical centers in its region, then each school would need to increase its number of completers by five annually.
4. In Region Seven, for every 5 CTE completer students who graduate and enter the workforce with their CTE credentials, the income tax revenue to be claimed by the state is estimated to be \$5,418,950.60. Over five years, the income tax revenue available to Virginia's State Treasury could increase by \$27,094,752.98

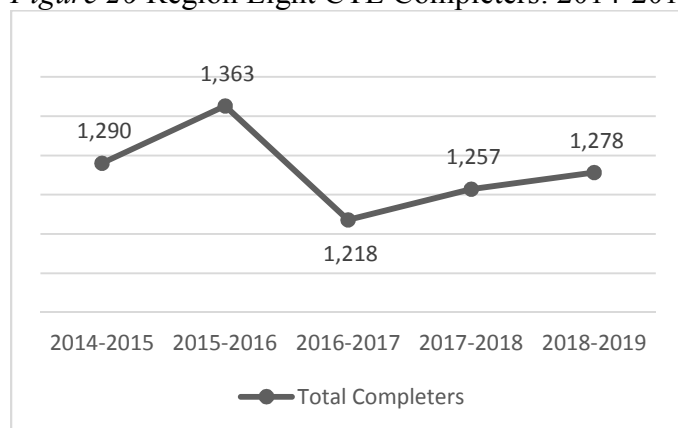
Region Eight: Southside

Southside, as Superintendent Region 8, consists of 12 school divisions, comprising among its number 15 high schools (including specialist technical centers). Of the 8 Superintendent regions, this region has the smallest number of high schools available to its students (VDOE, 2020). The following data represent the findings of this study into the relationship between the earning of Career and Technical industry credentials and the Virginia economy, with specific reference to Region Eight: Southside.

Research Question 1: What is the trend for high school participation in CTE programs in Virginia (Region Eight), over the past five years?

Noticeable in Figure 26 is the 12% decrease in the number of completer students in Region Eight. While the following years of 2016-2019 reflect years of positive growth, this growth is at the 3% and 2% range. Increasing the number of completers by 10% annually may require targeted action.

Figure 26 Region Eight CTE Completers: 2014-2019



Note: Figure 26 presents the number of Virginia's Region Eight CTE completer students. Data is provided by the Virginia Department of Education, Office of Education Information Management (2019).

Research Question 2: What is the trend for high school completer students earning industry certifications in Virginia (Region Eight), over the past five years?

The industry certification data for Region Eight demonstrates that over the past five years, completer students taking “technical” certifications represent 13% of the total number of students taking industry certifications, with 11% of them earning that credential. In contrast, the number of credentials taken by students still on their pathway is 30%, with a passing rate of 32%. However, those earning industry credentials via soft-skill assessments such as WISE, Workplace Readiness Skills represent, CWRA+ and others, represent 57% of the students taking industry certifications, with 57% of them earning the certification. With a difference in the number of students taking soft skills assessments (10,402), and those earning them (7,441) compared to those taking and earning technical certifications, these data reflect a growing number of CTE students on their pathway to completer status in the earning of technical certifications.

Research Question 3: What are the potential earnings for students gaining industry credentials in Virginia’s (Region Eight) labor market?

Region Eight CTE students electing to enter the labor market immediately upon graduation, have a projected 9,658 annual employment openings available to them. However, for those with credentials who choose the postsecondary route, primarily the postsecondary, non-degree route, the projected number of annual employment openings are 755. Ultimately, degree-seeking students who have industry credentials as a foundation to build upon, have projected annual openings of 537 (Associate’s Degree) and 1,750 (Bachelor’s Degree). For students gaining industry credentials, the potential earnings to be received in the Region Eight labor market is estimated to be an average of \$42,548. Accounting for the 10% value-add pay that 6 of

Virginia's employer survey respondents stated they would offer students with industry credentials, the additional \$4,245 increases the potential earnings figure to an average annual salary of \$46,802. Region Eight students graduating high school with a completer series of industry credentials, the minimum annual salary they could expect to earn is \$46,802.

Research Question 4: What is the potential economic impact for the state if the number of CTE students earning industry credentials (in Region Eight) were to increase by 10% annually?

1. If Region Eight were to increase the number of successful completers by 46 annually for the next five years, the state income tax revenue could increase by \$973,976.81 annually.
2. If Region Eight were to divide the 46 completer credentials annually by each of the 12 divisions in its region, then each division would need to increase its number of completers by four annually.
3. If Region Eight were to divide the 46 completer credentials annually by each of the 15 high schools/technical centers in its region, then each school would need to increase its number of completers by three annually.
4. In Region Eight, for every 3 CTE completer students who graduate and enter the workforce with their CTE credentials, the income tax revenue to be claimed by the state is estimated to be \$973,976.81. Over five years, the income tax revenue available to Virginia's State Treasury could increase by \$4,869,884.03

Accounting for the 10% value-added to the earning of CTE industry credentials agreed upon by respondents from the Virginia economy survey, the projected economic impact for the Commonwealth of Virginia if the number of Region Eight CTE completers was to increase by 10% annually is as follows:

1. If Region Eight were to increase the number of successful completers by 46 annually for the next five years, the state income tax revenue could increase by \$108,5488.92 annually.
2. If Region Eight were to divide the 46 completer credentials annually by each of the 12 divisions in its region, then each division would need to increase its number of completers by four annually.
3. If Region Eight were to divide the 46 completer credentials annually by each of the 15 high schools/technical centers in its region, then each school would need to increase its number of completers by three annually.
4. In Region Eight, for every 3 CTE completer students who graduate and enter the workforce with their CTE credentials, the income tax revenue to be claimed by the state is estimated to be \$1,08,5488.92. Over five years, the income tax revenue available to Virginia's State Treasury could increase by \$5,427,444.62.

Concluding remarks

The data is clear; students earning CTE industry credentials are at an advantage when compared to those without them. Whether CTE students choose to enter the workforce upon graduation or enhance their technical skills further by undertaking an apprenticeship, a two-year or four-year degree, both students, and the state will see the economic impact of their decisions. Ultimately, the key finding of the research is this: we do a significant disservice to our students, and our children, nation, state, and economy if we continue to take the “Technical” out of “Career and Technical Education.”

References

- ACE. (2020). *Evaluations, credits and transcripts*. Retrieved from American Council on Education: Earning college credit through ACE CREDIT
- ACTE. (2019). *ACTE strategic directiton and vision statement*. Retrieved from Association for Career and Technical Education: <https://www.acteonline.org/about/acte-mission-standards/>
- ACTE. (2019). *CTE stigma: A barrier to advancing success*. Alexandria, VA: Association for Career and Technical Edcuation.
- all4Ed.org. (2019). *Innovating for equity and excellence: Recommendations to states for implementing the Strengthening Career and Technical Education for the 21st Centry Act (Perkins V)*. Washington, DC.: Alliance for Excellent Education.
- Bartlett, K. (2012). *A theoretical review of the signalling role of certifcations in career and technical education*. Washington DC: National Research Center for Career and Technical Education .
- Bartlett, K., Horwitz, S., Ipe, M., & Liu, Y. (2005). The perceived influence of industry-sponsored credentials on the recruitment process in the information technology industry: Employer and employee perspectives. *Journal of Career and Technical Education*, 21(2), 51-65.
- Bauer, L., Moss, E., Nunn, R., & Shambaugh, J. (2019). *Employment, educationm and the time use of American youth*. Washington DC: The Hamilton Project.

- Becker, G. S., & Ewald, F. (2012). *Becker on Ewald on Foucault on Becker. Public law and legal theory (Working Paper No. 401)*. Retrieved from University of Chicago:
<http://www.law.uchicago.edu/files/file/401-bh-Becker.pdf>
- Bedard, K. (2001). Human capital versus signalling models: University access and high school dropouts. *Journal of Political Economy*, 109(4), 749-775.
- Benjamin, D., Gunderson, M., & Riddell, W. C. (1998). *Labor market economics* (4th ed.). Toronto: McGraw-Hill Ryerson.
- Bielick, S., Cronen, S., Stone, C., Montaquila, J., Brock Roth, S., & Boivin, S. (2013). *The adult training and education survey (ATES) pilot study*. Washington DC: National Center for Education Statistics.
- Bishop, J., & Mane, F. (2003). *The impacts of career-technical education on high school completion and labor market success*. Cornell University: Center for Advanced Human Resource Studies.
- BLS. (2018). *Occupational Outlook Handbook*. Retrieved from Bureau of Labor Statistics:
<https://www.bls.gov/ooh/computer-and-information-technology/home.htm>
- BLS. (2019). *BLS information: About the U.S. Bureau of Labor Statistics*. Retrieved from United States Department of Labor: Bureau of Labor Statistics:
<https://www.bls.gov/bls/infhome.htm>
- BLS. (2019). *Employment projections: Occupational projections and worker characteristics*. Retrieved from Bureau of Labor Statistics: <https://www.bls.gov/emp/tables/occupational-projections-and-characteristics.htm>

- Brand, B. (2008). *Supporting high quality career and technical education through federal and state policy*. Washington D.C.: American Youth Forum.
- Brand, B., Valent, A., & Browning, A. (2013). *How Career and Technical Education Can Help Students Be College and Career Ready: A Primer*. American Institutes for Research.
- Bureau of Labor Statistics. (2017). *Employment projections: 2016-2026*. Washington DC: U.S. Department of Labor.
- Bureau of Labor Statistics. (2018). *Occupational Employment Statistics*. Retrieved from Bureau of Labor Statistics:
<https://beta.bls.gov/dataViewer/view/timeseries/OEUN000000061100025201001>
- Bureau of Labor Statistics. (2019). *Occupational Employment Statistics*. Retrieved from United States Department of Labor: https://www.bls.gov/oes/current/oes_va.htm
- Bureau of Labor Statistics. (2020). *Occupational Employment Statistics*. Retrieved from May 2019 State Occupational Employment and Wage Estimates: Virginia:
https://www.bls.gov/oes/current/oes_va.htm
- Burningglass. (2017). *The narrow ladder: The value of industry certifications in the job market*. Boston, MA: Burningglass Technologies.
- Carnevale, A., & Strohl, J. C. (2017). *Good jobs that pay without a BA*. Washington D.C.: Georgetown University: Center on Education and the Workforce.
- Carnevale, A., & Cheah, B. (2018). *Five rules of the college and career game*. Washington DC: Georgetown University Center on Education and the Workforce.

- Carnevale, A., Smith, N., & Strohl, J. (2010). *Help wanted: Projections of jobs and education requirements through 2018*. Washington DC: Georgetown University Center on Education and the Workforce. Retrieved from <https://1gyhoq479ufd3yna29x7ubjn-wpengine.netdna-ssl.com/wp-content/uploads/2014/12/fullreport.pdf>)
- Caselli, F., Eaquivel, G., & Lefort, F. (1996). Reopening the convergence debate. *Journal of Economic Growth*, 1(3), 363-389.
- Casner-Lotto, J., & Barrington, L. (2006). *Are They Really Ready to Work? Employers Perspectives on the Basic Knowledge and Applied Skills of New Entrants to the 21st Century U.S. Workforce*. New York: The Conference Board.
- Castellano, M., Stone, J., & Stringfield, S. (2005). Earning industry-recognized credentials in high school: Exploring research and policy issues. *Journal of Career and Technical Education*, 21(2), 7-34.
- Castellano, M., Stone, R. J., & Stringfield, S. (2005). Earning Industry-Recognized Credentials in High School: Exploring Research and Policy Issues. *Journal of Career and Technical Education*, 21(2), 7-34.
- CCSSO. (2018). *Credential Currency*. Washington D.C.: New Skills for Youth.
- Chappelow, J. (2019). *Baby Boomer*. Retrieved from Investopedia:
https://www.investopedia.com/terms/b/baby_boomer.asp
- Cheng, A., & Hitt, C. (2018). *Hardwork and softskills: The attitudes, abilities and character of students in career and technical education*. Washington DC: American Enterprise Institute.

