Self-Identified Professional Development Needs of Virginia Career and Technical Education Teachers

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ABSTRACT

Improving teacher quality is an effective strategy for improving student outcomes. For professional development to be effective at changing student practice and improving student outcomes the professional development topic needs to be relevant to the work of the teacher. This study surveys Virginia CTE teachers to identify their self-identified, most needed professional development topics. Virginia CTE teachers were asked to rate 136 separate teaching competencies based on each competency's importance to the teacher's practice and the teacher's ability to implement the competency.

A quantitative research design was used to conduct this study. The Borich Needs Assessment Model was utilized to calculate a Mean Weighted Discrepancy Score (MWDS) for each competency. Competencies were with the largest MWDS were identified as those most needed for teacher professional development. Respondent data was disaggregated by gender, ethnicity, intention to remain in the teaching profession, CTE content area, years of experience, school division, and pre-service training in order to identify differences in professional development topic rankings for on each demographic area. Mann-Whitney U testing and Kruskal-Wallis one-way analysis of variance test by ranks were used. The results of this study can be used by school divisions, schools, and professional development providers to benefit the work of CTE teachers and CTE programs.

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GENREAL AUDIENCE ABSTRACT

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Dedication

This dissertation is dedicated to my family. First to my wife Sarah who has sacrificed her time and energy to support my efforts as a seemingly non-stop graduate student. I owe her more than I can ever repay. I appreciate her more than she will ever know. To my daughters, Elisabeth and Noel, who I have consistently thought about as I've worked towards the goal of earning a doctorate. I hope my work on this topic improves your secondary and postsecondary educational experiences. I look forward to more nights and weekends doing things with each of you. To my parents Gary, Sr. and Debi who have been both supportive and proud during this process. Finally, to my friends and colleagues who have thoughtfully supported my efforts to complete this degree. My thanks are a small token in comparison to the impact all of you have had on me.

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My sincerest thanks for my classmates in our CTE seminar course. It was a great pleasure to learn alongside each of you as we pushed each other to continually take one more step towards completing this process. To Morgan, Mike, Diane, Jihyun, Diane, Tom, Gerald, and Jerald – thanks to each of you for the time and wisdom you provided over the past three years.

Lastly, my deepest appreciation for the 102 Virginia CTE teachers who took the time to complete the study used for this survey. Their diverse perspectives on working as a CTE teacher in Virginia made the work of analyzing the data engaging, interesting, and informative. I am truly grateful for that and sincerely hope the results from this study will be used to improve professional development offerings of CTE across the state.

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CHAPTER ONE

INTRODUCTION

During the 2017-2018 academic year, Virginia Public Schools Career and Technical Education (CTE) programs provided educational services to over 550,000 students in grades six through twelve. CTE programs in Virginia exist to meet the needs of two stakeholder groups. The first group is students. As a part of the Virginia Public Schools educational system, CTE programs prepare students for success in life after the completion of their secondary school career. This preparation can serve to allow students to obtain gainful employment upon graduation or as a foundation to continue preparing for a career through post-secondary educational programs. The second stakeholder group is employers. CTE programs are designed to develop "well-trained and industry certified technical workers" who can engage in the demanding work required for the modern economy (Virginia Department of Education, 2018).

Preparing students for work in the modern economy is a complex task that requires cooperation between all levels of government, businesses, non-profit organizations, and public schools. Standing at the frontlines of this work are CTE teachers and administrators. Opper (2019) observes that there is a strong research base that supports the idea that the in-school factor with the greatest impact on student learning is the teacher. Virginia's CTE programs require knowledgeable and effective teachers and administrators to carry out the day-to-day activities that will achieve the national goal embedded in the *Every Student Succeeds Act* (ESSA), which is to equip every high school graduate with "the skills to compete in today's global, knowledge-based economy" (United States Department of Education, 2018).

The importance of having highly-effective teachers for CTE programs is exemplified by the fact that CTE programs require teachers to participate in responsibilities and possess

expertise beyond those of teachers in core academic subjects (Brand, Valent, & Browning, 2013). For example, CTE programs provide students the opportunity to participate in Work-Based Learning (WBL) programs and Career and Technical Education Student Organizations (CTSO) in order to make connections between learning activities done in the classroom and workplace tasks employers require (Association for Career and Technical Education, 2014). Facilitating participation in these activities is a core responsibility of CTE teachers that academic teachers are not expected to carry out. Research by Brand, Valent, and Browning (2013) has shown that student participation in WBL and CTSO activities are meaningful components of the overall CTE program.

CTE teachers also need to stay current with industry best practices, technological changes, and employment trends (Threeton, 2007). In order to achieve these objectives, teachers need to have a system in place that gives them access to the information and training they need. One approach school districts in Virginia use to help ensure CTE teachers have up-to-date industry skills is CTE Local Advisory Committees. These advisory committees connect local industry leaders with school administrators and teachers in order to update curriculum and practices to align with industry standards (Virginia Department of Education Office of Career and Technical Education, 2012). When utilized well, these partnerships help CTE teachers stay aware of the practices, changes, and trends occurring and allow opportunities for teachers to implement these changes in their programs.

Background to the Study

Effective implementation of CTE instructional program strategies requires teachers who have demonstrated the requisite knowledge and skills related to CTE program implementation, including planning and organization of content delivery, instructional strategies for working with

students, technical skills specific to the program area, technology integration appropriate for industry, and assessment and evaluation of student learning that informs practice (American Institutes for Research, 2015). As discussed previously, CTE teachers are also responsible for integrating CTSO activities in the classroom, implementing work-based learning experiences and correlating those activities with course instruction and assessment, program promotion, and when developing community-based programs. As such, in addition to pedagogical knowledge and skills, CTE teachers must also possess program operational skills. When CTE teachers lack the full range of knowledge and skills required for the position, students are not offered the holistic educational model needed to prepare them for the modern workforce. As more and more CTE teachers enter the profession through the various alternative licensure pathways allowed, the overall quality of CTE programs will also decline without significant structural supports for the local school and/or school division (Gordon, 2009).

Increasingly, CTE teachers are entering the profession through a variety of alternative licensure routes (Stephens, 2015; Wilkin & Nwoke, 2011). This means that CTE teachers are entering the classroom without having experienced a robust teacher pre-service program that prepares them to manage all aspects of a CTE program. In Virginia, prospective teachers can apply for a three-year provisional license and begin working as a teacher if they have the necessary content-area coursework and are sponsored by a school division (Virginia Department of Education, 2018). Virginia also utilizes the Career Switcher program where a prospective teacher with a bachelor's degree and five years of industry experience can complete 180 clock hours of coursework in topics including, curriculum and instruction, instructional technology, differentiation, reading in the content area, language acquisition, classroom management, assessment, and human growth and development before being granted a one-year provisional

license to teach in a public school. After one year the school division can recommend the teacher be given a five-year post-graduate professional license or complete one additional year on a provisional license (Virginia Department of Education, 2018).

Neither of these pre-service routes to teacher licensure includes adequate training related to the unique aspects of CTE programs or the practical art of teaching. The result is a need for schools and school divisions to provide induction programs and professional development offerings that provide teachers with the knowledge and skills they need to effectively manage their programs (Zirkle, Fletcher, Sander, & Briggs, 2011). In Virginia, all teachers are required to complete 180 hours of professional development in order to renew a five-year license or complete 360 hours to renew a ten-year license (Virginia Department of Education, 2019). Schools divisions and CTE teachers need to be strategic with the time they are required to use for professional development by focusing on the knowledge and skills CTE teachers need to effectively run their programs. Doing so requires school divisions, schools, CTE departments, and CTE teachers to adopt a shared understanding of collective mission for their CTE program (Walter & Gray, 2002). This intentional approach to professional development can positively impact the quality of their CTE program and improve student outcomes (Kennedy, 2016).

Statement of the Problem

At present, the CTE teaching profession suffers from a shortage of qualified teachers entering the profession. Additionally, research by the American Institutes for Research (2015) found that experienced CTE teachers report needing additional training in order to operate their programs. Under ESSA and Perkins V, school divisions are responsible for preparing all students for college and career success. Running a CTE program requires a combination of knowledge-bases and skill-sets aligned with the college- and career-readiness goals of the school

division and CTE best practices. Given the wide variety of ways that CTE teachers enter the profession, as well as the varying demands associated with the different CTE disciplines and the individual complexities of the diverse school contexts across the state of Virginia and the country, it goes to reason that not all CTE teachers possess the same knowledge-bases and skill-sets nor do they necessarily possess the knowledge-bases and skill-sets needed for their CTE program. Therefore, the problem to be addressed in this study is to identify professional development topics that CTE teachers in Virginia believe they need training in, so that they are better prepared to provide comprehensive and high quality CTE programs.

Purpose of the Study

The notion that professional development (PD) can be used to improve teacher practice is widely acknowledged within education research (Kennedy, 2016). However, that does not mean that all forms of PD are equally effective at changing teacher practice. Opfer and Pedder (2009) recommend using PD models that consider school and teacher context, given the large impact this context has on student achievement and program effectiveness. The purpose of this study is to collect and analyze data related to CTE teachers' professional development needs in order to support the efforts of teachers, schools, and school divisions so that CTE teachers can provide excellent classroom experiences for students and operate CTE programs that are effective and comprehensive.

Significance

Secondary CTE programs are a necessary part of an education system that seeks to ensure all students graduate from high school with the knowledge and skills required to compete in the global marketplace. CTE teachers need to provide high-quality instruction, but there is much more to running a CTE program than teaching courses. CTE programs need teachers who are

well-equipped to operate the various aspects of their programs, including offering WBL experiences, student participation in CTSOs, career pathway exploration, creating connections with post-secondary educational opportunities, and obtaining industry certifications.

Given the various routes CTE teachers take to enter the profession, as well as differing levels of support and wide-range of experiences, it is necessary to understand what CTE teachers identify as their own most pressing professional growth needs in order to provide targeted support through professional development activities. Adult learning theory posits five assumptions about adult learners: (1) they can direct their own learning, (2) their life experiences influence their learning, (3) they desire learning that applies to their daily lives, (4) they are most interested in learning how to solve problems they experience, and (5) they are more intrinsically than extrinsically motivated (Merriam, 2004). This theory supports asking teachers for their perspectives on the most needed professional development activities. Their responses will provide the best possibility for developing and implementing professional development plans and activities that change teacher behaviors and, in turn, lead to improved program effectiveness and student outcomes.

Research Questions

The primary focus of the study is to identify professional development needs of CTE teachers as perceived by the teachers themselves. The study was guided by these major research questions:

1. What knowledge-bases and/or skill-sets do CTE teachers in Virginia identify as those most important for the CTE program they currently work within?

2. What professional development topics do CTE teachers feel are most needed relative to the knowledge-bases and/or skill-sets identified as most important to their program?

3. What relationship do demographics, including gender, ethnicity, and intention to stay in the teaching profession, have with the teacher's perceived professional growth needs?

4. What relationship does the CTE program area a teacher works within have with the teacher's current perceived professional growth needs?

5. What relationship does the number of years of experience a CTE teacher possesses have with the teacher's perceived professional growth needs?

6. What relationship does the school division a teacher works within have with the teacher's current perceived professional growth needs?

7. What relationship does the type of pre-service training a CTE teacher received have with the teacher's current perceived professional growth needs?

Theoretical Framework

The theoretical framework for this study is based on two concepts: John Dewey's (1938) constructivist learning theory and Guskey's (1986) model for teacher professional development. Dewey's constructivist learning theory asserts that prior knowledge and experiences are highly significant factors for learning and applying new information and skills. When applied to the work of teachers, Dewey's constructivist learning theory suggests that teacher learning needs to be based on teacher practice. In other words, the learning activities a teacher participates in need to be related to the work he/she is doing as part of his/her job as a CTE teacher. Learning, in this context, is a broad idea that can be applied to any area related to teacher quality, including, but not limited to, pedagogical knowledge, content-specific knowledge, classroom management, CTE program management, and assessment. According to Lambert (2002), "Within the framework of constructivist leadership, faculties must have the ability to make sense of their unique situation and to develop strategies that fit."

Guskey (1986) asserts that teacher professional development is the most important activity for improving education. Guskey's view of the importance of teacher professional development is built on the findings of Coleman (1966), who identified the teacher as the most important school-related factor that contributes to student achievement. Guskey's model for teacher professional development is grounded in the idea that teacher practice is improved when

teachers are able to recognize the impact their learning will have on their work (Guskey, 2002). A detailed discussion of these two theories and how they serve as a framework for this study can be found in Chapter Two of this prospectus.

Methodology

The research questions in this quantitative study were investigated using a needs assessment survey that is based on the Borich Needs Assessment Model. The model engages the teacher in the process of identifying professional development needs by utilizing a descriptive survey that simultaneously assesses the level of importance as identified by the teacher and the teacher's self-reported competence level (Cannon, Kitchel, Duncan, & Arnet, 2011). Mean and standard deviation scores were calculated to represent importance and ability from the survey results for each item. Mean Weighted Discrepancy Scores (MWDS) were calculated to inform the ranking of competencies identified on the survey. Survey data was also disaggregated by gender, ethnicity, desire to remain in the teaching profession, CTE program area, years of experience, school division, VDOE region, and pre-service training type to explore trends within those subgroup categories. A detailed discussion of the methodology used in this study, including the instrument development process, is presented in Chapter Three of this prospectus.

Limitations

The following limitations were identified for this study:

1. The study utilized a survey sent to CTE teachers based on teacher distribution lists used by district CTE directors. CTE teachers from districts whose CTE director did not respond, or who were not invited to participate, were not included in the study. Additionally, teachers who received the survey could have neglected to provide a completed response. This could lead to underrepresentation for specific subgroups.

2. The study was conducted in the Fall of 2020, during which time schools were working to plan and adjust their work due to the COVID-19 pandemic. This impacted the number of school divisions who agreed to participate in the study and thus the number of teachers who participated.

3. The study requires CTE teachers to self-report importance and ability. This is a subjective assessment that can vary by individual teacher. Similarly, the identification of importance and ability on one item might influence the response to another item.

4. The only aspect studied in this research is the identification of professional development topics. No other aspects of professional development, such as effectiveness or impact on teaching practice, were addressed in this study.

Delimitations

The following delimitations were identified for this study:

1. The survey uses a list of pre-identified competencies (Manley & Zinser, 2012). This list of competencies may not include the most pertinent professional growth needs of some CTE teachers.

2. The survey does not take into account division- or school-wide goals which can influence a teacher's perception of importance and/or ability.

Definition of Terms

Career and Technical Education (CTE): A branch of education concerned with providing students the knowledge and training needed to be lifelong learners and participants in economic activities as both producers and informed consumers.

Career and Technical Education (CTE) Program: A combination of courses, co-curricular activities, and work-based learning activities which are all related to one of seven discipline areas. The seven CTE areas in Virginia include: agriculture education, business & information technology, family & consumer sciences, health & medical sciences, marketing, technology education, and trade & industrial education. Program area teachers at a school are responsible for implementing the program in their area.

Career and Technical Student Organization (CTSO): Student run organizations that allow students to engage in co-curricular activities directly associated with a CTE program. Each CTE program area includes their own CTSO. Students who participate in a CTSO are able to compete in competitions with students from other schools.

Co-curricular Activities: CTSO activities, programs, and/or learning experiences that are correlated with CTE curriculum. These activities, programs, and learning experiences can be directly or tangentially related to a course's prescribed curriculum and support the learning of course content being taught in the classroom.

Professional Development: Training for faculty and staff that intends to increase knowledge and improve practice. CTE teacher professional development seeks to improve any and all areas of program implementation.

Work-Based Learning (WBL): WBL is an educational experience that occurs in the context of a specific workplace, business, and/or industry. These experiences are intended to help

students make a direct connection between classroom learning activities and the work that professionals in that field engage in. WBL experiences can include job shadowing, mentorships, service learning, internships, clinical practice, externships, apprenticeships, and cooperative education, as well as other innovative approaches that can be used.

Summary

The ability of CTE teachers to implement all relevant aspects of a CTE program is a significant factor in preparing students for the demands of college and career. This study aims to identify the competencies Virginia CTE teachers feel are most important for their own professional growth. CTE teachers operate at varying levels of competency. As a result, CTE programs at one school will potentially operate much differently than at another school. CTE programs also exist within different school and community contexts, causing additional program variations. As a result of this reality, it is necessary to examine teachers' perceived professional development needs in relation to those differing contexts.

The remainder of this document is divided into four additional chapters. Chapter two provides a comprehensive review of existing literature related to this study. Chapter three provides a detailed discussion of the methodology used to conduct the study. Chapter four presents the findings of the study. Chapter five provides conclusions, discussion, and recommendations based on the study's findings.

CHAPTER TWO

REVIEW OF LITERATURE

Chapter Two presents a review of the literature related to CTE teacher professional development needs. This review examines the overall educational context of CTE within the United States educational system. Specific topics addressed include: a history of legislation that has impacted CTE, the current context for and role of CTE within public schools, current issues in teacher recruitment and retention, CTE teacher licensure pathways, teacher professional development, and CTE teacher competencies. The theoretical framework for the study is based on Dewey's constructivist learning theory, Guskey's model of professional development, and Knowles' andragogy. An overview of each of these topics is also presented.

Background and Context

The history of modern public schools in the United States can be traced back to the state of Massachusetts in the late 1830s and early 1840s. Massachusetts Secretary of Education Horace Mann crafted a vision for schools that resonated with citizens of the state and quickly gained traction as a viable model for improving the personal characteristics of every educated American (Danns & Span, 2008). Mann's vision for public schools was born out of a desire to benefit both individuals and society overall. To accomplish this lofty goal, Mann desired schools to include, among other things, a system that educated all students, free attendance for all students, and an administrative model that was not governed by a specific political or religious agenda (Cubberley, 1919). Mann's schools became known as common schools and served as the model for public schools used in other states across the country. In addition to the development of common schools, Mann is also known for his work starting teacher training schools, known as normal schools (Groen, 2008). Mann's vision for developing a well-trained workforce for

schools that are available to all students was not only forward thinking for his time, it is also a model that continues to be vitally important for modern schools in the United States.

As the model for a free public education started taking hold across the country, the desire for standardization across schools also began to increase. In response, a working group of ten members came together and crafted a set of recommendations for a standardized high school curriculum. They were known as the Committee of Ten and their report for the National Education Association of the United States (1894) laid a foundation for public schools that persists today. These foundational tenets are (1) curriculum that includes language, mathematics, science, and history as core subject areas, (2) twelve years of compulsory education, (3) equity for course offerings, and (4) the use of highly qualified teachers.

A modern example of the lasting influence of the work of the Committee of Ten is the graduation requirements for high school students in Virginia. Students working towards a standard diploma in Virginia must complete a total of 22 courses. Of those 22 courses, 13 must be from the core content areas identified by the Committee of Ten: language, mathematics, science, and history. Of the remaining courses, two are in the area of physical education, one is a course in Economics and Personal Finance, four are elective courses the student is able to self-select, and two are a sequence of courses from world languages, fine arts, or a Career and Technical Education (CTE) program area (Virginia Department of Education, 2018).

Even though the recommendations of the Committee of Ten did not include a focus on vocational skills, the need for such skills has not been lost on the educators responsible for implementing schools or on the legislators responsible for institutionalizing and funding schools. The educational discipline that focuses on the general skills needed for the workplace and the specific skills needed for a particular profession was traditionally know as vocational education,

however, today the term used to describe the discipline that focuses on these skills is Career and Technical Education (CTE). The role of education in equipping students with the general and specific skills needed for the workplace is a topic that is often debated and can occasionally be controversial (Morales-Burnett, 2017). Despite that fact, the need for an education that focuses on general and job-specific skills remains an integral part of the work modern public schools are tasked with performing.

History and Evolution of Career and Technical Education

The history of modern-day CTE programs can be traced back to the late middle ages when guild master craftsmen accepted apprentices to work and learn under their expert tutelage (Augustyn, et al, 2010). The European guild apprenticeship model provided a skilled workforce required by the marketplace and jobs for individual members of society. The goals of modern-day CTE programs – preparing students for the workforce in order to be contributing members of society – are similar to those of the European guilds even though the education model is significantly different. The path CTE has journeyed to become what it is today provides important context for the current professional learning needs of modern-day CTE teachers and avenues towards CTE program improvement – the very topics this study seeks to address. Therefore, what follows is a brief overview of the history of CTE in the United States.

Early Apprenticeship through the Industrial Revolution

Europeans who began settling in the American colonies during the sixteenth and seventeenth centuries brought the models of apprenticeship unique to their home countries with them. Gradually, the apprenticeship model of vocational training evolved into a system where a contracted master teacher took an apprentice to learn under his guidance. The apprentice agreed to work for the master in exchange for food, lodging, a general education, and a vocational education in the specific trade of the master. The apprenticeship model was the predominant

model of vocational training until the late eighteenth century and early nineteenth century when the industrial revolution began to exert greater influence on the training needs for individuals entering the new world of work created by technological advancement (Gordon, 2009).

The period of economic expansion known as the First Industrial Revolution began in England in the year 1760. The Industrial Revolution was marked by a period of significant changes in the realms of technology, socioeconomics, and culture. The use of new machines, which required new sources of energy, new tools, and new skills for workers, fundamentally shifted the manner in which individuals lived, worked, sought to build wealth, and were educated (Augustyn, et al, 2019). The Industrial Revolution did not significantly impact the United States until the beginning of the nineteenth century, when the Embargo Act of 1807, the Non-Intercourse Act of 1809, and the War of 1812 strictly and severely limited foreign trade. The result was a demand for products that could not be matched by suppliers, since they were not using the technological production processes used by the British for mass production. In order to transition to this technologically advanced form of production, a new model of workforce training was needed (Gordon, 2009).