- Coleman, J. S., Campbell, E. Q., McPartland, J., Mood, A. M., Weinfeld, F. D., & York, R. L. (1966). *Equality of educational opportunity*. Washington, DC: Government Printing Office.
- CompTIA. (2016). *Cyberstates 2016: The definitive state-by-state analysis of the U.S. tech industry*. Il: CompTia.
- Corporation for a Skilled Workforce. (2016). *Connecting Credentials: Building Learning-Based Credentialing Systems*. Retrieved from Connecting Credentials National Campaign: <http://skilledwork.org/projects/connecting-credentials-national-campaign/>
- Crespin, K. (2017). *Youth labor force participation and workplace readiness in Virginia*. Retrieved from Stat Chat: From the Demographics Research Group at UVA: <http://statchatva.org/2017/12/21/youth-labor-force-participation-and-workplace-readiness-in-virginia/>
- Crespin, K. (2019, March 1). *Visualizing the nation's future population*. Retrieved from University of Virginia: Weldon Cooper Center for Public Service: <http://statchatva.org/2019/03/01/visualizing-the-nations-future-population/>
- CTAE. (2018). *Trailblazers: Career and Technical Education in Virginia*. Retrieved from CTE Trailblazers: <http://ctetrailblazers.org/labor-market-data/>
- CTEA. (2019). *Labor market data*. Retrieved from Trailblazers: Career and Technical Education in Virginia: <http://ctetrailblazers.org/labor-market-data/>
- Dilts, A. (2011). From entrepreneur of the self to care of the self: Neoliberal governmentality and Foucault's ethics. *Foucault's Ethics*, 12, 130-146.

Dougherty, S. (2016). *Career and technical education in high school: Does it improve student outcomes?* Washington DC: Thomas B. Fordham Institute.

Dougherty, S., & Lombardi, A. (2016). From vocational education to career readiness. The ongoing work of linking education and the labor market. *Review of Research in Education*, 326-355.

Duncombe, C. (2018). *Where money matters most in K-12*. Retrieved from The Commonwealth Institute:

file:///C:/Users/TCE/Dropbox/@CTE/2%20LR/NLR/Where%20Money%20Matters%20Most%20in%20K-12.pdf

Duncombe, C. (2018). *Where money matters most in K-12*. Retrieved from The Commonwealth Institute: <https://thehalfsheet.org/post/172868163273/where-money-matters-most-in-k-12>

ESG, Advance CTE; CCSSO. (2018). *Credential Currency*. Washington D.C.: Education Strategy Group.

Farrier, D., Rober, K., & Sciarra, D. (2019). *Making the grade 2019: How fair is school funding in your state - A guide for advocates and policymakers*. Washington, DC. : Education Law Center.

Fitzsimons, P. (2017). *Human Capital Theory and Education*. Retrieved from Encycloedia of Educational Philosophy and Theory:

https://link.springer.com/referenceworkentry/10.1007%2F978-981-287-588-4_331

- Flanigan, J. L., Marion, R. A., & Richardson, M. D. (1996). Casual and temporal analyses of increased funding on student achievement. *Journal of Research and Development in Education*, 30, 222-247.
- Fogg, N., Harrington, P., & Khatiwada, I. (2018). *Skills and earnings in the full-time labor market*. Retrieved from ETS Research: <https://www.ets.org/research/report/earnings-full-time-labor-market/preface>
- General Assembly of Virginia. (2006). *2006 Session: Senate Bill No. 683 -* . Retrieved from Virginia Legislative Information System: <http://lis.virginia.gov/cgi-bin/legp604.exe?061+ful+SB683>
- General Assembly of Virginia. (2019). *RD122 - House Bill 1530 - High school diploma options and stigma in career and technical education - January 24, 2019*. Retrieved from LIS: Reports to the General Assembly: <https://rga.lis.virginia.gov/Published/2019/RD122>
- Gentry, M., & Rizza, M. P. (2005). Professionalism, sense of community, and reason to learn: Lessons from an exemplary career and technical education center. *Career and Technical Education Research*, 30(1), 47-85.
- Glassdoor.com. (2018). *Salaries*. Retrieved from Glassdoor.com: https://www.glassdoor.com/Salaries/cosmetologist-salary-SRCH_KO0,13.htm
- Goger, A. (2019). *Free college won't be enough to prepare Americans for the future of work*. Retrieved from Brookings: <file:///C:/Users/TCE/Dropbox/@CTE/2%20LR/NLR/2019%20Brookings%20Free%20College%20wont%20be%20enough.....future%20of%20work.pdf>

Greenstone, M., & Looney, A. (2011). *Building America's job skills with effective workforce programs: A training strategy to raise wages and increase work opportunities.*

Washington D.C.: Brookings.

Greenstone, M., Looney, A., Patashnik, J., & Yu, M. (2013). *Thirteen economic facts about social mobility and the role of education.* Washington D.C.: Brookings.

Hanushek, E. A. (1986). The economics of schooling: Production and efficiency in public schools. *Journal of Economic Literature*, 1141-1177.

Harris, J., Warner, M., Yee, K., & Wilkerson, S. (2020). *Assessing the alignment between West Virginia's high school and Career and Technical Education programs and the labor market.* Retrieved from Institute of Education Sciences - Regional Educational Laboratory Program: <https://ies.ed.gov/ncee/edlabs/projects/project.asp?projectID=4579>

Hedges, L., & Greenwald, R. (1996). *Have times changed? The relation between school resources and student performance.* In G. Burtless (Ed.) *Does money matter? The effect of school resources on student achievement and adult success.* Washington, DC.: The Brookings Institution.

Hussar, W., & Bailey, T. (2009). *Projections of Education Statistics to 2018.* National Center for Education Statistics: Institute of Education Sciences.

Institute for Women's Policy Research. (2015). *The status of women in the states: 2015 - Employment and earnings.* Washington D.C. : Institute for Women's Policy Research.

Jacob, B. (2017). *What we know about career and technical education in high school.* Washington DC: Brookings.

- Jonas, D. L., & Garland, M. Y. (2014). *Following Virginia's Career and Technical Education Completers out of high school and into college: A study of high school graduates' college enrollment, persistence and completion*. Richmond: Virginia Longitudinal Data System.
- Kandalec, K. (2016). *Perceptions of postsecondary career and technical education: A Q method examination*. Retrieved from NC State Theses and Dissertations :
<https://repository.lib.ncsu.edu/handle/1840.20/33349>
- Leachman, M., & Mai, C. (2014). *Most states still funding schools less than before the recession*. Washington, DC.: Center on Budget and Policy Priorities.
- LeFevre, A. T., & Hederman, R. S. (2001). *Report card on American education: A state-by-state analysis: 1976-2000*. Washington, DC.: American Legislative Exchange Council.
- Lou, C., Blagg, K., Rosenboom, V., Lee, V., & Mudrazija, S. (2018). *School district funding in Virginia: Computing the effects of changes to the standards of quality funding formula*. Washington, DC.: Urban Institute.
- Malkus, N. (2019). *The evolution of career and technical education: 1982 - 2013*. Washington DC: American Enterprise Institute.
- Manikiw, G., & Romer, D. W. (1992). A contribution to the empirics of economic. growth. *Quarterly Journal of Economics*, 107(2), 407-437.
- Mishel, L. (2011). *Education is not the cure of high unemployment or for income inequality*. Washington D.C.: Economic Policy Institute. Retrieved from
https://www.epi.org/publication/education_is_not_the_cure_for_high_unemployment_or_for_income_inequality/

- Muller, R., & Beatty, A. (2009). *Work readiness certification and industry credentials: What do state high school policy makers need to know?* Washington DC: Measures that Matter.
- National Research Council. (2004). *Engaging schools: Fostering high school students' motivation to learn*. Washington DC: National Academy Press.
- NCCRS. (2020). *NOCTI and Nocti Business Solutions*. Retrieved from National College Credit Recommendation Service: <http://www.nationalccrs.org/organizations/nocti-and-nocti-business>
- Null, N. (2013). *The benefits of industry certifications for high school students*. Retrieved from TUInnovates: <http://tuinnovates.com/2013/04/29/the-benefits-of-industry-certifications-for-high-school-students/>
- NWLS. (2007). *National Women's Law Center: 2006-2007 Annual Report*. Washington D.C.: National Women's Law Center:.
- Oakes, J., Selvin, M., Koroly, L., & Guiton, G. (1992). *Educational matchmaking: Academic and vocational tracking in comprehensive high schools*. National Center for Research in Vocational Education, University of California at Berkley.
- OECD. (2010). *Synthesis report of the OECD reviews of vocational education and training: Learning for jobs*. OECD.
- Opkala, C. O. (2002). Educational resources, student demographics, and achievement scores. *Journal of Education Finance*, 23(7), 885-908.
- Partnership for 21st Century Skills. (2007). *The Intellectual and Policy Foundations of the 21st Century Skills Framework*. Partnership for 21st Century Skills.

- Passarella, A. (2018). *Policy Brief: The necessary components of an effective career and technical education (CTE) program*. Baltimore, MD: Johns Hopkins School of Education: Institute for Education Policy.
- PCRN. (2019). *Perkins IV*. Retrieved from Perkins Collaborative Resource Network: <https://cte.ed.gov/legislation/about-perkins-iv>
- Quailey, J. (2012). *Career and technical education in the crossroads of change (Doctoral dissertation, Duquesne University)*. Retrieved from <https://dsc.duq.edu/etd/1073>
- Rothwell, J. (2013, June 10). *The Hidden STEM Economy*. Washington D.C.: Metropolitan Policy Program at Brookings. Retrieved from Brookings: <https://www.brookings.edu/research/the-hidden-stem-economy/>
- S. 250, 109th Cong. . (2006). *One Hundred and Ninth Congress of the United States of America*. Retrieved from Perkins Collaborative Resource Network: https://s3.amazonaws.com/PCRN/uploads/perkins_iv.pdf
- Salmon, R. G. (2010). The evolution of Virginia public school finance: From the beginnings to today's difficulties. *Journal of Education Finance*, 36(2), 143-161.
- Shanholtz, S. (2019). *It's time to think about middle-skill jobs and education*. Charlottesville, VA: Weldon Cooper Center.
- Shanholtz, S. (2019). *Talent in Virginia: Where is it coming from and where is it going?* Charlottesville, VA: Weldon Cooper Center for Public Service.