Prior to the Industrial Revolution, formal education was mostly limited to the social elite who could afford the costs associated with schooling. As the Industrial Revolution took shape, the availability of educational opportunities for the working class grew as well. A variety of factors contributed to this change. First, the skills needed to work during the Industrial Revolution were fundamentally different than the artisan work of craftsmen. A new model was needed to prepare large numbers of individuals for the labor market. In response to this new need, formal education was deemed necessary for the general populace, resulting in a significant increase in the number of students attending school (Carl, 2009). A second factor associated

with the need for additional education was the additional risks associated with industrial work. Worker accidents, layoffs, and poor working conditions were all issues that increased at the start of the Industrial Revolution (Gordon, 2009). Preparing workers for these environments became an important public concern. A third factor connecting the rise of the industrial revolution with the rise in mass education was the increased wealth associated with technological advancement. As more families entered what would come to be known as the middle-class, more young people were allowed the opportunity for a formal education (Carl, 2009). These shifts in work and education caused large numbers of workers to move from rural areas to cities in order to take advantage of the economic opportunities that awaited them there (Augustyn, et al, 2019).

Early Vocational Schools and Philosophies

As the Industrial Revolution began to build steam, important philosophies of vocational education were taking shape in Europe and the United States. Johann Heinrich Pestalozzi was a Swiss education reformer who believed that (1) vocational education needed to be interwoven with other educational disciplines, (2) education needed to help individuals overcome the dangers of industry, and (3) education of the poor was important and necessary. Pestalozzi was greatly influenced by the work of Jean Jacques Rousseau, another Swiss education reformer, who believed that education was a means to "free humankind from social status and permit enjoyment of the senses" (Gordon, 2009, p. 3). Both men viewed manual arts as a fundamental component of education – arguing that the role of school was not only to help students learn how to think, but to also learn how to do – establishing a place for vocational training within formal education. Schools based on Pestalozzi's methods opened as early as 1809, in Pennsylvania, and as late as 1891, in California, Connecticut, Maryland, Massachusetts, New Jersey, and Pennsylvania (Gordon, 2009).

In addition to the schools based on Pestalozzi's vision for education, the early- to mid-nineteenth century saw a number of other school models emerge that focused on vocational education and training. The Farm and Trade School – also named the Boston Asylum for Indigenous Boys, the Boston Farm School, the Boston Asylum and Farm School, and Thompson's Academy – was located on Thompson Island in Boston Harbor (Healey Library, 2018). According to the Thompson Island Outward Bound Education Center, the goal of the Farm and Trade School, established in 1833, was to introduce students to "agriculture, gardening, or other useful occupations as would contribute to their maintenance and tend to form in them habits of industry and order."

Another example of early vocational schools is the Rensselaer School. The Rensselaer School still exists today as Rensselaer Polytechnic Institute, however when it was founded in 1824 its purpose was to provide instruction "in the application of science to the common purposes of life" (Rensselaer Polytechnic Institute, 2010). Rensselaer became the first continually-operated school for science and engineering in the English-speaking world. Other schools, such as the Worcester Polytechnic Institute and Washington University, also sought to prepare students for jobs without participating in an apprenticeship program by offering a curriculum that combined theory and application (Gordon, 2009).

The creation of new schools for vocational training were helped, at least in part, by the increased school enrollment that occurred at this point in time; however, vocational schools were not the only new schools opening. During this same time period, schools that put a greater emphasis on academics and a liberal arts education, such as Horace Mann's common schools, were opening as well. As mentioned previously, Mann's vision for free schooling available to all students eventually became the dominant form of education in the United States – a

development that lead to a divided vision of education much removed from the holistic vision promoted by Pestalozzi as well as the modern vision for schools in the United States.

The Emergence of Vocational Education

Prior to the separation of academic education from vocational training that took place in the early twentieth century, many schools and educators held the view that an education that incorporated vocational training, or manual arts, was an integral part of a proper education. After the conclusion of the Civil War in 1865, the reconstructionist movement furthered the expansion of schools, especially in the south where freedmen schools were established for the education of children from newly freed African Americans (Harvey, 2010). As education grew in importance for life in the south, different philosophies of education and training rose to the forefront. One prominent example occurred in 1868, when former General Samuel Chapman Armstrong opened Hampton Institute – later to become Hampton University. Hampton Institute utilized the manual training movement. This meant that students at the school were expected to work at the school to earn their tuition. Another famous proponent of manual training was Booker T. Washington. Washington was the first leader of what became known as the Tuskegee Institute. One of the tasks assigned to his first cohort of students was to build their own school by constructing buildings, farming, and raising livestock (Gordon, 2009).

The Russian System and American Sloyd

The most significant event in the history of the manual training movement occurred at the Centennial Exposition in Philadelphia in 1876. A system of tool instruction known as the Russian System was presented by Victor Della Vos, director of the Imperial Technical School of Moscow. The system took students step-by-step through a progression of increasing complex tasks that required the use of specific tools. To move to the next step, the student needed to

demonstrate mastery of the current skill (Angulo, 2009). The system was adopted by the Massachusetts Institute of Technology in order to merge the theory and principles they learned in classes with the hands-on training employers needed their graduates to also possess (Gordon, 2009).

Another form of manual training, known as the Sloyd System, made its way to the United States from Sweden in 1888. Gustaf Larson, a Swedish Sloyd teacher, introduced the system in Boston. After adopting the system to fit American learners, and adjusting the name to American Sloyd, the system was used in schools for a few years before it phased out (Eyestone, 1992). Even though American Sloyd did not last, many of the principles associated with the system have persisted within the realm of vocational training and CTE through today. The use of trained teachers, importance placed on critical thinking and creativity, connecting learning to concepts students are already familiar with, and the use of collaborative learning are all examples of aspects associated with American Sloyd that both distinguished it from other existing models of vocational training and also persist within CTE today (Gordon, 2009).

Manual Training Movement

As the manual training movement began to gain popularity, proponents of a more traditional model of education, one that focused on liberal arts, argued for the minimization of vocational training in public schools. This debate came to a head at the 1884 convention of the National Education Association (NEA). Proponents of vocational training argued for its value as a support for learning general subjects such as science and math. Opponents of vocational training argued that the skills taught acted as a substitute for apprenticeships and therefore should be relegated to specialty schools focused solely on vocational training (Gordon, 2009).

While vocational training maintained its place as a part of schools, specialized vocational schools also maintained appeal for some. Instead of putting greater importance on one aspect of education and training over the other, some schools, such as the Baltimore Manual Training High School, sought to balance manual and academic training. Other schools also sought to provide this balance and utilized Baltimore Manual Training High School's curricular model in schools across the nation (Gordon, 2009).

Academics and Vocational Training

In 1892, the NEA commissioned a committee of ten members to develop a list of subjects that students should learn in order to move from secondary school to college. This group, known as the Committee of Ten, developed a list of nine subject areas that secondary schools should teach students prior to college enrollment. Despite the limited scope of the committee's recommendations – applying only to students going on to college, which was approximately 2% of the 18- to 24-year-old population in 1900 (Snyder, 1993) – they were adopted by many schools and applied to all students, regardless of each student's plan to attend college (Bohan, 2010). As highlighted previously in this chapter, the adoption of the committee's recommendations resulted in a secondary school curriculum that lacked flexibility for vocational training in public schools; an issue that has persisted in many schools to this day.

Despite the debate over the most appropriate education model for schools, the result of this era in vocational education was the realization that manual training skills could be taught to large groups of students in preparation for the demands of the workforce. There was also strong evidence to suggest that vocational training could be done alongside a general education to best prepare a student for all aspects of life. As the technologies and processes used for production continued to advance, with the adoption of the Ford assembly line chief among the technological

advances, the need for a workforce with the requisite education and vocational training remained for modern society (Gordon, 2009).

CTE in the Early- through Mid-Twentieth Century

As the United States moved into the twentieth century, a variety of factors began to exert influence over the direction of vocational education. Two factors stand out as especially significant. The first was a philosophical debate on the role of vocational education – a debate which has been repeated and reshaped over the past 100 years (Martinez, 2007). In 1914, Charles Prosser led a commission to study vocational education in order to determine if the federal government should provide financial support for that form of education. Prosser was an advocate of social efficiency as taught David Snedden. Social efficiency sought to separate education into vocational and academic disciplines – or tracks. Students in a vocational program would focus on training for entry into a specific field of work directly out of school and would largely forgo academic preparation. Snedden and Prosser accepted this form of social stratification as inevitable and therefore sought to maximize efficiency in the process through early implementation (Hyslop-Margison, 1999).

An outspoken critic of the findings of the commission lead by Prosser, and of the form of education contained in the report, was Prosser's contemporary John Dewey. Dewey labeled the social efficiency philosophy of Snedden and Prosser as social predestination. Instead of training in job-specific skills, Dewey believed that education should focus on providing a broad understanding of the function of work and industry (Zehr, 1999). At the time, the debate was won by Prosser and the focus of vocational education was placed on training for specific job skills, however, Dewey's vision of education that situated academic learning within the context

of work and industry would reemerge and become the dominate form of vocational education in the late-twentieth century (Doolittle & Camp, 1999).

Another factor that influenced vocational education in the United States in the early twentieth century was the country's participation in World War I and II, wars that significantly impacted society and culture in the early twentieth century into today (Hampson, 2015; Hendley, 2017). Prior to entry into World War I, it became obvious that the United States was not ready to engage in a technologically advanced war. According to Gordon (2009), "the war found America vocationally unprepared" (p. 67).

In response to the model of social efficiency espoused by Snedden and Prosser, as well as entry into World War I, the Smith-Hughes Act of 1917 was passed to provide additional funding for vocational training and the War Department, the U.S. Shipping Board, and Federal Board for Vocational Education coordinated efforts to offer vocational training in tandem with military training. This was the first instance of schools in the United States responding to a mandate from the federal government to offer vocational training (Gordon, 2009).

During World War I, U.S. forces required training programs for a variety of mechanical and technical trades. At the conclusion of the war, there was a new need to provide retraining in workplace-specific skills to the returning soldiers so that they could find work back home. The approach proved effective and the domestic economy grew throughout a period known as the Roaring Twenties (Gordon, 2009). After this period of low unemployment and increasing wages, the stock market crash of 1929 resulted in the start of the Great Depression (Amadeo, 2020).

As the economy recovered from the Great Depression and industrial activity resumed in the 1930s, the workforce was unknowingly preparing for entry into World War II. The technical

skills required for soldiers in World War II were more advanced than those required for World War I (Association for Career and Technical Education, 2020). The need to train a large number of workers for wartime activity was great, but a collaborative effort between the federal government and vocational schools successfully accomplished the task (Gordon, 2009).

At the conclusion of World War II, soldiers again needed to be retrained to enter the world of work. This time, however, the training programs returning soldiers needed to participate in were more formalized than after World War I. The *Servicemen's Readjustment Act of 1944*, also known as the G.I. Bill of Rights, was passed to provide these opportunities. Within seven years of the passage of the G.I. Bill, approximately eight million veterans received benefits totaling $14.5 billion. The G.I. Bill had a major positive impact on the number of individuals who received a college or trade school degree and/or participated in formal on-the-job training, such as an apprenticeship (National Archives, n.d.).