- Scherer, M. (2002). Do students care about learning? A conversation with Mihaly Csikszentmihalyi. *Educational Leadership*, 60(1), 12017.
- Simms, R. (2004). *School funding, taxes, and economic growth: An analysis of the 50 states*. Washington, DC.: National Education Association .
- Statista. (2019). *Number of college students in the U.S. 1965-2028*. Retrieved from Statista.com: <https://www.statista.com/statistics/183995/us-college-enrollment-and-projections-in-public-and-private-institutions/>
- Stone, J. (2014). More than one way: The case for high-quality CTE. *American Educator*, 4-39.
- Stone, J. (2017). Introduction to pathways to a productive adulthood: The role of CTE in the American high school. *Peabody Journal of Education*, 92, 155-165.
- Stone, J., Alfeld, C., Pearson, D., Lewis, M., & Jensen, S. (2006). *Building academic skills in context: Testing the value of enhanced math learning in CTE (Final study)*. St. Paul, MN: National Research Center for Career and Technical Education.
- Tan, E. (2014). Human capital theory: A holistic criticism. *Review of Educational Research*, 84(3), 411-445.
- The Chronicle of High Education. (2017). *Backgrounds and Beliefs of College Freshmen*. Retrieved from The Chronicle of Higher Education: <http://www.chronicle.com/interactives/freshmen-survey>
- TrailBlazers. (2019). *Local Workforce Investment Areas (LWIAs) in Virginia*. Retrieved from CTETrailBlazers.org: http://ctetrailblazers.org/files/2019/08/Local-Workforce-Investment-Areas-Map_Virginia.pdf

- TrailBlazers. (2020). *Labor Market Data: LWIA 1 – Southwest Virginia*. Retrieved from TrailBlazers: Career and Technical Education in Virginia: <http://ctetrailblazers.org/labor-market-data/lwia-1-southwest-virginia/>
- TrailBlazers. (2020). *Labor Market Data: LWIA 11 and 12 - Combined Projections Area*. Retrieved from TrailBlazers: Career and Technical Education in Virginia: <http://ctetrailblazers.org/lwia-11-12-nv-aa/>
- TrailBlazers. (2020). *Labor Market Data: LWIA 14 - Greater Peninsula*. Retrieved from TrailBlazers: Career and Technical Education in Virginia: <http://ctetrailblazers.org/lwia-14-greater-peninsula/>
- TrailBlazers. (2020). *Labor Market Data: LWIA 15 – Crater Area* . Retrieved from TrailBlazers: Career and Technical Education in Virginia: <http://ctetrailblazers.org/lwia-15-crater-area/>
- TrailBlazers. (2020). *Labor Market Data: LWIA 16 - Hampton Roads*. Retrieved from TrailBlazers: Career and Technical Education in Virginia: <http://ctetrailblazers.org/lwia-16-hampton-roads/>
- TrailBlazers. (2020). *Labor Market Data: LWIA 17 - West Piedmont*. Retrieved from TrailBlazers: Career and Technical Education in Virginia: <http://ctetrailblazers.org/labor-market-data/>
- TrailBlazers. (2020). *Labor Market Data: LWIA 3 - Western Virginia*. Retrieved from TrailBlazers: Career and Technical Education in Virginia: <http://ctetrailblazers.org/lwia-3-western-virginia/>

- TrailBlazers. (2020). *Labor Market Data: LWIA 4 - Shenandoah Valley*. Retrieved from TrailBlazers: Career and Technical Education in Virginia: <http://ctetrailblazers.org/lwia-4-shenandoah-valley/>
- TrailBlazers. (2020). *Labor Market Data: LWIA 4 – Shenandoah Valley*. Retrieved from TrailBlazers: Career and Technical Education in Virginia: <http://ctetrailblazers.org/lwia-4-shenandoah-valley/>
- TrailBlazers. (2020). *Labor Market Data: LWIA 6 - Piedmont Workforce Network*. Retrieved from TrailBlazers: Career and Technical Education in Virginia : <http://ctetrailblazers.org/lwia-6-piedmont-workforce-network/>
- TrailBlazers. (2020). *Labor Market Data: LWIA 8 - South Central*. Retrieved from TrailBlazers: Career and Technical Education in Virginia : <http://ctetrailblazers.org/lwia-8-south-central/>
- TrailBlazers. (2020). *Labor Market Data: LWIA 8 – South Central*. Retrieved from TrailBlazers: Career and Technical Education in Virginia: <http://ctetrailblazers.org/lwia-8-south-central/>
- TrailBlazers. (2020). *Labor Market Data: LWIA 9 – Capital Region Workforce Partnership*. Retrieved from TrailBlazers: Career and Technical Education in Virginia: <http://ctetrailblazers.org/lwia-9-capital-region-workforce-partnership/>
- TrailBlazers. (2020). *Labor Market Data: LWIA II - New River/Mt. Rogers*. Retrieved from TrailBlazers: Career and Technical Education in Virginia: <http://ctetrailblazers.org/lwia-2-new-rivermt-rogers/>

- TrailBlazers. (2020). *Labor Market DataL LWIA 13 - Bay Consortium*. Retrieved from TrailBlazers: Career and Technical Education in Virginia: <http://ctetrailblazers.org/lwia-13-bay-consortium/>
- TrailBlazers. (2020). *Labor Market DataL LWIA 6 – Piedmont Workforce Network*. Retrieved from TrailBlazers: Career and Technical Education in Virginia: <http://ctetrailblazers.org/lwia-6-piedmont-workforce-network/>
- TrailBlazers. (2020). *Labor Market DataL LWIA 7 – Region 2000/Central VA*. Retrieved from TrailBlazers: Career and Technical Education in Virginia: <http://ctetrailblazers.org/lwia-7-region-2000central-va/>
- Trailblazers CTAE. (2019). *Labor market data*. Retrieved from Trailblazers: Career and Technical Education in Virginia: <http://ctetrailblazers.org/labor-market-data/>
- Tucker, M. (2018). *What, exactly, should the purpose of career and technical education be?* Retrieved from Education Week: http://blogs.edweek.org/edweek/top_performers/2018/06/_what_exactly_is_career_and_technical_education.html
- U.S. Department of Education. (2013). *National Assessment of Career and Technical Education: Interim Report*. Retrieved from U.S. Department of Education, Office of Planning, Evaluation and Policy Development, Policy and Program Studies Service: <https://www2.ed.gov/rschstat/eval/sectech/nacte/career-technicaleducation/interim-report.pdf>.

- U.S. Department of Education. (2017). *Teacher shortage areas*. Washington, DC.: U.S. Department of Education: Office of Post Secondary Education. Retrieved from <https://www2.ed.gov/about/offices/list/oep/pol/ateachershortageareasreport2017-18.pdf>
- U.S. Department of Education. (2018). *Career and Technical Education: Programs in Public School Districts: 2016-2017*. Washington D.C.: Institute of Education Sciences: National Center for Education Statistics.
- U.S. Department of Education. (2018). *Family Educational Rights and Privacy Act (FERPA)*. Retrieved from U.S. Department of Education: <https://www2.ed.gov/policy/gen/guid/fpco/ferpa/index.html>
- U.S. Department of Labor. (2010). *Training and employment guidance letter. No. 5-15*. Retrieved from Department of Labor and Training: https://wdr.doleta.gov/directives/corr_doc.cfm?DOCN=2967
- U.S. Dept. of Education. (2016). *United States Department of Education Office for Civil Rights, Office of Career, Technical, and Adult Education*. Retrieved from Ed.gov: <https://www2.ed.gov/about/offices/list/ocr/letters/colleague-201606-title-ix-gender-equity-cte.pdf>
- United States Department of Labor. (1991). *What Work Requires of Schools: A SCANS Report for America 2000*. Washington D.C.: Department of Labor.
- VACTEA. (2018). *Issues and solutions for career and technical education in Virginia*. Virginia Association of Career and Technical Education Administrators.

- Van Noy, M., McKay, H., & Michael, S. (2019). *Non-degree credential quality: A conceptual framework to guide measurement*. Piscataway, N.J.: Rutgers Education and Employment Research Center.
- VDOE. (2016). *Career & Technical Education: The Path to Industry Certification: High School Industry Credentialing*. Retrieved from Virginia Department of Education:
http://www.doe.virginia.gov/instruction/career_technical/path_industry_certification/
- VDOE. (2018). *Previous years archived Board-approved list: April 26, 2018 Approved list*. Retrieved from Virginia Department of Education:
http://www.doe.virginia.gov/instruction/career_technical/path_industry_certification/index.shtml
- VDOE. (2019). *2017-2018 Reports by school division and regional career and technical education center: School divisions*. Retrieved from Virginia Department of Education:
http://www.doe.virginia.gov/instruction/career_technical/statistics_reports/division_reports/2017-2018/index.shtml
- VDOE. (2019). *CTE program enrollment report*. Retrieved from Virginia Department of Education:
http://www.doe.virginia.gov/instruction/career_technical/statistics_reports/enrollment.shtml
- VDOE. (2019). *CTERS User's Manual* . Retrieved from Virginia Department of Education :
http://www.doe.virginia.gov/info_management/data_collection/instruction/career_tech/index.shtml

- VDOE. (2019). *Data on industry credentialing in Virginia: Student pass percentage by credential*. Retrieved from Virginia Department of Education:
http://www.doe.virginia.gov/instruction/career_technical/path_industry_certification/index.shtml
- VDOE. (2019). *Industry Credential Assessments: 2012-2019*. (S. Williams, Compiler)
Richmond, Virginia.
- VDOE. (2019). *Master Schedule Collection*. Retrieved from Virginia Department of Education:
http://www.doe.virginia.gov/info_management/data_collection/master_schedule_collection/index.shtml
- VDOE. (2019). *The path to industry certification: High school industry credentialing*. Retrieved from Virginia Department of Education:
http://www.doe.virginia.gov/instruction/career_technical/path_industry_certification/index.shtml
- VDOE. (2019). *Virginia Index of Performance (VIP) Program*. Retrieved from Virginia Department of Education:
http://www.doe.virginia.gov/statistics_reports/va_index_performance_awards/index.shtml
1
- VDOE. (2020). *Academic and Career Plans Of Study*. Retrieved from Virginia Department of Education:
http://www.doe.virginia.gov/instruction/career_technical/career_clusters/plans_of_study/index.shtml

- VDOE. (2020). *Board of Education-Approved Industry Credentials*. Retrieved from The path to industry certification: High school industry credentialing:
http://www.doe.virginia.gov/instruction/career_technical/path_industry_certification/index.shtml
- VDOE. (2020, July 2). *Career Clusters: Pathways to College and Career Readiness*. Retrieved from Career Clusters Academic and Career Plans of Study; Virginia's Best Practices :
http://www.doe.virginia.gov/instruction/career_technical/career_clusters/index.shtml
- VDOE. (2020). *Commonwealth of Virginia Department of Education: Superintendent's Regions*. Retrieved from Virginia.gov: http://www.doe.virginia.gov/directories/va_region_map.pdf
- VDOE. (2020). *School Report Card Data for School Year 2016-2017*. Richmond, VA.: Virginia Department of Education . Retrieved from
http://www.doe.virginia.gov/instruction/career_technical/path_industry_certification/index.shtml
- Vertsegen, D., & King, R. A. (1998). The relationship between school spending and student achievement: A review and analysis of 35 years of production function research. *Journal of Education Finance*, 24, 243-262.
- Wilkin, T., & Nwoke, G. (2011). Career and Technical Education Teacher Shortage: A Successful Model for Recruitment and Retention. *Journal of STEM Teacher Education*, 23-34.
- World Economic Forum. (2014). *Global Agenda Council on Employment: Matching skills and labour market needs - Building social partnerships for better skills and better jobs*. Davos-Klosters, Switzerland: World Economic Forum.