In 1950, the United States entered into what became nearly two consecutive decades of war. The first was the Korean War and the second was the Vietnam War. Participation in these wars highlighted a number of needs within the United States education system, including: a clear need for vocational education programs in schools, the need for additional training for adult workers, the need to incorporate women more significantly in the workforce, and a need for intensive teacher training courses (Gordon, 2009). At the same time, the civil rights movement had a significant impact on public education in the US. The result was an increased focus on educational opportunities for students living in poverty, students with disabilities, and students from economically suppressed areas of the country (Cohen & Besharov, 2002).

The Modern Era of CTE

The final two decades of the twentieth century mark a significant point in the history of

public education in the United States. As variety of factors, including the long-standing continuation of the Cold War, the decline in average scores on standardized tests, such as the SAT, and the publication of *A Nation at Risk*, all contributed to the creation of a new sense of urgency to reform the United States' educational system (Rojewski, 2002). The initial focus of the reform movement sought to minimize or remove vocational education programs from public schools in favor of a more rigorous academic program. The goal was to prepare a greater number of students for high-skill careers that required a great deal of critical-thinking and problem-solving (Aliaga, Kotamraju, & Stone, 2014).

Many in favor of this approach possessed an inherently negative view of vocational education programs. Eliminating vocational education programs would prevent students from "being placed" on the low-skill education tracks many associated with vocational training in schools. Many also believed that vocational training programs focused too heavily on job-specific skills – to the detriment of students' future job prospects (Cohen & Besharov, 2002).

Fortunately, there was swift and comprehensive pushback to the reform recommendations arguing for substantial decreases or the outright elimination of vocational education programs. Instead of decreasing the availability of vocational education programs within public schools, a new direction for vocational education programs was developed. Vocational education programs would increase their focus on general workplace skills needed across multiple jobs and careers within various industries. This change recognized the changing demands of the modern workplace resulting from a newly emerging economy (Rojewski, 2002).

For the same reason, vocational education also moved to integrate academics with general workplace skills. This approach seeks to provide students with practical applications associated with the academic courses they are required to take in order to earn a high school

diploma. A goal of this integration is to provide all students with a clear pathway from secondary to postsecondary education and ultimately into the workforce. This vision for articulation is commonly referred to as Tech Prep or "new vocationalism" (Aliaga, Kotamraju, & Stone, 2014; Rojewski, 2002).

As the role and purpose of vocational education changed, so did the name. In the 1998, the term vocational education was effectively replaced with Career and Technical Education (CTE). After the *Carl D. Perkins Vocational and Technical Education Act of 1998* was passed, the American Vocational Association (AVA) changed their name to the Association for Career and Technical Education (ACTE) (Cohen & Besharov, 2002).

Since that time, the foundational purpose of CTE has remained a constant despite the significant changes that took place in public education. CTE programs are part of a larger system of education and must be understood in light of that relationship. As the United States educational system changes in response to societal pressure and legislative action, CTE programs shift and change as well. Without understanding the legislative phenomena that have guided education and CTE since their inception, it is nearly impossible to understand or appreciate the work required of CTE programs and teachers. From the *Morrill Act* to *Perkins V* and everything in between, laws and social changes have significantly impacted the world of CTE.

Legislation Impacting CTE

Legislation that has significantly impacted CTE is not isolated to CTE-specific laws. Over the nearly 250-year history of the United States, a wide variety of laws have helped define and refine the role of CTE within the overall system of education. Whether intentionally or unintentionally, these laws impacted the work of CTE teachers and the opportunities available to students seeking to pursue educational and career goals. An overview of the laws and reports that influenced CTE practices is presented here.

Vocational Legislation History Prior to the Modern Era of CTE

The first law passed with the purpose of positively impacting vocational education was the *Morrill Act* – signed into law by Abraham Lincoln in 1862. The act included a provision for the donation of public lands to establish land grant colleges, later to become land grant universities. The purpose of these land grant colleges was to improve agriculture and mechanical arts within each state (Library of Congress, 2017). While this law did not initially directly impact the work of vocational education in public schools, the initial act and its reauthorization in 1890 did impact the availability of training for individuals who could go on to become vocational education teachers in later years. For example, many of the public universities founded by the *Morrill Act* currently have CTE teacher preparation programs (Bruening, Scanlon, Hodes, Dhital, Shao, & Li, 2001; Gordon, 2009).

Early-Twentieth Century Legislation

In 1917, the *Smith-Hughes National Vocational Education Act* was passed. The *Smith-Hughes Act* was the seminal legislation for vocational education in the United States and established the foundation for modern CTE programs. The legislation originally provided funding totaling almost $7.2 million for agriculture, home economics, and trade and industrial education programs between the years 1917 and 1926 (Association for Career and Technical Education, 2018; Barlow, 1976). Funding from reauthorizations of the *Smith-Hughes Act* served as a foundation for federally-sourced funding for vocational education programs, but was not the only source. Other legislation provided additional funding sources for vocational educational programs, including adding additional disciplines to the field of vocational education.

Significantly, one senator sponsored every bill that provided funding for vocational education between the passage of the *Smith-Hughes Act* in 1917 and the year 1958. Walter F.

George, a six-time senator from the state of Georgia, believed that vocational education and academic training should co-exist in order to provide individuals who wouldn't go on to college the opportunity to learn skills to help them earn a living in a vocation. During his time in office, Senator George sponsored additional funding of $2.5 million through the *George-Reed Act of 1929*, $3 million through the *George-Ellzey Act of 1934*, $14.5 million through the *George-Deen Act of 1936*, $28.5 million through the *George-Barden Act of 1946* (Barlow, 1976), and $48.9 million through the *George-Barden Act Amendments of 1956* (Carlson, Kelley, & Williams, 1964). Collectively, these acts provided over one hundred million dollars in funding for vocational education form 1929 through 1965 (Blunk, 2010; Gordon, 2009). Funding for vocational programs through these acts was in addition to funding provided by the continued reauthorization of the *Smith-Hughes Act* (Barlow, 1976).

In addition to continuing funding for disciplines already identified as part of a vocational education program, including agriculture education, home economics, and trade and industrial education, many of these laws expanded the reach of vocational education. The *George-Dean Act of 1936* added distributive education, later to be known as marketing education, as an available offering for vocational education programs (Barlow, 1976). The *George-Barden Act of 1946* added employment training for soldiers returning from World War II (Gordon, 2009). The *George-Barden Act Amendments of 1956* added fishery trades and industries through *Title I – Fishery Training Act* and nursing programs through *Title II – Health Amendments Act* (Carlson, Kelley, & Williams, 1964). The passage of these laws expanded the reach of the Smith-Hughes Act, and helped to cause a rapid advance in the field of vocational education and training.

Mid-Twentieth Century Legislation

Legislation passed after the work of Walter F. George was used to meet a wide variety of

social and economic needs. The *National Defense Education Act of 1958*, which is technically *Title III – National Defense Education Act* of the *George-Barden Act Amendments of 1956*, provided $60 in funding over four years to train individuals for work in scientific and technical fields (Carlson, Kelley, & Williams, 1964). The law was in response to the launch of Sputnik by the Russians and the onset of the decades long Cold War. *The Manpower Development Training Act of 1962* was passed to allocate $370 million over a three-year period to retrain workers who lost their jobs as a result of automation and other similar advances in technology. The bill was important for its focus on economically disadvantaged individuals not traditionally served by existing vocational programs. The law was phased out in 1973 in favor of a newer version of the law, the *Comprehensive Employment Training Act of 1973* (CETA). The primary purpose of this change was to shift decision making ability for training programs from the federal to the state level in order to streamline services and their associated funding. CETA was replaced by the *Job Training Partnership Act of 1982* (JTPA) once it expired. JTPA gave additional responsibilities to state government and private industry to provide training for those needing skills to enter, or reenter, the workforce (Gordon, 2009).

Gordon (2009) describes the *Vocational Education Act of 1963* as the most important vocational education law passed since the *Smith-Hughes Act*. The law allocated 90% of total funds to states based on age groups, thus requiring 50% of funding for 15- to 19-year-olds, 20% for 20-to 25-year-olds, 15% for 25- to 65-year-olds, and 5% for all age groups. This funding was intended to maintain, expand, and improve vocational education programs for youth who needed work part-time while completing school full-time and for individuals who are academically or socioeconomically disadvantaged and thus unable to participate in a traditional vocational education program. The *Vocational Education Act of 1963* also provided federal funding for

business education for the first time. The act was amended in 1968, as the *Vocational Education Amendments of 1968*, in order to emphasize the role of vocational education in postsecondary schools and to better align the definition of vocational education with that of general education. In practice, the amendments allowed funding from the original act to be used for secondary and postsecondary students, retraining, building vocational facilities, and vocational guidance, as well as other related services. Additional amendments were made with the *Vocational Education Amendments of 1976*, which expanded funding for services provided by the original act in 1963 and amendments of 1968. The 1976 amendments also provided for enhanced vocational guidance and counseling, additional pre-service and in-service training opportunities, facility renovations, and grants to enhance participation by underrepresented genders in specific industries (Gordon, 2009).

The *Manpower Development Training Act of 1962* and the *Vocational Education Act of 1963* served as the foundational laws for vocational education until the early- to mid-1980s, when education reform movements started to play a more dominant role in public schools – including vocational education. The result was the passage of a number of laws related to both general education and vocational education that have greatly shaped the format of current day CTE programs.

A Brief History of Perkins

Legislation in the modern era of CTE began in 1984 when the *Vocational Education Act of 1984*, which later came to be known as either the *Carl D. Perkins Act* or simply Perkins, was passed, allocating $835,300,000 annually between 1985 and 1989 (Carl D. Perkins Vocational Education Act, 1984). Perkins is the central piece of legislation that provides funding for CTE programs at both the secondary and postsecondary levels of education (National Association of

Special Education Teachers, 2019). According to the Council for Exceptional Children (n.d.), the purpose of Perkins is to "increase the quality of technical education within the United States by providing individuals with the academic and technical skills necessary to be successful in a knowledge- and skill-based economy." The act has been reauthorized four times, most recently as *Perkins V* in 2018 (United States Department of Education Office of Career, Technical, and Adult Education, 2018).

Each authorization of Perkins has brought with it important changes to the work of CTE teachers. The *Vocational Education Act of 1984* significantly impacted the field of vocational education by making access to vocational programs more widely available, especially to individuals with disabilities, single parents, individuals currently incarcerated, and individuals living in low socioeconomic conditions. The law was amended in 1990 as the *Carl D. Perkins Vocational and Applied Technology Education Act Amendments of 1990*, what is now referred to as Perkins II. Perkins II increased the scope of the original legislation by adding requirements for states to track program success and student learning through the creation and utilization of performance standards and instituted Tech Prep to promote student articulation from secondary to postsecondary education (National Conference of State Legislatures, 2015).

The next authorization of the law, titled the *Carl D. Perkins Vocational and Applied Technology Education Amendments of 1998*, or Perkins III, changed the funding formula for state and local CTE programs. Perkins III required states to increase the distribution of federally allocated funds to localities to a minimum of 85%. This increase in funding to localities was accompanied by increased incentives for meeting target goals agreed to by the state and Secretary of Education and sanctions for not meeting specified program targets (National Conference of State Legislatures, 2015).

In 2006, the *Carl D. Perkins Career and Technical Education Improvement Act*, known as Perkins IV, was the next version of Perkins passed into law. Perkins IV focuses on establishing core indicators for success for CTE programs, requires the use of a state-level improvement plan when indicators are not met, aligns CTE with academic standards set by federal education law, and allows for funding streams to be merged into a single pool by certain state agencies under specific situations. Perkins IV provided between $1.3 and $1.1 billion annually between 2007 and 2018 (Hills, 2019).

In 2018, the *Strengthening Career and Technical Education for the 21st Century Act*, Perkins V, was signed into law. Perkins V is the current version of Perkins that states use as their primary source of funding for CTE programs. Perkins V is similar in focus to Perkins IV, including its focus on CTE program flexibility and improvement, as well as program data collection and accountability. One important change from Perkins IV to Perkins V relates to the process used for states to develop performance indicators. Under Perkins IV, states negotiated indicators with the United States Secretary of Education. Perkins V eliminated that negotiation process by setting more stringent requirements on states wishing to procure funding through Perkins (Advance CTE & Association for Career and Technical Education, 2018). Perkins V provides $1.3 billion to CTE programs (Hills, 2019).

Other Legislation Impacting CTE

The role of education has been a topic of ever-increasing importance since the inception of the United States. On July 4, 1776, the Continental Congress adopted the Declaration of Independence announcing the establishment of the United States of America as an independent nation. Within two years of that announcement, Thomas Jefferson, the primary writer of the Declaration of Independence and member of the Virginia House of Delegates, authored *A Bill for*

the More General Diffusion of Knowledge in the state of Virginia to serve as a comprehensive plan for public education for the state. The bill did not become a law until 1796, when it was finally passed as *An Act to Establish Public Education* (Sass, 2020).

State Control of Education Laws

The passage of the *Bill of Rights* in 1791 established that states were to be responsible for creating laws related to education, since none of the first nine amendments dealt with education and the tenth established that any powers not delegated to the federal government within the *Bill of Rights* revert to the domain of the states (Sass, 2020). As states began to establish models for educating young people, models in certain states began to rise to prominence. In Massachusetts in 1821, the Boston English High School, previously called the English Classical School and now known as simply English High School, was the first public school opened in the United States (English High School Association, 2019). In 1827, Massachusetts created a law requiring towns with more than 500 families to establish a public school (Sass, 2020). Massachusetts is also home to Horace Mann, a lawyer and politician who became the first Secretary of the Massachusetts Board of Education in 1837. His reform efforts earned him the nickname "Father of the Common School" (Levin & Pinto, 2001). In 1852, Massachusetts established the first compulsory attendance law. By 1885, an additional 15 states established similar laws. By 1918, every state in the nation had enacted mandatory attendance laws (Sass, 2020).

The focus on a need for state education legislation was also seen in the creation of new states after the establishment of the original thirteen colonies. The Ordinance of 1784 divided territories north of the Ohio River and east of the Mississippi River into separate territories that would later become 10 new states – each with the same rights and responsibilities as the original 13 states. The Ordinance of 1785 then further required that townships in the western territories

create townships that include space set aside for the establishment of public schools. The Northwest Ordinance of 1787, which included a clause that espoused the value of education, also stipulated the reservation of land for the purpose of education within townships in those states (Sass, 2020; Snyder & Hoffman, 2003).

The Federal Government and Education Law

In 1867, after the conclusion of the Civil War, the federal government passed the *Department of Education Act* authorizing the creation of the United States Department of Education. The push for more centralized governance of public education increased the following year, when the 14th Amendment of the United States Constitution was ratified. The 14th Amendment established public education as a right granted to United States citizens. The law was used to decide some of the most important education-related court cases in the country's history, including: *Plessy vs Ferguson* – which found that school segregation was constitutional (Sass, 2020), *Brown vs. Board of Education* – which occurred after *Plessy vs Ferguson* and found that school segregation was unconstitutional (Stahl, 2015), and *Plyler vs Doe* – which found that immigrants cannot be denied a free, public education on account of their immigration status (Sass, 2020). The 14th Amendment was also used as an argument in *San Antonio Independent School District vs Rodriguez* – which found that the use of local property did not violate the requirement to provide a free, public education (Stahl, 2015), and in *The State of Tennessee vs John Thomas Scopes*, commonly known as the Scopes Monkey Trial, which ultimately lead to a national discussion on the teaching of science and religion (Augustyn, et al, 2019).

Federal Laws and the Workforce

Vocational education has a strong natural connection with both public schools and

workforce preparation. In many ways, it is the overlap between two disparate institutions. Given this relationship, it is natural for vocational education's history to be intertwined with laws designed to impact industry and employment – especially in those areas typically described as vocational work. Many examples of laws impacting the workforce have been passed within the last 100-plus years of United States history. The laws highlighted here are not intended to be a comprehensive list. Instead, this list is intended to highlight laws that had a direct connection with vocational education programs. Laws presented here span the earliest parts of the first decade of the 1900s through the mid-1960s.

The *State Marine School Act of 1911* allocated funds for nautical schools in 11 cities with seaports, helping to provide workers for items shipped via sea. The *Vocational Rehabilitation Act of 1918* created grants for job-training for soldiers returning from World War I, an important source of labor for prospective employers. The Smith-Bankhead Act of 1920 created grants for job-retraining for civilian workers needing to change careers. In 1948, the *United States Information and Educational Exchange Act* generated more opportunities for individuals to exchange their knowledge and skills with those from other countries. The *Area Redevelopment Act of 1961* provided funding for training of individuals living in areas identified as needing redevelopment. In 1962, the Migration and Refugee Assistance Act created opportunities for refugees through loans, advances, and grants for education and training. Finally, the *Health Professions Education Assistance Act of 1962* expanded teaching facilities in the health care industry and provided loans to students seeking education and training in health care (Snyder & Hoffman, 2003).

Providing for Education Facilities and Equipment

Another focus-area for legislation associated with vocational education was facilities and

equipment. As advanced technologies became more common across industries, it became apparent that secondary and postsecondary education institutions needed access to buildings, equipment, and resources aligned with current industry standards. As in the previous section, this list is not intended to be all inclusive. Instead, it focuses on the laws that most impacted the work of vocational education from the 1910s through the 1960s.

In 1919, *An Act to Provide Further Educational Facilities* authorized the sale of surplus machinery and tools owned by the federal government to educational institutions at 15% of the original cost. The *Bankhead-Jones Act of 1935* provided funding for state agricultural experiment stations. The *Agriculture Adjustment Act of 1935* allocated 30% of annual customs revenue be used to support increased farm production, some of which was exported and some of which was used domestically – including for school lunches starting in 1936. The 1940 *Amendment of the Lanham Act* and the *Financial Assistance for Local Educational Agencies Affected by Federal Activities of 1950* authorized funds for the construction, maintenance, and operation of schools in areas with a limited local-tax base caused by the purchase of land by the federal government and/or high levels employment in federal government. The *Surplus Property Act of 1944* and the Federal Property and Administrative Service Act of 1949 allowed for the donation and transfer of surplus property to educational institutions. Finally, the *Higher Education Facilities Act of 1963* provided grants and loans for institutions of higher education, including community colleges, technical institutes, colleges, and universities, to construct classrooms, libraries, and laboratories (Snyder & Hoffman, 2003).

Expanding Opportunities in Public Schools

The relationship between vocational education and public schools is important for working towards the creation of an educational system that provides for the needs of students

while preparing them for life beyond the classroom. Much of the education law that exists, and has been previously mentioned or will be mentioned later in this chapter, focuses on the purpose and expectations of educational programs; however, other laws have been more focused on providing equitable opportunities for students to seek an education. The following laws have each provided increased opportunities to students by meeting common needs instead of addressing the work of schools.

The *Richard B. Russell National School Lunch Act of 1946* expanded on the *Agriculture Adjustment Act of 1935* by creating the National School Lunch Program (NSLP) which supplies lunch to qualifying students with reduced or no cost. The wide-sweeping *National Defense Education Act of 1958* allocated funding for six significant purposes. The first was improved instruction in critical subject areas, such as science, mathematics, and foreign language at the secondary level. The second was improved guidance, counseling, and testing services. The third was modern foreign language programs at the postsecondary level. The fourth was increased student loans and fellowships, also at the postsecondary level. The fifth was enhanced public relations for the purpose of advancing education – specifically through the media. The sixth purpose was for additional education and training in vocational and technical fields necessary for increased national defense. Finally, in 1958, the *Education of Mentally Retarded Children Act* was passed, providing federal assistance to train teachers to provide appropriate instruction to handicapped students. This law served as the precursor to the Education of *Handicapped Children Act in 1970*, *Section 504 of the Rehabilitation Act of 1973*, and the *Individuals with Disabilities Act of 1990*. The significance of these law is still seen in schools today, guiding the way schools are legally required to educate all students (Snyder & Hoffman, 2003).

Education as a Civil Right

The 1960s is arguably the most significant period in United States history for education legislation, although not every piece of legislation targeted education alone. For example, even though the *Civil Rights Act of 1964* was not specific to education it nevertheless had a major impact on the public education establishment by working towards a more equitable environment for women and racial minorities (Pettit & Sykes, 2015; Guy & Fenley, 2014). After its inception in 1965, the *Immigration and Nationality Act*, also known as the *Hart-Celler Act*, fundamentally changed the national culture and identity of the United States by removing immigration restrictions on people from Asia, Eastern Europe, and Southern Europe (Lee, 2015). These laws helped make the nation's education system more open and equitable than it had previously been. According to the United States Department of Education's Office for Civil Rights (1999), improved civil rights caused by improved laws resulted in:

> *Many barriers that once prevented minorities, women, individuals with disabilities, and older persons from freely choosing the educational opportunities and careers they would like to pursue have been eliminated.*

The impact on minority students, as defined by ethnicity, race, gender, and disability, includes decreased drop-out rates, increased graduation rates, increased participation in advanced coursework, increased college enrollment, and increased employment opportunities (United States Department of Education's Office for Civil Rights, 1999).

Education-centric legislation was also passed during this same time period. The *Elementary and Secondary Education Act of 1965* – the forerunner to more modern education legislation – has been called "the most important piece of education legislation in U.S. history" and legislation that "changed the course of U.S. public education (Gamson, McDermott, & Reed,

2015)." Amendments made to the *Elementary and Secondary Education Act* in 1969 brought a number of separate educational laws and directives together under this single piece of legislation. Title II of the law provided specific direction for refugees and students living in government subsidized housing. Title VI covered educating students with disabilities. Title VII enhanced the *Vocational Education Act of 1963* and Title VIII provided a definition for gifted and talented students, as well as established the National Teacher Corps to improve schools in impoverished areas (Paul, 2018).