Zinth, J. D. (2013). Career & Technical Education: Not Your Father's Vocational Education. *The Progress of Education Reform*, 14(1), 1-7.

APPENDIX 1.1***Industry Credential to Occupational Alignment Likert Survey: CTE Experts******Business and Information Technology Occupational Alignment***

CTE Program Area	Survey Question Number	Assessment	Occupation
BIT	1	Accounting (Basic) Assessment: National Occupational Competency Testing Institute (NOCTI)	Financial Clerks
BIT	2	Accounting--Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	Accountants and Auditors
BIT	3	Administrative Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	Office and Administrative Support Occupations
BIT	4	Adobe Certified Associate: Animate CC 2015/Certiport	Arts, Design, Entertainment, Sports, and Media Occupations
BIT	5	Adobe Certified Associate: Dreamweaver CS5, CS6, Cloud 2015, 2018 Examination/Certiport	Web Developers
BIT	6	Adobe Certified Associate: Photoshop CS3, CS4, CS5, CS6, Cloud 2013, 2015, 2018 Examination/Certiport	Arts, Design, Entertainment, Sports, and Media Occupations
BIT	7	Adobe Certified Associate: Premiere CS5 Examination/Certiport	Arts, Design, Entertainment, Sports, and Media Occupations
BIT	8	Adobe Certified Associate: Flash, CC2013, CS6 Examination/Certiport	Arts, Design, Entertainment, Sports, and Media Occupations
BIT	9	Adobe Certified Associate: Illustration 2018 Examination/Certiport	Arts, Design, Entertainment, Sports, and Media Occupations
BIT	10	Adobe Certified Associate: Illustrator Cloud, 2015, CS6 Examination/Certiport	Arts, Design, Entertainment, Sports, and Media Occupations
BIT	11	Adobe Certified Associate: InDesign 2018 Examination/Certiport	Arts, Design, Entertainment, Sports, and Media Occupations
BIT	12	Adobe Certified Associate: Premier Pro CS6, CC2015, 2018 Examination/Certiport	Arts, Design, Entertainment, Sports, and Media Occupations
BIT	13	American Medical Certification Association Examinations: AMCA	Medical Assistants
BIT	14	ASK Concepts of Entrepreneurship and Management Assessment: ASK Business Institute	Sales and Related Occupations
BIT	15	ASK Fundamental Business Concepts Assessment: ASK Business Institute	Sales and Related Occupations
BIT	16	ASK Fundamental Marketing Concepts Assessment: ASK Business Institute	Sales and Related Occupations

BIT	17	Certified Clinical Medical Assistant (CCMA) Examination: National Healthcareer Association (NHA)	Medical Assistants
BIT	18	Certified Electronic Health Record Specialist (CEHRS) Examination: National Healthcareer Association (NHA)	Medical Records and Health Information Technicians
BIT	19	Cisco Certified Entry Network Technician (CCENT) Examination: Cisco Systems, Inc.	Computer User Support Specialists
BIT	20	Cisco Certified Networking Associate (CCNA) Routing and Switching Examination: Cisco Systems, Inc.	Computer User Support Specialists
BIT	21	Cisco Certified Networking Associate (CCNA) Security Examination: Cisco Systems, Inc.	Computer User Support Specialists
BIT	22	Cisco Composite Exam for CCNA (640-802): Cisco Systems	Computer User Support Specialists
BIT	23	Cisco Interconnecting Cisco Networking Devices Part 2 (640-816)	Computer User Support Specialists
BIT	24	Cisco IT Essentials, PC Hardware and Software End-of-Course Examination: Cisco Systems	Computer User Support Specialists
BIT	25	CIW (Certified Internet Webmaster) Professional Examinations: Certification Partners, LLC	Web Developers
BIT	26	CIW Internet Business Associate Examination: Certification Partners, LLC	Web Developers
BIT	27	CIW Network Technology Associate Examination: Certification Partners, LLC	Web Developers
BIT	28	CIW Site Development Associate Examination: Certification Partners, LLC	Web Developers
BIT	29	CIW Web Design Specialist Examination: Certification Partners, LLC	Web Developers
BIT	30	College Level Examination Program (CLEP): Financial Accounting: The College Board	Accountants and Auditors
BIT	31	CompTIA IT Fundamentals Certification Examination: CompTIA	Computer User Support Specialists
BIT	32	CompTIA A+ Certification Examination (must pass both exams):: CompTIA	Computer User Support Specialists
BIT	33	CompTIA Linux+ Examination Program-- Powered by Linux Professional Institute: (must pass both exams):: CompTIA	Computer Network Support Specialists
BIT	34	CompTIA Network+ Examination: CompTIA	Computer Network Support Specialists
BIT	35	CompTIA Security + Examination: CompTIA	Computer Network Support Specialists
BIT	36	CompTIA Server+ Examination: CompTIA	Computer Network Support Specialists
BIT	37	Computer Networking Fundamentals Assessment: National Occupational Competency Testing Institute (NOCTI)	Computer Network Support Specialists
BIT	38	Computer Programming Assessment: National Occupational Competency Testing Institute (NOCTI)	Computer User Support Specialists

BIT	39	Computer Repair Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	Computer User Support Specialists
BIT	40	Computer Service Technician (CST) Examination : Electronics Technicians Association (ETA), International	Computer User Support Specialists
BIT	41	Computer Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	Computer User Support Specialists
BIT	42	CompTIA A+ 901 Examination	Computer User Support Specialists
BIT	43	HTML 5 CSS 3 Specialist Examination: Certification Partners, LLC	Web Developers
BIT	44	IC3 Internet and Computing Core Certification Examinations:2005, 2007, 2010, GS4, GS5, Certiport (student has passed all three examinations)	Computer User Support Specialists
BIT	45	Intuit QuickBooks Certified User Certification Test: Certiport	Accountants and Auditors
BIT	46	MCP - MCSA: Cloud Platform (pass any two exams): Microsoft	Computer User Support Specialists
BIT	47	MCP - MCSA: Machine Learning (must pass both exams): Microsoft	Computer User Support Specialists
BIT	48	MCP - MCSA: Microsoft Dynamics 365 for Operations (must pass two required exams): Microsoft	Computer User Support Specialists
BIT	49	MCP - MCSA: SQL 2016 BI Development (must pass two required exams): Microsoft	Computer User Support Specialists
BIT	50	MCP - MCSA: SQL 2016 Database Administration (must pass two required exams): Microsoft	Computer User Support Specialists
BIT	51	Medical Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	Medical Assistants
BIT	52	MOS 2013 Master/Certiport (must pass four exams)	Computer Operators
BIT	53	MOS Examinations (Advanced level): Microsoft Office Specialist/Certiport	Computer Operators
BIT	54	MOS Excel Expert Level: Microsoft Office 2013/Certiport (must pass parts 1 & 2)	Computer Operators
BIT	55	MOS Microsoft Office Expert 2013/Certiport (must pass both Word & Excel at expert levels)	Computer Operators
BIT	56	MOS Microsoft Office Expert Excel 2016/Certiport (only one exam)	Computer Operators
BIT	57	MOS Microsoft Office Master Level: 2010/Certiport	Computer Operators
BIT	58	MOS Microsoft Office Specialist Master 2010/Certiport	Computer Operators

BIT	59	MOS Word Expert Examination: Microsoft Office 2007, 2010, 2016/Certiport	Word Processors and Typists
BIT	60	MTA Examination: Gaming Development Fundamentals	Computer User Support Specialists
BIT	61	MTA Examination: .NET Fundamentals (98-372)	Computer User Support Specialists
BIT	62	MTA Examination: Database Administration Fundamentals (98-364)	Computer User Support Specialists
BIT	63	MTA Examination: Gaming Development Fundamentals	Computer User Support Specialists
BIT	64	MTA Examination: HTML5 Application Development Fundamentals (98-375)	Computer User Support Specialists
BIT	65	MTA Examination: Mobility and Device Fundamentals (98-368)	Computer User Support Specialists
BIT	66	MTA Examination: Networking Fundamentals (98-366)	Computer User Support Specialists
BIT	67	MTA Examination: Security Fundamentals (98-367)	Computer User Support Specialists
BIT	68	MTA Examination: Software Development Fundamentals (98-361)	Computer User Support Specialists
BIT	69	MTA Examination: Web Development Fundamentals (98-363)	Computer User Support Specialists
BIT	70	MTA Examination: Windows OS Fundamentals (98-349)	Computer User Support Specialists
BIT	71	MTA Examination: Windows Server Administration Fundamentals (98-365)	Computer User Support Specialists
BIT	72	MTA Examination: Introduction to Programming using HTML & CSS (98-383)	Computer User Support Specialists
BIT	73	MTA Examination: Introduction to Programming using Java (98-388)	Computer User Support Specialists
BIT	74	MTA Examination: Introduction to Programming using JavaScript (98-382)	Computer User Support Specialists
BIT	75	MTA Examination: Introduction to Programming using Python (98-381)	Computer User Support Specialists
BIT	76	Network Pro Certification Examination: Test Out Corporation (TOC)	Computer User Support Specialists
BIT	77	Oracle Certification Program Examination: PL SQL	Computer Operators
BIT	78	Oracle Certification Program Examinations (Pass any one exam from this certification program): Oracle Corporation	Computer Operators
BIT	79	PC Pro Certification Examination: Test Out Corporation (TOC)	Computer User Support Specialists
BIT	80	Security Pro Certification Examination: Test Out Corporation (TOC)	Computer User Support Specialists
BIT	81	Visual Communications and Interactive Media Design Assessment: National Occupational Competency Testing Institute (NOCTI)	Media and Communication Equipment Workers

BIT	82	Visual Communications and Multimedia Design Assessment: National Occupational Competency Testing Institute (NOCTI)	Media and Communication Equipment Workers
BIT	83	Web Design Assessment: National Occupational Competency Testing Institute (NOCTI)	Web Developers

Family and Consumer Sciences Occupational Alignment

CTE Program Area	Survey Question Number	Assessment	Occupation
FACS	1	AAFCS: Culinary Arts Examination	Food Preparation and Serving Related Occupations
FACS	2	AAFCS: Early Childhood Education Examination	Preschool Teachers, Except Special Education
FACS	3	AAFCS: Education Fundamentals Examination	Teacher Assistants
FACS	4	AAFCS: Family and Community Services Examination	Childcare Workers
FACS	5	AAFCS: Fashion, Textiles, and Apparel Examination	Personal Appearance Workers
FACS	6	AAFCS: Food Science Fundamentals Examination	Dietetic Technicians
FACS	7	AAFCS: Interior Design Fundamentals Examination	Interior Designers
FACS	8	AAFCS: Housing and Furnishings Examination	Textile, Apparel, and Furnishings Workers
FACS	9	AAFCS: Nutrition, Food and Wellness Examination	Dietetic Technicians
FACS	10	ACCESS Examination: American Culinary Federation, Inc. (ACF)	Food Preparation and Serving Related Occupations
FACS	11	ACF Culinary Arts Certification Assessment: American Culinary Federation, Inc. (Assessment is administered by NOCTI)	Food Preparation and Serving Related Occupations
FACS	12	Certification of Pharmacy Technicians (ExCPT) Examination: Virginia Board of Pharmacy	Pharmacy Technicians
FACS	13	Certified Dental Assistant and National Entry Level Assistant: Infection Control (ICE) Examination: Dental Assisting National Board	Dental Assistants
FACS	14	Certified Dental Assistant and National Entry Level Assistant: Radiation Health & Safety (RHS) Examination: Dental Assisting National Board	Dental Assistants
FACS	15	Certified Medical Administrative Assistant (CMAA) Examination: National Healthcareer Association (NHA)	Medical Records and Health Information Technicians