National Education Reports

Another significant contribution made to public education during the 1960s was the *Equality of Education Opportunity Study* in 1966. This study – commonly known as the *Coleman Report* – is still referenced when discussing the purposes, needs, and goals of the United States education system (Murray, 2009). The study found that approximately 10% of a student's educational achievement as measured by standardized test scores is attributable to differences between schools while the other 90% is attributable to individual students and their home environments. Many responded to this report by concluding that schools contribute minimally towards student achievement. Others responded to the report by noting that using an aptitude test to draw a conclusion about student achievement is an inappropriate use of that type of assessment data. Instead, an assessment of student achievement needs to be used to measure achievement, which in turn can be used to make conclusions about the impact of school environments (Carver, 1975). This report had – and continues to have – a significant influence on the perception of public schools, the purpose of schooling, and education policy in the years since its release (Dickinson, 2016; Towers, 1992).

Despite the fact that the Coleman Report only dedicated three pages out of a total of 547

to vocational education, the findings it did provide helped to create a stigma that is often referred to when discussing modern CTE programs. Coleman (1966, p. 545) states, "Negroes are somewhat more likely than whites to have taken at least one vocational course; this is particularly the case in the metropolitan South." Later, Coleman (1966, p. 545) makes the observation, "The sentiment in favor of vocational training is stronger in the South than the non-South, and is stronger among Negroes than among whites." While a more nuanced examination of the data might reveal a desire by African-Americans to pursue an education that prepares them for gainful employment, the data has often been used to disparage the role of vocational education in schools, demeaning it as a second-class education (National Commission on Secondary Vocational Education, 1985). The challenge for vocational educators after the publication of the *Coleman Report*, as well as for modern-day CTE educators, is to demonstrate the value of vocational programs both on their own and as part of a comprehensive education that prepares students for both college and career (Brand, Valent, & Browning, 2013).

A Nation at Risk

In 1984, the National Commission on Excellence in Education (1983) released a report that started with the following lines, "Our Nation is at risk. Our once unchallenged preeminence in commerce, industry, science, and technological innovation is being overtaken by competitors throughout the world." The report is titled, *A Nation at Risk: The Imperative for Educational Reform* and is considered one of the most impactful analyses of the education profession since the *Coleman Report*. While the report made national headlines and was used as a central talking-point for debates on education reform, the findings of *A Nation at Risk* were considered controversial for many reasons – such as the make-up of the committee, the harsh, dramatic language used in the report, and the intentional cherry-picking of data – and not well received by

many educators who felt professionally attacked by the report (Kamenetz, 2018).

In a counter argument to *A Nation at Risk*, two publications were created. The first was *The Unfinished Agenda: The role of vocational education in the high school*. Published in 1985, *The Unfinished Agenda* argues for a public school curriculum for all students that balances academic coursework and vocational preparation, treating them as equals. *The Unfinished Agenda* also argues that top-down, sweeping reforms are unlikely to generate the desired changes. Instead, the individual student needs and interests need to be addressed in order to cause overall improvement. Instead of diminishing the role of vocational education, as suggested by *A Nation at Risk*, the *Unfinished Agenda* calls to increase the role of vocational education to the benefit of all students (Lotto, 1985).

The second, published by the William T. Grant Foundation (1989), was *The Forgotten Half: Non-College Youth in America*. *The Forgotten Half* collected and synthesized existing data on economic opportunities available to young people who lack a formal postsecondary education. The report found a need for policy and practice that provides employment opportunities for this group of young people (Blum, 1989; The William T. Grant Foundation, 1989). *The Forgotten Half* also highlighted the potential for increased job prospects and reduced wage disparity through the use of an organized approach for providing work to youth who would otherwise potentially not have access to a job due to not attending a postsecondary education program (Lear, 1989).

Blum (1989) observed that encouraging academic achievement is an important national goal, however it needs to be simultaneously supported by providing opportunities for individuals who don't take an academic route through secondary and postsecondary education. This important observation was seemingly missed, or misunderstood, by policymakers who crafted

recommendations based on observations from *A Nation at Risk*. As a result, many of the issues related to the lack of opportunities for young people identified in *The Forgotten Half* continue to impact current debates on education and employment (Rosenbaum, Ahearn, Becker, & Rosenbaum, 2015).

Despite the fact that *A Nation at Risk's* findings were roundly criticized, or out-right rejected by many, the basic premise of the report persistently permeates the beliefs of education reformers – which is to say that public schools are failing children, communities, and the country (Guthrie & Springer, 2004). As a result, schools have been regularly pushed to innovate in order to avoid the perception of failure – based on a set of criteria that change regularly – creating a school environment that negatively impacts the work of educators and students (Hunt, 2008). This mistrust between the education establishment and the public has led to a desire by some legislators to see schools and educators held primarily accountable for student achievement.

The national debate created by education publications, such as *A Nation at Risk* and *The Forgotten Half*, led to a publication in 1991 by The National Center on Education and the Economy titled *America's Choice: High Skills or Low Wages!* This report concluded that the United States economy had reached a point where there was little to no need for "unskilled labor" and identified the existence of a widening achievement gap for students who are ethnic minorities and/or members of low socio-economic families.

Outcome-Based Education Reform and CTE

In response to *America's Choice: High Skills or Low Wages!*, the Secretary's Commission on Achieving Necessary Skills (SCANS) adopted the *School-to-Work Opportunities Act* (STWOA) in 1994. STWOA was intended to help ensure all students were given the opportunity to attain the knowledge and skills needed to be gainfully employed and

have opportunities for promotion in their profession (Perry & Wallace, 2012). In addition to *STWOA*, the year 1994 also brought *Goals 2000: Educate America* through the *Improving America's Schools Act*. *Goals 2000* was the first piece of federal education legislation that would come to be known as outcome-based general education reform. The basic premise of any outcome-based education reform is to (1) set federal-level goals that states and local school districts must meet, (2) measure how well schools are meeting those goals, and (3) provide financial incentives or administrative discipline based on those measurements. The legislation was not a federal mandate – it focused on providing a financial incentive to states who meet the parameters set forth in the legislation – and therefore had a limited impact on schools (National Center for Home Education, 2002; Portway & Lane, 1997). Although *Goals 2000* was not as impactful as was hoped, the desire for legislation that holds states and local school divisions more accountable for education outcomes was ultimately met through the passage of the *No Child Left Behind Act* of 2001.

No Child Left Behind and Every Student Succeeds Act

The purpose of *No Child Left Behind* (NCLB) was to close achievement gaps that exist between majority and minority student groups, ensuring an equitable, high-quality level of education for all students. *NCLB* sought to accomplish this by requiring states to (1) create their own accountability measures for student achievement, (2) provide flexibility to school districts to use funds to improve student achievement, (3) promote research-based programs and practices within schools, and (4) increase parent options for students attending Title I schools (Paige & Gibbons, 2004; State of Washington Office of Superintendent of Public Instruction, 2011).

The *NCLB* requirement for all students to achieve proficiency in core academics caused significant issues for CTE programs. The focus on core academic subject areas threatened to

decrease enrollment in CTE programs resulting in fewer course offerings, elimination of CTE programs, and loss of CTE teachers. In response to the demands placed on schools, CTE programs were encouraged to utilize activities that (1) improved student academic achievement in their core courses by aligning CTE course competencies with core course learning standards, (2) furthered the instructional objectives of core course teachers, and (3) utilized academic test data to plan for future instruction (Daggett, 2003). As a result of this reform initiative, CTE teachers were being asked to (1) teach the vocational and technical skills required for future employment, (2) engage students in high interest activities that promote retention for at-risk students, (3) become content area experts in topics related to their CTE program area, and (4) use high-yield pedagogical practices for core content instruction.

Although the student achievement goals connected with *NCLB* were widely lauded as positive – as were other aspects of the law, such as requirements for highly qualified teachers (Sawchuk, 2016) and the use of targeted professional development for teachers (Wood, Goodnight, Bethune, Preston, & Cleaver, 2016) – the final response to the test-heavy accountability model that resulted from *NCLB* is largely viewed as negative (Sunderman & Orfield, 2006). As a result, new federal legislation that continues *NCLB*'s focus on (1) education equity, (2) use of accountability measures, (3) use of researched best practices while also shifting more general focuses to areas such as college and career readiness, (4) increased access to high-quality preschool programs, and (5) increased communication with families and community stakeholders was crafted. The new legislation is known as the *Every Student Succeeds Act* (ESSA) and was signed into law on December 10, 2015 (United States Department of Education, 2018).

ESSA provides promising potential to reverse the negative impact *NCLB* had on both

CTE programs and student outcomes. By shifting the focus of accountability from test scores to measures of college and career readiness, CTE programs benefit from increased importance within the educational landscape. In addition to *ESSA*, the reauthorization of Perkins, in the form of Perkins V, is another piece of legislation needed to revitalize CTE programs in public schools across the country. Perkins V provides important funding to CTE programs allowing them to continue the work of meeting the needs of students, educators, and employers (United States Department of Education Office of Career, Technical, and Adult Education, 2018).

Contemporary Context for CTE

Working as a CTE teacher is fundamentally different than teaching a traditional academic course (Meeder & Suddreth, 2012). First, CTE teachers are required to utilize a wide-variety of instructional strategies that prepare students for the tasks commonly associated with an occupation or industry. Fletcher and Djajalaksana (2014) found that CTE teachers employ as many as six different signature pedagogies in their instructional practice. Second, CTE teachers are tasked with the work of managing Career and Technical Student Organizations (CTSO). Managing a CTSO requires the teacher to connect the content covered in class to meaningful, real-world applications through a student run organization. Third, CTE teachers must develop course sequences and curriculum that align with industry needs, prepare students to earn industry certifications, coordinate CTSO activities with student leaders, and facilitate Work-Based Learning (WBL) inside and outside of the classroom.

The Association for Career and Technical Education (ACTE) outlined twelve broad categories of attributes that are present in highly-effective school-based CTE programs (Appendix A). Each category contains between seven and twelve program attributes that a CTE teacher must understand and/or be able to manage in order to successfully run a CTE program.

The most poignant aspect of the list is that only six of the twelve categories include attributes that are considerations for teachers in non-CTE disciplines (Imperatore & Hyslop, 2017). CTE program management is a highly sophisticated activity which requires a wide and deep knowledge base that both includes and goes beyond the job tasks required of a traditional teacher. The work that highly-effective CTE teachers engage in is complex, diverse, and overall unique in the broader landscape of secondary education.

The difference between teaching CTE courses and running a CTE program with a CTSO can also lead to major differences in student outcomes. For example, DeLuca, Plank, and Estacio (2006) observed that the college admissions rate for students who took CTE courses without participating in a CTSO was lower than their peers who participated in a CTSO – even if students who only took CTE courses took more CTE courses than their peers who participated in a CTSO. According to the Virginia Department of Education (2019), CTSOs in Virginia Public Schools boasted a combined total membership of 57,195 during the 2018-2019 school year, which is approximately 9% of total student enrollment (640,000) in CTE programs across the state. Planning, managing, and facilitating a CTE program is worth the effort, but teachers must have the requisite skills to be effective.

Modern CTE programs evolved out of the vocational education programs available to students throughout much of the twentieth century (Rojewski, 2002). During the 1980s the demands of employers began to shift. More skilled workers were required for the post-industrial economy which resulted in the appearance of a "college-for-all" mentality amongst many in education, industry, and government (Butrymowicz, 2016). The belief was that vocational education only prepared students for low-skill jobs that were being progressively phased out of the United States workplace (Perry & Wallace, 2012). As a result, there was a reduction in the

number of students who participated in vocational education programs.

As vocational education programs evolved, it became clear that a name change was needed to help distinguish modern CTE programs – those built on a model integrating high academic standards and expectations with real-world experiences that require the application of knowledge commonly found in academic coursework – from the stigmatizing perceptions typically associated with vocational education, such as low skill development, non-academic tasks, and limited potential for advancement in the modern workforce (Achieve, 2015; Hernandez-Gantes, 2016). This change was put into law with the *2006 Carl D. Perkins CTE Improvement Act (Perkins IV)*. In addition to the important name change, this revision of Perkins also pushed to modernize CTE practice by requiring CTE programs to (1) be more responsive to economic needs, (2) imbed the work of school guidance counselors within the CTE framework, and (3) better integrate academic instruction within the content of CTE courses (Threeton, 2007).

Unfortunately, the changes made through *Perkins IV* legislation did not have an immediate positive effect and many of the negative and inaccurate perceptions of CTE programs remained prevalent in schools (Butrymowicz, 2016; Gammill, 2015; Hernandez-Gantes, 2016). The perception of CTE programs as a "lesser" form of education has been most prevalent amongst two groups: (1) families where enrollment in a four-year college or university is the norm or expectation and (2) families with students whose gender, ethnicity, socioeconomic status, and/or parental education level make them traditionally under-represented in institutions of higher education. The first set of families believe that CTE programs offer no value to students who will attend college or university. The second set of families believe that participation in CTE programs is a form of tracking that limits their students' options for

postsecondary education and future gainful employment (Butrymowicz, 2016; DeLuca, Plank, & Estacio, 2006).

As a result of the CTE perception problem, a generation of students went underserved. Many students lost out on the long-term opportunities afforded by CTE program participation. Research by Dougherty (2016) found that the percentage of high school credits awarded to students in CTE courses decreased from 18 percent to 13 percent between the years 1990 and 2009. The same study also found that there were significant advantages for students who participated in CTE programs. First, students who participated in one CTE course above the average were more likely to graduate from high school, enroll in a two-year postsecondary education program, and earn a higher wage than if they had gone directly into the workforce. Second, students who took a pre-determined series of related CTE courses – commonly called concentrators – saw an even greater increase in (1) graduation rates, (2) participation in two-year postsecondary education programs, and (3) wages upon entering the workforce. Third, the impact on male students and students from low socio-economic backgrounds who completed a CTE concentration saw even greater gains in all three areas than other groups.

To address CTE's perception problem, a strategy that combines the use of published research, analysis of statistical trends, and media promotion that highlights the promise of student achievement associated with participation in CTE programs was implemented (Achieve, 2015; Dougherty, 2016; Gammill, 2015; Hernandez-Gantes, 2016; Hunter, 2018; Renzulli, 2019; Orr, 2016; Perry & Wallace, 2012; Shipe, 2018). The message the strategy hoped to communicate is poignant. Modern CTE programs integrate high academic standards into coursework that situates learning content and skills within real-world workplace problems. This integration of high standards, learning, and situation results in opportunities for students to

benefit from (1) course clustering and concentrations, (2) CTSOs, (3) dual enrollment courses, (4) articulation agreements, (5) Advanced Placement (AP) and International Baccalaureate (IB) courses, (6) career guidance and pathways, (7) a wide variety of WBL opportunities during and after a student's secondary education career, and (8) highly-effective administration, faculty, and staff. This program design requires significant levels of collaboration and effort between CTE teachers, CTE programs, schools, institutions of postsecondary education, and employers, but results in improved student outcomes (Achieve, 2015; Erickson, 2016; Fistolera, 2018).

Fortunately, a more recent trend is starting to emerge in the area of perceptions about CTE programs. Research by Hess and Martin (2018) found that news articles about CTE have been steadily increasing since the year 1998. While other topics, such as Common Core, NCLB, and teacher evaluation have spiked and receded during that same timeframe, CTE has been on a steady incline. This steady push, which saw its most significant increase between 2011 and 2014, has resulted in a renewed focus for elected officials and families. Three examples include: 241 CTE–related budget provisions, laws, and executive actions were passed in 2017 (Hefling, 2018), CTE is showing up as an education reform priority across the country (Hess & Gallo, 2018; National Governor's Association, 2018), and students earning a concentration in CTE increased by 22% between 2008 and 2019 (Hackman, 2018). Given the consistent, long-term upward trajectory of CTE's news cycle prevalence, it is reasonable to believe the renewed focus on CTE will allow it to avoid the sharp attention decline suffered by other education trends (Hess, 2019).

The Role of CTE in United States Schools

As a result of a renewed focus on CTE, many students, parents, schools, businesses, and communities are experiencing the significant positive impact that effective CTE programs have.

In an editorial for Education Week, Richard Buery, Jr. (2019), chief of policy and public affairs for KIPP public charter schools, identifies CTE as a core piece of a school model that best prepares students for success in college and career. He writes,

> *Historically, KIPP has not been focused on CTE. But after years of research and student input, we are evolving. The best CTE classes cultivate creativity, collaboration, and innovation, which we will feature in our programming to help students build the "hard" and "soft" skills required in colleges and careers alike.*

Buery recognizes that CTE courses are not only for students who won't attend college. In fact, KIPP schools are organized around the premise that "a college degree remains the most reliable path to opportunity in America today" and they therefore make college admission a primary focus of their schools. Instead, the realization is that CTE programs offer the opportunity for student learning to be contextualized in meaningful ways. The end-product is the potential for improved future outcomes for all students. Students who won't attend postsecondary education right out of high school will be able to earn higher wage jobs in order to be better financially prepared for future enrollment in postsecondary education. Students who do pursue postsecondary education right out of high school will be better equipped to select a major, program of study, and school that best aligns with their informed career aspirations because they will have had the academic exposure and experiences needed to make those decisions as a result of their participation in high school CTE programs.

Modern CTE Programs

While many view CTE through the traditional lens of "training in the trades," the reality is that modern CTE programs also include law, engineering, health care, computer science, public service, entrepreneurship, and communications – all of which are topics that transition to

degree programs at four-year universities (Gewertz, 2019). Taking a view of education that does not include a CTE course sequence undermines the essential purpose of modern schools, which is to ensure all students leave high school college and career ready (Gammill, 2015).

Since the publication of *A Nation at Risk*, the need to better integrate academic content with technical and vocational skills has been a focal point for CTE teachers and programs. Eight models integrating vocational and academic education were developed and published in 1991 by Grubb, Davis, Lum, Phihal, and Morgaine (1991). Those early models included (1) updating CTE curriculum to include more academic content, (2) having CTE teachers co-teach classes with academic course teachers, (3) updating academic course curriculum to include more vocational training, (4) aligning curriculum in CTE and academic courses, (5) utilizing capstone projects for a student's academic career, (6) utilizing school academies, (7) developing career-focused schools, and (8) defining career clusters and pathways that align with specific occupations.

Many of those same models continue to be implemented in schools across the country, while other models, such as authentic assessment found in problem-based and project-based learning, WBL, and Tech Prep programs are also used (Lynch, 2000). Grubb, et al (1991) also notes that models used to integrate academics and vocational training can vary in their specific implantation across schools and disciplines. More current research on the same topic has yielded the same observation (Fletcher, Gordon, Asunda, & Zirkle, 2015). All of these models exist in order to promote learning that increases relevance, engagement, and the foundational understanding that "why do things work" and "how do things work" are questions that must be asked and understood in concert with each other (Hernandez-Gantes, 2016; Hunter, 2018).

The goal of integrating vocational training with academic coursework is a vital part of

CTE's role in modern secondary education. Renzulli (2019) notes that 82% of people surveyed believe students should take more job and career skill classes – even if that results in students taking fewer academic subjects – while less than half of respondents felt that the main goal of public education should be to prepare students academically. Preparing students for postsecondary education and the workforce does not require all students to attend a four-year college right after high school. Students can find success through other paths, such as the many high-paying jobs in our economy that do not require a bachelor's degree (Hunter, 2018; Orr, 2016; Perry & Wallace, 2012). Carnevale, Strohl, Cheah, & Ridley (2017) note that the workforce is currently made up of 66 million "good jobs," defined as jobs that pay more than $35,000 for workers under age 45 and more than $45,000 for workers age 45 and older. Of those 66 million jobs 36 million (55%) require a bachelor's degree or higher while 30 million (45%) do not require a bachelor's degree.

Middle Skills Jobs

The segment of jobs that require some specialized postsecondary education and/or training, but does not require a bachelor's degree, is commonly known as the "middle skills" jobs sector (National Academies of Sciences, Engineering, and Medicine, 2017; Renzulli, 2019). Currently, training programs for those types of jobs are provided by an inefficient combination of independent subsystems. The result of the current model for job training is a deficit in skilled workers prepared to work in those occupations. CTE programs can improve the school-to-work pipeline for students who desire to work these jobs in two ways. First, CTE programs can offer a pathway that starts in high school and leads directly into the postsecondary educational programs needed to enter a specific career field (Perry & Wallace, 2012; Shipe, 2018). Second, CTE programs can provide students with the transferrable skills needed to be successful across a

wide-variety of "middle skills" occupations. Such skills include literacy, numeracy, interpersonal, technical, and problem-solving (National Academies of Science, Engineering, and Medicine, 2017). These skills become even more vital due to the pace of technological advancement across industries. Workers in existing industries find it necessary to update their job-specific skills in order to maintain their employability (Cavanagh, 2019). A strong foundation of transferable skills makes those changes less daunting for workers.

According to Dimock (2019), president of the Pew Research Center, individuals born between 1981 and 1996 are part of the Millennial generation. Individuals born in the years after Millennials are part of Generation Z. There are currently 73 million millennials in the United States (Fry, 2018). By 2020, Millennials will be the largest age-group in the workforce – with workers spanning in age from 24 to 39 (Shipe, 2018). Generation Z currently has a population of nearly 91 million – and it won't take them long to overtake Millennials in the workforce. By 2022, almost half of all open employment positions in the United States economy will be in "middle skills" occupations. Preparing today's students for tomorrow's careers requires the efforts of effective CTE programs (Orr, 2016; Renzulli, 2019; Rojewski, 2002). A "college-for-all" mentality is not viable or preferable due to the high-cost of university tuition, minimal increase in income as compared to current tuition costs, and future job market projections. Recent research by Morton (2018) suggests that we have reached a point where simply attending college no longer guarantees higher wages and access to jobs – instead choice of major and/or vocation dictates income and job prospects. Creating, maintaining, and growing highly effective CTE programs provides students with a greater breadth of opportunities and choices when it comes to postsecondary education and career entry. Offering CTE programs that provide students those opportunities has become culturally significant and must remain that way in order

to ensure those opportunities not only persist but increase.