FACS	16	Certified Patient Care Technician (CPCT) Examination: American Allied Health (AAH)	Nursing Assistants
FACS	17	Certified Patient Care Technician (CPCT/A) Examination: National Healthcareer Association (NHA)	Nursing Assistants
FACS	18	Certified Pharmacy Technician (CPht) Examination: American Allied Health (AAH)	Pharmacy Technicians
FACS	19	Certified Pharmacy Technician (ExCPT) Examination: National Healthcareer Association (NHA)	Pharmacy Technicians
FACS	20	Certified Physical Therapy Aide (CPTA) Examination: American Allied Health (AAH)	Physical Therapist Aides
FACS	21	Child Development Associate Certification: CDA Council	Childcare Workers
FACS	22	Clinical Medical Assistant Certification (CMAC) Examination: American Medical Certification Association (AMCA)	Medical Assistants
FACS	23	Commercial Foods Assessment: National Occupational Competency Testing Institute (NOCTI)	Food Preparation and Serving Related Occupations
FACS	24	Culinary Arts Prep Cook-Level 2 Assessment: National Occupational Competency Testing Institute (NOCTI)	Chefs and Head Cooks
FACS	25	Dental Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	Dental Assistants
FACS	26	Early Childhood Education and Care, Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	Teacher Assistants
FACS	27	Early Childhood Education and Care, Basic Assessment: National Occupational Competency Testing Institute (NOCTI)	Childcare Workers
FACS	28	Food Safety & Science Certification Examination: American Meat Science Association (Exam is administered by iCEV)	Food Preparation and Serving Related Occupations
FACS	29	Health Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	Healthcare Support Occupations
FACS	30	Licensed Practical Nurse Examination: Virginia Board of Nursing (VBN)	Licensed Practical and Licensed Vocational Nurses
FACS	31	Nationally Registered Certified Medical Assistant (NRCMA) Examination: National Association of Health Professionals (NAHP)	Medical Assistants
FACS	32	National Certified Patient Care Technician (NCPCT) Examination: National Center for Competency Testing (NCCT)	Nursing Assistants
FACS	33	National Nurse Aide Assessment Program (NNAAP) Examination: Virginia Board of Nursing	Nursing Assistants

FACS	34	Nationally Registered Certified Dental Assistant (NRCDA) Examination: National Association of Health Professionals (NAHP)	Dental Assistants
FACS	35	Nationally Registered Certified Pharmacy Technician (NRCPhT) Examination: National Association for Health Professionals (NAHP)	Pharmacy Technicians
FACS	36	NHA: Certified Medical Laboratory Assistant (CMLA)	Medical Assistants
FACS	37	Nursing Assisting Assessment: National Occupational Competency Testing Institute (NOCTI)	Nursing Assistants
FACS	38	ParaPro: Educational Testing Service (ETS)	Teacher Assistants
FACS	39	Patient Care Technician Certification (PCTC) Examination: American Medical Certification Association (AMCA)	Nursing Assistants
FACS	40	Phlebotomy Technical Certification (PTC) Examination: American Medical Certification Association (AMCA)	Phlebotomists
FACS	41	Practical Nursing Assessment: National Occupational Competency Testing Institute	Nursing Assistants
FACS	42	Praxis Core Academic Skills for Educators Tests: Educational Testing Service (must pass all three tests)	Teacher Assistants
FACS	43	ProStart Program End-of-Course Examination (Level 2): Education Foundation of the National Restaurant Association	Food Preparation and Serving Related Occupations
FACS	44	Retail Commercial Baking Assessment: National Occupational Competency Testing Institute (NOCTI)	Chefs and Head Cooks
FACS	45	ServSafe Manager Certification Examination: National Restaurant Association	Food Preparation and Serving Related Occupations

Marketing Education Occupational Alignment

CTE Program Area	Survey Question Number	Assessment	Occupation
ME	1	Advanced Customer Service and Sales Certification Assessment: National Retail Federation (NRF) Foundation	Sales and Related Occupations
ME	2	AHLA Certified Hospitality and Tourism Management Professional Examination (Must pass Level 1 and Level 2 exams): American Hotel and Lodging Association	Hotel, Motel, and Resort Desk Clerks

ME	3	AHLA Hospitality and Tourism Management Program, Level 2: American Hotel and Lodging Association	Hotel, Motel, and Resort Desk Clerks
ME	4	AHLA: Certified Guest Service Professional Examination: American Hotel and Lodging Association	Hotel, Motel, and Resort Desk Clerks
ME	5	AHLA: Certified Restaurant Server Examination: American Hotel and Lodging Association	Hotel, Motel, and Resort Desk Clerks
ME	6	Hospitality Management Food and Beverage Option Assessment: National Occupational Competency Testing Institute (NOCTI)	Hotel, Motel, and Resort Desk Clerks
ME	7	Hospitality Management Lodging Option Assessment: National Occupational Competency Testing Institute (NOCTI)	Hotel, Motel, and Resort Desk Clerks
ME	8	Restaurant, Food and Beverage Services Assessment: National Occupational Competency Testing Institute (NOCTI)	Food Preparation and Serving Related Occupations
ME	9	Retail Management Certification Assessment: National Retail Federation (NRF) Foundation	Sales and Related Occupations
ME	10	Retail Merchandising Assessment: National Occupational Competency Testing Institute (NOCTI)	Sales and Related Occupations

Technical Engineering Occupational Alignment

CTE Program Area	Survey Question Number	Assessment	Occupation
TE	1	Advertising and Design Assessment: National Occupational Competency Testing Institute (NOCTI)	Arts, Design, Entertainment, Sports, and Media Occupations
TE	2	Architectural Apprentice Drafter Examination: American Design Drafting Association (ADDA)	Mechanical Drafters
TE	3	Architectural Certified Drafter Examination: American Design Drafting Association (ADDA)	Mechanical Drafters
TE	4	Architectural Drafting Assessment: National Occupational Competency Testing Institute (NOCTI)	Mechanical Drafters
TE	5	Architectural Drafting Examination: American Design Drafting Association (ADDA)	Mechanical Drafters
TE	6	AutoCAD Certified User: Autodesk	Mechanical Drafters
TE	7	AutoCAD Civil 3D Certified Professional Examination: Autodesk	Mechanical Drafters

TE	8	Autodesk 2010 AutoCAD Associate Examination: Autodesk	Mechanical Drafters
TE	9	Autodesk 3ds Max Certified User Examination: Autodesk	Mechanical Drafters
TE	10	Autodesk AutoCAD Certified Professional Examination: Autodesk	Mechanical Drafters
TE	11	Autodesk Certification Program (Pass any one exam at fundamentals level)	Mechanical Drafters
TE	12	Autodesk Fusion 360 Certified User Examination: Autodesk	Mechanical Drafters
TE	13	Autodesk Inventor Certified Professional Examination: Autodesk	Mechanical Drafters
TE	14	Autodesk Inventor Certified User: Autodesk	Mechanical Drafters
TE	15	Autodesk Maya Certified User Examination: Autodesk	Mechanical Drafters
TE	16	Autodesk Revit Architecture Certified User Examination: Autodesk	Mechanical Drafters
TE	17	Autodesk Revit Certified Professional Examination: Autodesk	Mechanical Drafters
TE	18	CAD Assessment: National Occupational Competency Testing Institute (NOCTI)	Mechanical Drafters
TE	19	CAD/CAM Assessment: National Occupational Competency Testing Institute (NOCTI)	Mechanical Drafters
TE	20	Certified SOLIDWORKS Associate (CSWA) Examination: SOLIDWORKS Corporation	Mechanical Drafters
TE	21	Electronic Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	Helpers--Electricians
TE	22	Electronics Assessment: National Occupational Competency Testing Institute (NOCTI)	Helpers--Electricians
TE	23	Fundamentals of Construction Assessment: National Occupational Competency Testing Institute (NOCTI)	Helpers, Construction Trades
TE	24	Graphic Production Technology Assessment: National Occupational Competency Testing Institute	Printing Workers
TE	25	Manufacturing Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	Mechanical Drafters
TE	26	Mechanical Apprentice Drafter Examination: American Design Drafting Association (ADDA)	Mechanical Drafters
TE	27	Mechanical Certified Drafter Examination: American Design Drafting Association (ADDA)	Mechanical Drafters
TE	28	Mechanical Drafting and Design Assessment: National Competency Testing Institute (NOCTI)	Mechanical Drafters

TE	29	Mechatronics: National Competency Testing Institute (NOCTI)	Electro-Mechanical Technicians
TE	30	Precision Machining Assessment: National Occupational Competency Testing Institute (NOCTI)	Production Occupations
TE	31	Pre-Engineering/Engineering Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	Industrial Engineering Technicians
TE	32	Small Engine Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	Outdoor Power Equipment and Other Small Engine Mechanics
TE	33	Technical Drafting Assessment: National Occupational Competency Testing Institute	Mechanical Drafters

Trade & Industry Occupational Alignment

CTE Program Area	Survey Question Number	Assessment	Occupation
TI	1	Agriculture Mechanics Assessment: National Occupational Competency Testing Institute (NOCTI)	Transportation and Material Moving Occupations
TI	2	Air Conditioning Employment Ready Examination: HVAC Excellence	Heating, Air Conditioning, and Refrigeration Mechanics and I
TI	3	Basic Refrigeration & Charging Procedures Employment Ready Examination: HVAC Excellence	Heating, Air Conditioning, and Refrigeration Mechanics
TI	4	ASE Auto Maintenance and Light Repair Examination (G1): National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	5	ASE Automotive & Light Truck Certification Test-Automatic Transmission/Transaxle (A2): National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	5	ASE Automotive & Light Truck Certification Test-Brakes (A5): National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	5	ASE Automotive & Light Truck Certification Test-Electrical/Electronic Systems (A6): National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	5	ASE Automotive & Light Truck Certification Test-Engine Performance (A8): National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	5	ASE Automotive & Light Truck Certification Test-Engine Repair (A1): National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics

TI	5	ASE Automotive & Light Truck Certification Test-Heating and Air Conditioning (A7): National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	5	ASE Automotive & Light Truck Certification Test-Light Vehicle Diesel Engines (A9): National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	5	ASE Automotive & Light Truck Certification Test-Manual Drive Train and Axles (A3): National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	5	ASE Automotive & Light Truck Certification Test-Suspension & Steering (A4): National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	6	ASE Collision Repair & Refinish Certification Test - Mechanical & Electrical Components (B5): National Institute for Automotive Service Excellence	Automotive Body and Related Repairers
TI	6	ASE Collision Repair & Refinish Certification Test - Structural Analysis & Damage Repair: National Institute for Automotive Service Excellence	Automotive Body and Related Repairers
TI	6	ASE Collision Repair & Refinish Certification Test - Structural Analysis & Damage Repair: National Institute for Automotive Service Excellence	Automotive Body and Related Repairers
TI	6	ASE Collision Repair and Refinish Certification Test - NonStructural Analysis & Damage Repair (B3): National Institute for Automotive Service Excellence	Automotive Body and Related Repairers
TI	6	ASE Collision Repair and Refinish Certification Test - Painting & Refinishing (B2): National Institute for Automotive Service Excellence	Automotive Body and Related Repairers
TI	7	ASE Medium-Heavy Truck Certification Test - Brakes (T4): National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	7	ASE Medium-Heavy Truck Certification Test - Diesel Engines (T2): National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	7	ASE Medium-Heavy Truck Certification Test - Electrical/Electronic systems (T6): National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	7	ASE Medium-Heavy Truck Certification Test - Suspension & Steering (T5): National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	8	ASE Student Certification Automotive: Electrical/Electronic Systems: National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics

TI	8	ASE Student Certification Automotive: Engine Performance: National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	8	ASE Student Certification Automotive: Engine Repair: National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	8	ASE Student Certification Automotive: Heating and Air Conditioning: National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	8	ASE Student Certification Automotive: Maintenance and Light Repair: National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	8	ASE Student Certification Automotive: Manual Drive Train and Axles: National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	8	ASE Student Certification Automotive: Automatic Transmission/Transaxle: National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	8	ASE Student Certification Automotive: Automotive Service Technology National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	8	ASE Student Certification Automotive: Brakes: National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	8	ASE Student Certification Automotive: Suspension and Steering: National Institute for Automotive Service Excellence	Automotive Service Technicians and Mechanics
TI	9	ASE Student Certification Collision Repair & Refinish: Mechanical and Electrical: National Institute for Automotive Service Excellence	Automotive Body and Related Repairers
TI	9	ASE Student Certification Collision Repair & Refinish: Non-structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	Automotive Body and Related Repairers
TI	9	ASE Student Certification Collision Repair & Refinish: Painting and Refinishing: National Institute for Automotive Service Excellence	Automotive Body and Related Repairers
TI	9	ASE Student Certification Collision Repair & Refinish: Structural Analysis and Damage Repair: National Institute for Automotive Service Excellence	Automotive Body and Related Repairers
TI	10	ASE Student Certification M/H Truck: Brakes: National Institute for Automotive Service Excellence	Bus and Truck Mechanics and Diesel Engine Specialists
TI	10	ASE Student Certification M/H Truck: Diesel Engines: National Institute for Automotive Service Excellence	Bus and Truck Mechanics and Diesel Engine Specialists
TI	10	ASE Student Certification M/H Truck: Electrical/Electronic: National Institute for Automotive Service Excellence	Bus and Truck Mechanics and Diesel Engine Specialists

TI	10	ASE Student Certification M/H Truck: Steering & Suspension: National Institute for Automotive Service Excellence	Bus and Truck Mechanics and Diesel Engine Specialists
TI	11	Automotive Technician Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	Automotive Service Technicians and Mechanics
TI	12	Automotive Technician Core Assessment: National Occupational Competency Testing Institute (NOCTI)	Automotive Service Technicians and Mechanics
TI	13	Barbers Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	Hairdressers, Hairstylists, and Cosmetologists
TI	14	Beef Quality Assurance Certification	Farming, Fishing, and Forestry Occupations
TI	15	Building Construction Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	Helpers, Construction Trades
TI	16	Building Trades Maintenance Assessment: National Occupational Competency Testing Institute (NOCTI)	Helpers, Construction Trades
TI	17	Cabinetmaking Assessment: National Occupational Competency Testing Institute (NOCTI)	Woodworkers
TI	18	Carpentry Assessment: National Occupational Competency Testing Institute (NOCTI)	Woodworkers
TI	19	Certified Emergency Telecommunicator Examination: International Academies of Emergency Dispatch (IAED)	Dispatchers, Except Police, Fire, and Ambulance
TI	20	Certified Inpatient Coder (CIC) Examination: American Academy of Professional Coders (AAPC)	Medical Secretaries
TI	21	Certified Satellite Installer (CSI) Examination: Electronics Technicians Association (ETA), International	Telecommunications Line Installers and Repairers
TI	22	Certified Veterinary Assistant Examination: American Allied Health (AAH)	Veterinary Assistants and Laboratory Animal Caretakers
TI	23	Certified Veterinary Assistant Examination: Texas Veterinary Medical Association	Veterinary Assistants and Laboratory Animal Caretakers
TI	24	Collision Repair and Refinishing Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	Automotive Body and Related Repairers
TI	25	Collision Repair Assessment: National Occupational Competency Testing Institute (NOCTI)	Automotive Body and Related Repairers
TI	26	Commercial Pesticide Applicator Certification Examination: Virginia Department of Agriculture and Consumer Services	Pest Control Workers
TI	27	Construction Masonry-Brick Assessment: National Occupational Competency Testing Institute (NOCTI)	Helpers, Construction Trades

TI	28	Cosmetology Assessment: National Occupational Competency Testing Institute (NOCTI)	Personal Care and Service Occupations
TI	29	Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology (Department of Professional & Occupational Regulations)	Personal Care and Service Occupations
TI	30	Criminal Justice Advanced Assessment: National Occupational Competency Testing Institute (NOCTI)	Legal Occupations
TI	31	Data Cabling Installer (DCI) Certification Examination: Electronics Technicians Association (ETA), International	Telecommunications Line Installers and Repairers
TI	32	Diesel Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	Automotive Service Technicians and Mechanics
TI	33	Electric Power and Distribution Assessment: National Occupational Competency Testing Institute (NOCTI)	Helpers--Electricians
TI	34	Electrical Construction Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	Helpers--Electricians
TI	35	Electrical Employment Ready Examination: HVAC Excellence	Helpers--Electricians
TI	36	Electrical Occupations Assessment: National Occupational Competency Testing Institute (NOCTI)	Helpers--Electricians
TI	37	Electrician Level One - Entry-Level Assessment: National Center for Construction Education & Research (NCCER)	Helpers--Electricians
TI	38	Electronics Module: AC (EM2): Electronics Technicians Association (ETA), International	Helpers--Electricians
TI	39	Emergency Medical First Responder Certification: Department of Health, Office of EMS	Emergency Medical Technicians and Paramedics
TI	40	Emergency Medical Technician Examination: Department of Health, Office of Emergency Medical Services	Emergency Medical Technicians and Paramedics
TI	41	EPA Universal Examination (pass all three types): Environmental Protection Agency (EPA)	Environmental Science and Protection Technicians, Including
TI	42	Equine Science Examination – New York State Department of Education (Cornell University)	Farmworkers, Farm, Ranch, and Aquacultural Animals
TI	43	Equine Science-Year Certification Examination: Precision Exams	Farmworkers, Farm, Ranch, and Aquacultural Animals
TI	44	Fiber Optics Installer (FOI) Certification: Electronics Technicians Association (ETA), International	Telecommunications Line Installers and Repairers
TI	45	Firefighter II Certification Examination: Virginia Department of Fire Programs	Fire Fighting and Prevention Workers

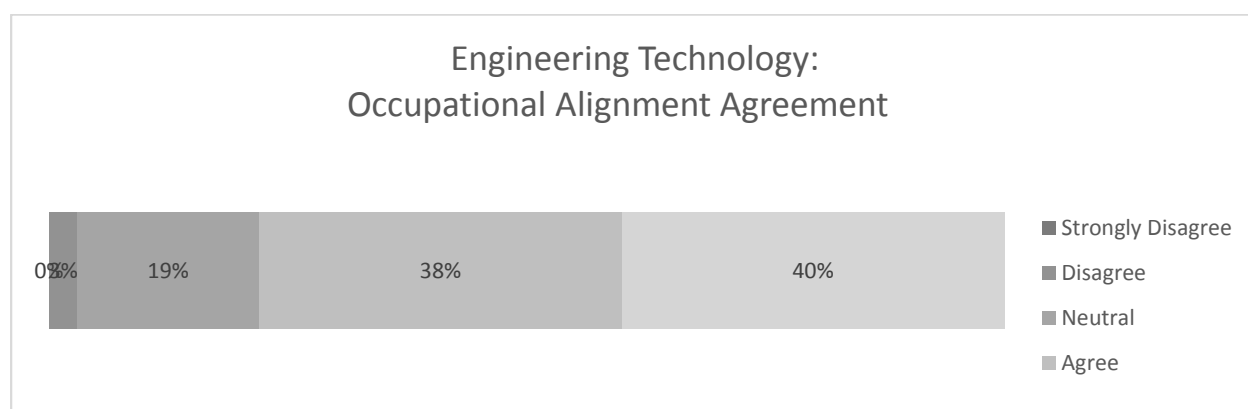
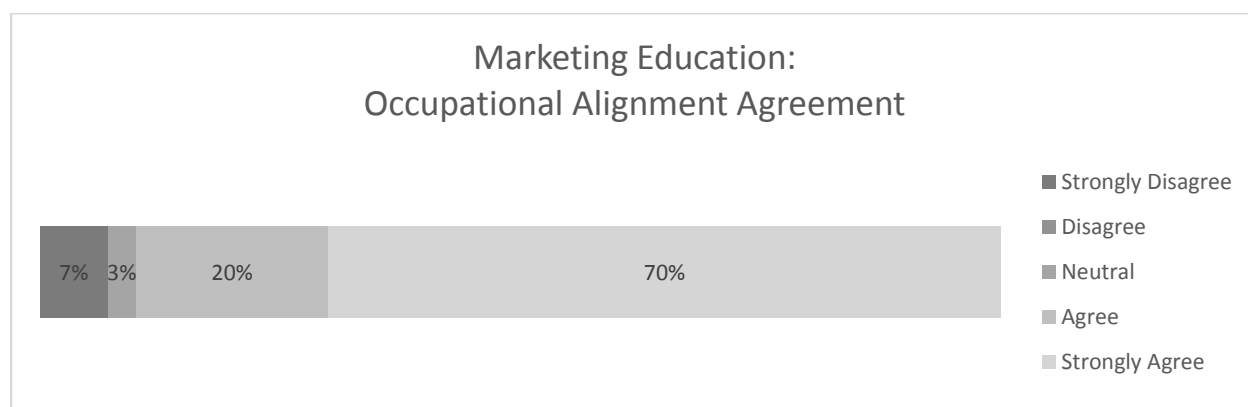
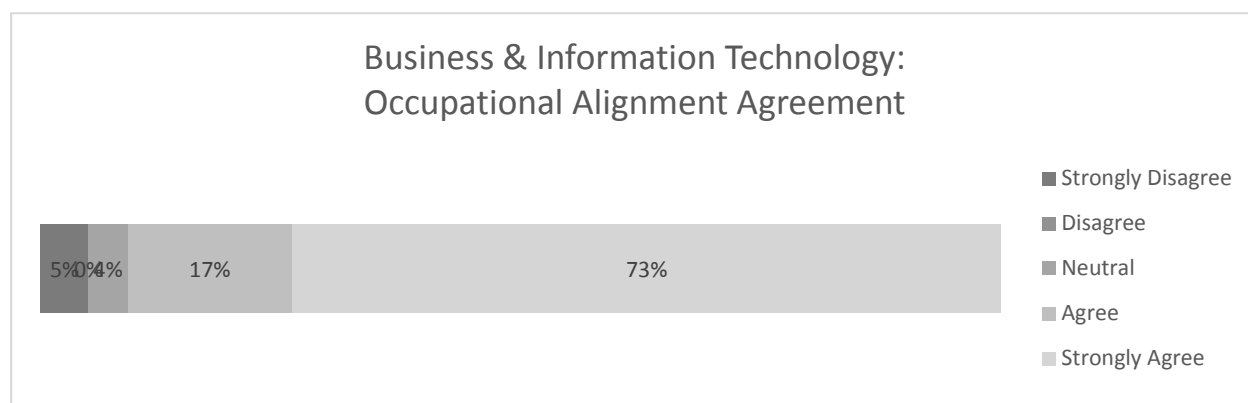
TI	46	Floriculture Assessment: National Occupational Competency Testing Institute (NOCTI)	Farmworkers and Laborers, Crop, Nursery, and Greenhouse
TI	47	Floriculture-Greenhouse Assessment: National Occupational Competency Testing Institute (NOCTI)	Farmworkers and Laborers, Crop, Nursery, and Greenhouse
TI	48	Forestry Products & Processing Assessment: National Occupational Competency Testing Institute (NOCTI)	Forest, Conservation, and Logging Workers
TI	49	Fundamentals of Animal Science Certification Examination: Elanco (Exam is administered by iCEV)	Veterinary Assistants and Laboratory Animal Caretakers
TI	50	Gas Heat Employment Ready Examination: HVAC Excellence	Heating, Air Conditioning, and Refrigeration Mechanics
TI	51	Greenhouse Operators Certification Examination: Southeast Greenhouse Growers Association/Virginia Flower Growers Association	Farmworkers and Laborers, Crop, Nursery, and Greenhouse
TI	52	Heating, Electrical, Air Conditioning Technology Examination (HEAT): HVAC Excellence	Heating, Air Conditioning, and Refrigeration Mechanics
TI	53	Heating, Ventilation & Air Conditioning (HVAC) Assessment: National Occupational Competency Testing Institute (NOCTI)	Heating, Air Conditioning, and Refrigeration Mechanics
TI	54	Heating, Ventilation, Air Conditioning & Refrigeration (HVAC/R) Assessment: National Occupational Competency Testing Institute (NOCTI)	Heating, Air Conditioning, and Refrigeration Mechanics
TI	55	Home Health Aide Assessment: National Occupational Competency Testing Institute (NOCTI)	Personal Care and Service Occupations
TI	56	Horticulture Landscaping Assessment: National Occupational Competency Testing Institute (NOCTI)	Farmworkers and Laborers, Crop, Nursery, and Greenhouse
TI	57	HVAC (EPA) Technician Examinations (Levels: Core, I, II, or III): Environmental Protection Agency	Heating, Air Conditioning, and Refrigeration Mechanics
TI	58	HVAC Excellence Certification Program: HVAC Excellence (Pass an one exam in this program)	Heating, Air Conditioning, and Refrigeration Mechanics
TI	59	International Code Council Certificates of Achievement Examinations (Pass any one exam): International Code Council (ICC)	Construction and Building Inspectors
TI	60	Logistics Technology/Distribution Center Services Assessment: National Competency Testing Institute (NOCTI)	Material Recording, Scheduling, Dispatching, and Distribution
TI	61	Nail Technician Examination: Virginia Board for Barbers and Cosmetology	Hairdressers, Hairstylists, and Cosmetologists
TI	62	Network Cabling Specialist Certification Examination: C-Tech Associates	Telecommunications Line Installers and Repairers

TI	63	Physical Therapy Aide Certification (PTAC) Examination: American Medical Certification Association (AMCA)	Physical Therapist Aides
TI	64	Plant Science Certification Examination: Bayer CropScience (exam is adm. by iCEV)	Farmworkers and Laborers, Crop, Nursery, and Greenhouse
TI	65	Pork Quality Assurance Certification	Farming, Fishing, and Forestry Occupations
TI	66	Principles of Floral Design Certification Examination: Benz School of Floral Design (exam is adm. by iCEV)	Floral Designers
TI	67	Principles of Livestock Selection and Evaluation Certification Examination: National Collegiate Livestock Coaches Association (exam is adm. by iCEV)	Farming, Fishing, and Forestry Occupations
TI	68	Private Applicator Certification Examination: VA Dept of Agriculture and Consumer Services	Pest Control Workers
TI	69	Production Agriculture Assessment: National Occupational Competency Testing Institute (NOCTI)	Farming, Fishing, and Forestry Occupations
TI	70	Real Estate Salesperson Examination: Virginia Real Estate Board	Real Estate Sales Agents
TI	71	Registered Technician Certification Examination: VA Dept of Agriculture and Consumer Services	Pest Control Workers
TI	72	Small Animal Care Examination New York Dept. of Education (Cornell Univ.)	Animal Care and Service Workers
TI	73	Small Animal Science and Technology Assessment: National Occupational Competency Testing Institute (NOCTI)	Animal Care and Service Workers
TI	74	Television Production Assessment: National Occupational Competency Testing Institute (NOCTI)	Production Occupations
TI	75	Therapeutic Services Assessment: National Occupational Competency Testing Institute (NOCTI)	Personal Care and Service Occupations
TI	76	Veterinary Medical Applications Certification Examination: Elanco (exam is adm. by iCEV)	Veterinary Assistants and Laboratory Animal Caretakers
TI	77	Virginia Motor Vehicle Safety Inspection Program Examination: Virginia State Police	Automotive Service Technicians and Mechanics
TI	78	Welding Assessment: National Occupational Competency Testing Institute (NOCTI)	Welders, Cutters, Solderers, and Brazers

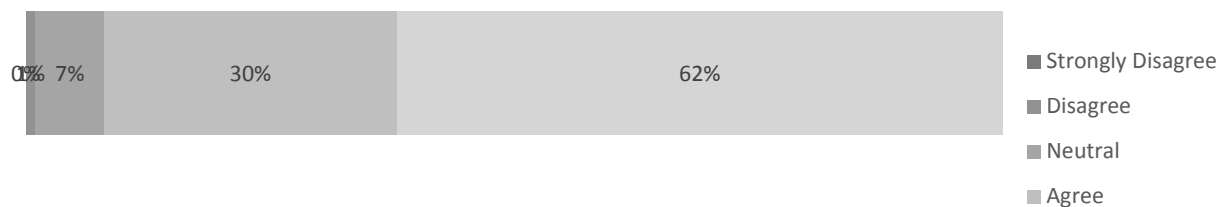
APPENDIX 1.2

Industry Credential to Occupational Alignment Likert Survey: Results

The data presented in these chart align with the initial feedback (as seen in Appendix 1.3). Once the feedback was applied to the alignments, and the recommended changes made, the final results are those appearing in the tables of data presented in this study.



Family & Consumer Sciences:
Occupational Alignment Agreement



Trade and Industrial Education:
Occupational Alignment Agreement



APPENDIX 1.3

Industry Credential to Occupational Alignment Likert Survey: Feedback

Feedback from survey respondents:

Certified Restaurant Server Examination: American Hotel and Lodging Association

From: Hotel, Motel, and Resort Desk Clerks

To: Nothing suggested

Action: Removed from spreadsheet

Hospitality Management Food and Beverage Option Assessment: National Occupational Competency Testing Institute (NOCTI)

From: Hotel, Motel, and Resort Desk Clerks

To: Food and Beverage Serving Workers, Food Service Managers

AutoCAD Certified User: Autodesk

From: Mechanical Drafters

To: User and Professional level of Autodesk certification

AutoCAD Civil 3D Certified Professional Examination: Autodesk

From: Mechanical Drafters

To: Revit certification as well

Autodesk 2010 AutoCAD Associate Examination: Autodesk

From: Mechanical Drafters

To: recommend using the latest AutoCAD software exams

Action: 2010 removed from spreadsheet

Autodesk 3ds Max Certified User Examination: Autodesk

From: Mechanical Drafters

To: 3D Max would be seen more in the digital arts and animation field

Action: Changed to arts, design, entertainment, sports and media occupations

Autodesk Maya Certified User Examination: Autodesk

From: Mechanical Drafters

To: Would see this more in the field of animation

Action: Removed from spreadsheet – zero results

Autodesk Revit Architecture Certified User Examination: Autodesk

From: Mechanical Drafters

To: Would use for occupational areas: Architects, except landscape and naval occupations; architectural and civil drafters

**Cosmetology Licensure Examination: Virginia Board of Barbers and Cosmetology
(Department of Professional & Occupational Regulations)**

From: Personal Care and Service Occupations

To: Hairdressers, Hairstylists, and Cosmetologists

Floriculture Assessment: National Occupational Competency Testing Institute (NOCTI)

From: Farmworkers and Laborers, Crop, Nursery, and Greenhouse

To: Floral Designers

CompTIA A+ Certification Examination (must pass both exams) CompTIA

From: Computer User Support Specialists

To: Better suited for Computer Hardware Engineers

Computer Programming Assessment: National Occupational Competency Testing Institute (NOCTI)

From: Computer User Support Specialists

To: Computer Programming

MCP - MCSA: SQL 2016 Database Administration (must pass two required exams):

Microsoft

From: Computer User Support Specialists

To: Computer Programming

MOS Microsoft Office Master Level: 2010/Certiport

From: Computer Operators

To: More recent software

MOS Microsoft Office Specialist Master 2010/Certiport

From: Computer Operators

To: More recent software

MTA Examination: Gaming Development Fundamentals

From: Computer User Support Specialists

To: Computer Programming

MTA Examination: Introduction to Programming using HTML & CSS (98-383)

From: Computer User Support Specialists

To: Computer Programming

MTA Examination: Introduction to Programming using Python (98-381)

From: Computer User Support Specialists

To: Computer Programming

Autodesk 2010 AutoCAD Associate Examination

From: Mechanical Drafters

To: Outdated

Autodesk 3ds Max Certified User Examination

From: Mechanical Drafters

To: Animation and Digital Visualization

Autodesk Inventor Certified User: Autodesk

From: Mechanical Drafters

To: Engineering Designers

Autodesk Revit Architecture Certified User Examination

From: Mechanical Drafters

To: Architectural Designers and Engineers

Certified SolidWorks Associate (CSWA) Examination

From: Mechanical Drafters

To: Engineering Designers

Electronic Technology Assessment: National Occupational Competency Testing Institute (NOCTI)

From: Helpers--Electricians

To: Electronics Technician Occupation

Electronics Assessment: National Occupational Competency Testing Institute (NOCTI)

From: Helpers--Electricians

To: Electronics Technician Occupation

Manufacturing Technology Assessment: National Occupational Competency Testing Institute (NOCTI)

From: Mechanical Drafters

To: Manufacturing Technician

Precision Machining Assessment: National Occupational Competency Testing Institute (NOCTI)

From: Production Occupations

To: Manufacturing Technician

While [*test vendor name removed*] certifications technically align, they do not hold the same value in industry (by employers) as other certifications.

College Level Examination Program (CLEP): Financial Accounting: The College Board

From: Accountants and Auditors

To: Remove from spreadsheet

Reason: While the [*test vendor name removed*] aligns, it isn't truly an industry credential, so there isn't any value in industry to completing the CLEP (all it does is test you out of first level classes at a collegiate level). A better credential for this would be the QuickBooks Certified User Exam (QBCU).

IC3 Internet and Computing Core Certification Examinations: 2005, 2007, 2010, GS4, GS5, Certiport (student has passed all three examinations)

From: Computer User Support Specialists

To: GS5 only

Reason: GS5 is the latest version available and would be the only truly acceptable and aligned version of the certification for value in today's industry.

Q52. Industry credential: MOS 2013 Master/Certiport (must pass four exams)

From: Computer Operators

To: MOS 2019 or MOS 365

Reason: While MOS is aligned for this occupation, the version listed (2013) is not. Technology is a dynamic industry, and the expectation for industry acceptability is always the latest iteration available. In this case, that would be MOS 2019 or MOS 365.

Q56. Industry credential: MOS Microsoft Office Expert Excel 2016/Certiport (only one exam)

From: Computer Operators

To: Most recent technology available.

APPENDIX 2
BUSINESS PARTNER SURVEY & FINDINGS

Question 1:

Please state the nature of your company/organization e.g. education, retail, manufacturing etc.

Respondents	Responses
1	Industry Association Representing Ship Repair / Shipbuilding
2	Managed Service IT / Government Contracting
3	Government
4	Medical Manufacturing
5	Information Technology Products and Consulting
6	Manufacturing
7	Ship Repair and Modernization
8	Education
9	Investment Casting
10	Education & Research
11	Non-Profit STEM / Workforce Development
12	Finance
13	General Management and Technology Consulting
14	Manufacturing
15	Education/Media
16	Non-Profit Education
17	Education
18	Travel and Tourism

Question 2:

Scenario: Your Company has ONE job opening for a high school graduate. Two candidates have applied for the position.

Candidate One is a high school graduate who does not have any industry credentials but is eager to learn.

Candidate Two is a high school graduate who has completed at least two years of a Career and Technical Education program relevant to your company's business area. The candidate has successfully earned a series of third-party industry credentials that validate the knowledge and skills to be used in your company's business area.

Question: Which candidate would you/your company employ?

	Responses	
Candidate One	5.56%	1
Candidate Two	94.44%	17

Question 3:

Scenario: Your Company has TWO job openings for high school graduates. Two candidates have applied for the position.

Candidate One is a high school graduate who does not have any industry credentials but is eager to learn.

Candidate Two is a high school graduate who has completed at least two years of a Career and Technical Education program relevant to your company's business area. The candidate has successfully earned a series of third-party industry credentials that validate the knowledge and skills to be used in your company's business area.

Question: Assuming you/your company employed both candidates, would they receive the same starting salary?

	Responses	
Yes	11.11%	2
No	88.89%	16

Question 4:

Would the industry credentials held by Candidate Two influence the starting salary they would receive?

	Responses	
Yes	88.89%	16
No	11.11%	2

Question 5:

If you/your company decided to give Candidate Two a higher starting salary to reflect the industry credentials they have, what percent increase would this look like?


Respondent	%
1	6
2	10
3	5
4	15
5	10
6	10
7	22
8	10

Respondent	%
9	5
10	25
11	10
12	25
13	20
14	20
15	10
16	25

Two respondents skipped this question

Appendix 3

Commonwealth of Virginia Plan of Study

 CareerClusters™ <small>PATHWAYS TO COLLEGE & CAREER READINESS</small> Information Technology		Commonwealth of Virginia Plan of Study				Student Name: _____ School: _____ Date: _____		Rev: 4/13
		Cluster: Information Technology Pathway: Web and Digital Communications						
<p><small>This Career Pathway Plan of Study can serve as a guide, along with other career planning materials, as learners continue on a career path. Courses listed within this plan are only recommended coursework and should be individualized to meet each learner's educational and career goals. This Plan of Study, used for learners at an educational institution, should be customized with course titles and appropriate high school graduation requirements as well as college entrance requirements.</small></p>								
EDUCATION LEVELS	GRADE	English/ Language Arts	Mathematics	Science	Social Studies/ Science	Other Required Courses Recommended Electives Learner Activities	Recommended Career and Technical Courses <small>Source: Administrative Planning Guide http://www.cteresource.org/apg/</small>	SAMPLE – Occupations Relating to This Pathway: <small>http://www.doe.virginia.gov/instruction/career_technical/career_clusters/sample_plan_study/index.shtml http://www.careerclusters.org http://www.cteresource.org/cpg/</small>
NOTE: Indicate State Course Titles and Codes								
Graduation Requirements: http://www.doe.virginia.gov/instruction/graduation/index.shtml								
MIDDLE	7	English 7 (1110)	Math 7 (3111)	Life Science (4115)	U S History (2354)		Keyboarding (6150)	<ul style="list-style-type: none"> - Animator - Digital Media Designer - Graphic Designer - Instructional Technologist - Media Specialist - Multimedia Author - Multimedia Developer - Multimedia Specialist - Producer - Production Assistant - Streaming Media Specialist - Virtual Reality Specialist - Web Administrator - Web Architect/Designer - Web Designer - Web Developer - Web Producer - Webmaster
	8	English 8 (1120)	Algebra I (3130)	Physical Science (4125)	Civics & Economics (2357)	Computer Solutions (6610/6609)	Digital Input Technologies (6160/6161)	
Career Assessment: Identify an appropriate career assessment instrument at the middle school level used to help students and their parents plan for high school: VA Wizard <input checked="" type="checkbox"/> or other assessment (please indicate): _____								
SECONDARY	9	English (1130)	Geometry (3143)	Earth Sciences (4210)	World History/ Geography I (2215)	Economics & Personal Finance (6120)	IT Fundamentals (6670)	<ul style="list-style-type: none"> - Virtual Reality Specialist - Web Administrator - Web Architect/Designer - Web Designer - Web Developer - Web Producer - Webmaster
	10	English (1140)	Algebra II (3135)	Biology (4310)	World History/ Geography II (2216)	Health & PE (2 years) Foreign Language (3 years) Other Electives to Complement Pathway (Core Academic and CTE):	Computer Information Systems (6612)	
	11	English (1150)	Advanced Mathematics (3160)	Chemistry (4410)	USVA History (2360)		Design Multi-Media & Web Technologies (6630)	
	12	English (1160)	Mathematical Analysis/Pre-Calculus (3162)	Physics (4510) or Principles of Technology I and II (9811/9812)	USVA Government(2440)		Advanced Design Multi-Media & Web Technologies (6631)	
High school courses in the pathway offered locally for college credit should be coded: DE (Dual Enrollment) and/or VC (Validated Credit)								
List related certifications/credentials approved by VDOE and offered locally: http://www.cteresource.org/apg (Go to Certification – License Section) Adobe Certified Expert (ACE) Certified Internet Webmaster Associate Brainbench Web Design and Development Certifications Macromedia Certified Professional Web Design Examination (Cisco Systems) Workplace Readiness Skills for the Commonwealth (CTECS)						Additional Learning Opportunities: CTSO Organization(s): <input type="checkbox"/> DECA <input checked="" type="checkbox"/> FBLA <input type="checkbox"/> FCCLA <input type="checkbox"/> FFA <input type="checkbox"/> FEA <input type="checkbox"/> HOSA <input type="checkbox"/> SkillsUSA <input type="checkbox"/> TSA		
Work-Based Learning: <input type="checkbox"/> Career Research <input checked="" type="checkbox"/> Cooperative Education <input type="checkbox"/> Internship <input checked="" type="checkbox"/> Mentorship <input type="checkbox"/> Job Shadowing <input type="checkbox"/> Service Learning Project <input type="checkbox"/> Student Apprenticeship								
Postsecondary: Placement Assessments such as Virginia Placement Test or COMPASS						College Entrance Exams such as ACT & SAT		
POSTSECONDARY	SAMPLE POSTSECONDARY PROGRAMS RELATED TO THIS CAREER PATHWAY <small>Individual plans must include locally agreed upon courses at the postsecondary level (See page 2)</small>							
	Pathway	Associate Degree, College Certificate, or Apprenticeship			Bachelors Degree		Postgraduate Degree	
	Web and Digital Communications	Information Systems Technology AAS			(Determined Locally)		(Determined Locally – Optional)	

College: _____		School Division(s): _____						
Postsecondary: Placement Assessments such as Virginia Placement Test or COMPASS								
POSTSECONDARY - COMMUNITY COLLEGE or APPRENTICESHIP - Determined Locally	Semester	English	Mathematics	Science	Social Studies	Required Courses or Recommended Electives		
	POSTSECONDARY PLAN OF STUDIES MUST INCLUDE POSTSECONDARY ACADEMIC, CTE, AND OTHER ELECTIVE COURSES APPROPRIATE FOR AN ASSOCIATE DEGREE.							
	Year 1 1st Semester							
	Year 1 2nd Semester							
	Year 2 1st Semester							
	Year 2 2nd Semester							
College courses offered locally in the high school for college credit should be coded: DE (Dual Enrollment) and/or VC (Validated Credit)								
Related Industry Certifications Available:					Additional Suggested Learning Opportunities:			
					Work-Based Learning: <input type="checkbox"/> Cooperative Education <input type="checkbox"/> Internship <input type="checkbox"/> Mentorship <input type="checkbox"/> Job Shadowing <input type="checkbox"/> Service Learning Project <input type="checkbox"/> Registered Apprenticeship			
UNIVERSITY	University/College: Degree or Major: Number of Articulated CC Credits:							
Notes:								

Source:

ACE. (2020). *Evaluations, credits and transcripts*. Retrieved from American Council on Education: Earning college credit through ACE CREDIT

Vita

Anjanette McFadden Hendricks

Education:

- | | |
|------|--|
| 2020 | Old Dominion University
Norfolk, Virginia, 23529
Doctor of Philosophy: Educational Leadership |
| 2016 | Old Dominion University
Norfolk, Virginia, 23529
Master of Science: Educational Leadership |
| 1999 | University of Leeds
Leeds, England
Post Graduate Diploma: Religious Studies |
| 1996 | University of York,
York, England
Bachelor of Arts: Religious Studies & Applied Social Studies |

Professional Experience:

- | | |
|--------------|---|
| 2011-Present | School-To-Work Transition Supervisor
Virginia Beach City Public Schools
2512 George Mason Drive
Virginia Beach, VA, 23456 |
| 2002-2004 | Internal Verifier & Assessor – Business & I.T. National Vocational Qualifications
Ministry of Civil Service Affairs & Housing
Qatar |
| 2001-2002 | Internal Verifier & Assessor – Business & I.T. National Vocational Qualifications
Institute of Private Education & Training: (PAAET)
Kuwait |
| 1999-2001 | Information & Communication Technology Teacher (acting Department Head)
Al Shohub School for Girls
Abu Dhabi |
| 1997-1999 | Assessor – Business & I.T. National Vocational Qualifications
Thrybergh Comprehensive School
Thrybergh, South Yorkshire, England |

Professional Endorsements:

Virginia Department of Education: Post Graduate Professional Licenses:
Administration & Supervision PreK-12
Business and Information Technology
Technology Education