Education in general, and CTE specifically, has seen many changes since the guilds of the middle ages, but despite the political posturing and changes that have occurred, the general needs of employers and workers have not fundamentally changed – employers still need workers with the necessary knowledge and skills that help their business complete in the marketplace. Modern day CTE programs continue to provide the skilled workers employers need by preparing students to obtain gainful employment even while the workplace CTE programs prepare students for changes rapidly (Fletcher, et al, 2015; Wilkin & Nwoke, 2011). In order to accomplish the goal of workforce readiness, CTE programs must set and implement goals that are aligned with economic forces, school reform initiatives, student achievement, and public expectations (Rojewski, 2002). The tasks that must be carried out in order to achieve these goals are complex and require highly-trained and effective CTE teaching staffs. Given the impact of educational reform initiatives on CTE programs over the past 40 years, and the changing role of CTE programs in modern schools, highly-trained and effective CTE teachers are a necessary resource schools need to have access to in order to meet the needs of all stakeholders.

Teacher Recruitment and Retention

Teachers are the most important factor for improving student learning and achievement (Borman & Dowling, 2008; Liston, Borko, & Whitcomb, 2008; Loeb & Myung, 2010; Wilson, 2009). The variation in effectiveness between high- and low-performing teachers causes inequitable student outcomes that result in significant cultural, societal, and economic consequences (Dobbie, 2011; Hanushek, 2011; Liston et al, 2008; Little & Bartlett, 2010). Hanushek (2011) argues that underperforming United States schools cause a permanent recession that costs the United States economy trillions of dollars each year.

Wilson (2009) found that elementary students who had three highly effective teachers in a row achieved at a level comparable to middle school students. Replacing the bottom five-to-ten percent of teachers with average teachers would result in a significant positive impact on the overall performance of United States schools and economic opportunities available to students (Hanushek, 2011). Despite these well-known statistics, attracting and retaining qualified individuals to the teaching profession is a significant challenge for many schools and school divisions (Aragon, 2016; Ashiedu & Scott-Ladd, 2012; Berry, Montgomery, & Snyder, 2008; Beteille, Kalogrides, & Loeb, 2010; Broman & Dowling, 2008; Brown & Schainker, 2008; Castro & Bauml, 2009; Guha, Hyler, & Darling-Hammond, 2017; Hanushek, 2011; Ingersoll & May, 2011; Ingersoll & May, 2016; Liston, et al, 2008; Little & Bartlett, 2010; Loeb, Kalogrides, & Beteille, 2011; Loeb & Myung, 2010; Podgursky & Springer, 2011; Sutcher, Darling-Hammond, & Carver-Thomas, 2016; Wilson, 2009).

Teacher Supply and Demand

The lack of qualified teachers is fundamentally an issue effected by supply and demand (Loeb & Myung, 2010; Podgursky & Springer, 2011). Until the start of the Great Recession in 2008, demand for teachers was at a relative level of equilibrium with teacher supply. During the Great Recession, schools cut teaching positions in order to fit into the new economic reality caused by significantly reduced budgets. Since the end of the Great Recession schools have begun to establish new positions in an attempt to return to pre-recession staffing levels. The result is a teacher supply that cannot meet the current teacher demand (Sutcher et al, 2016). This has been most impactful in hard-to-staff schools, such as those in urban areas with a high percentage of minority students and students from low socioeconomic backgrounds, as well as in rural areas (Castro & Bauml, 2009; Guha et al, 2017). Establishing a teacher supply that meets

the demands of the profession is done through two functions: recruitment and retention (Aragon, 2016; Beteille et al, 2010; Ingersoll & May, 2016; Sutcher et al., 2016).

Teacher recruitment is the process by which new teachers enter the profession. Traditionally, college teacher preparation programs have been the primary way new teachers prepared to enter the profession, but the deficit in teacher supply forced schools and divisions to use a variety of alternative routes to fill their teaching vacancies (Balter & Duncombe, 2007; Morgan & Kritsonis, 2008). Research on teacher preparation and effectiveness suggests that formal teacher preparation programs continue to be the most effective source of well-prepared teachers – especially when those programs focus on teacher practice and provide opportunities for pre-service teachers to enter school classrooms early and often during the program (Ball & Forzani, 2009; Morgan & Kritsonis, 2008; Ronfeldt, Reininger, & Kwok, 2013; Wilson, 2009).

Teacher Preparation Programs

Measures of teacher preparation program quality, such as the Teacher Qualifications and the Quality of Teaching Study (TQQT), currently exist and are readily available to teacher preparation programs (Liston et al, 2008). Unfortunately, teacher preparation programs are struggling to maintain enrollment (Loeb & Myung, 2010; Sutcher et al, 2016). Given the high cost of college and relatively low wages associated with teaching, perspective program participants who are high academic achievers, first generation college students, minority students, and/or enrolled in STEM majors are less likely to consider teaching as a viable career option. This has caused the greatest difficultly for creating teacher supply in mathematics, science, special education, English Language Learning (ELL) and CTE. Teacher preparation programs with a reputation for lacking a strong mentoring component and not providing any form of follow-up after graduation also deter enrollment (Aragon, 2016; Berry et al, 2008; Loeb

& Myung, 2010; Sutcher et al, 2016).

Despite these trends, some individuals do continue to enroll in teacher pre-service programs. Research by Ashiedu and Scott-Ladd (2012) found that intrinsic motivators are the primary predictor of an individual's choice of teaching as an educational and career pursuit. These motivators include the intellectually fulfilling nature of teaching, teaching's contributions to society, the opportunity to work with children, working in a subject area of interest, and the ability to make a positive impact as a role model. Only one extrinsic factor, schedule flexibility during summer and holidays, was found to significantly influence the decision to become a teacher.

A variety of policy approaches have been recommended by researchers. Teacher preparation programs can increase access through (1) forgivable loans and service scholarships, (2) initiating university-school relationships, and (3) creating and improving alternative pathways to the teaching profession such as teacher residency programs. Schools and school divisions can also positively impact teacher supply by (1) increasing teacher salaries and employment incentives, (2) utilizing the global teacher workforce, (3) offering ladder-based career differentiation, (4) improving hiring practices, (5) reforming due process, and (6) developing "grow your own teacher" programs (Little & Bartlett, 2010; Loeb & Myung, 2010; Podgursky & Springer, 2011; Sutcher et al, 2016; Wilson, 2009). Programs such as the Urban Teacher Residency (UTR) and Professional Development Schools (PDS) have shown promise in their ability to prepare teachers to work in hard-to-staff schools (Berry et al, 2008; Guha et al, 2017). Utilizing international teachers could also help alleviate teacher shortages (Gross, 2018).

Teacher Recruitment

While teacher preparation programs play an important role in supplying teachers,

recruitment efforts by schools also play an important role in meeting their staffing needs. School recruitment responsibilities include (1) advertising, (2) on-campus recruiting, (3) Internet accessible job posting, and (4) providing incentives for potentially talented teachers to enter the profession. For schools that struggle to fill open positions, using more modes of advertising improves results (Balter & Duncombe, 2007; Morgan & Kritsonis, 2008). Perhaps the most important part of the recruitment process for schools is the selection of applicants to interview and hire. Beteille, et al (2010) observed that school leaders who are more successful at fully staffing their schools also preside over higher performing schools. Having a fully staffed school is good for students and sends a positive message to existing staff and the school community.

As school leaders make decisions about teacher hires they should look beyond commonly used cognitive traits, such as academic background, college admissions data, standardized test scores, and IQ in order to also closely examine a candidate's non-cognitive skills (Dobbie, 2011; Hanushek, Piopiunik, & Wiederhold, 2018; Rockoff, Jacob, Kane, & Staiger, 2008). Non-cognitive skills found to be closely associated with teacher effectiveness include extraversion, conscientiousness, and self-efficacy as determined by personality tests (Rockoff, et al, 2008). While both cognitive and non-cognitive skills have been found to impact teacher quality, non-cognitive skills are often more difficult to assess and therefore given less consideration in the hiring process.

Teacher Retention and Attrition

Once a new teacher enters the profession, the retention of those who prove to be highly-effective becomes the next important task for school divisions and school leaders (Beteille et al, 2010). Analysis of the financial and institutional costs associated with replacing teachers suggests the work of teacher retention is at least as important as recruitment – and likely more so

(Brown & Schainker, 2008; Sutcher et al, 2016). Schools leaders need to work towards transitioning ineffective teachers out of the profession, however the majority of attrition that exists in the profession is not from ineffective teachers (Borman & Dowling, 2008). New teachers, alternatively licensed teachers, minority teachers, teachers in difficult to staff schools such as those in urban areas, minority-majority schools, Title I schools, and schools in the South and Midwest, as well as teachers in disciplines with low supply, such as science, math, special education, ELL, and CTE are most susceptible to leaving the profession regardless of effectiveness (Grollman, 2008; Sutcher et al, 2016).

Retention and Attrition Factors

A considerable body of research exists connecting factors associated with teacher attrition to recommendations that promote teacher retention. Table 1 lists factors commonly found to contribute to teacher attrition and identifies policy and practice recommendations to combat those factors and subsequently promote teacher retention.

Table 1
Factors Associated with Teacher Attrition and Corresponding Retention Policies and Practices

Teacher Attrition Factor	Teacher Retention Policy and/or Practice
Compensation factors include: • salary, • compensation packages, and • pension structures (Abdallah, 2009; Borman & Dowling, 2008; Loeb & Myung, 2010; Sutcher et al, 2016).	Recommendations include: • compensation packages that are competitive and equitable with other college graduates, • opportunities for performance-based bonuses, and • a national teacher pension program (Little & Bartlett, 2010; Loeb & Myung, 2010; Morgan & Kritsonis, 2008; Podgursky & Springer, 2011; Sutcher et al, 2016; Wilson, 2009).
Working-conditions factors include: • workload, • class sizes, • administrative support, • student discipline, • school facilities, • hiring practices and certification requirements, • peer collaboration and networking, • class autonomy, • instructional leadership, • lack of mentoring and induction programs, and • availability of classroom resources (Abdallah, 2009; Ashiedu & Scott-Ladd, 2012; Balter & Duncombe, 2007; Borman & Dowling, 2008; Brown & Schainker, 2008; Loeb & Myung, 2010; Sutcher et al, 2016).	Recommendations include: • improved collegiality, • increasing effectiveness principal staffing practices, • providing opportunities for teacher leadership, • allowing for greater classroom autonomy, • improved mentoring and induction programs, • personalized professional development opportunities, • intentional assignment of students to teachers, and • regular formal and information interaction with administration (Abdallah, 2009; Beteille et al, 2010; Ingersoll & May, 2011; Liston et al, 2008; Little & Bartlett, 2010; Loeb et al, 2011; Loeb & Myung, 2010; Morgan & Kritsonis, 2008; Sutcher et al, 2016; Wilson, 2009).

Table 1 (continued)
Factors Associated with Teacher Attrition and Corresponding Retention Policies and Practices

Teacher Attrition Factor	Teacher Retention Policy and/or Practice
School community factors include: • appreciation, • parental involvement, and • student demographics (Abdallah, 2009; Ashiedu & Scott-Ladd, 2012; Loeb & Myung, 2010; Sutcher et al, 2016).	Recommendations include: • improved collegiality, • increasing principal community relations effectiveness, and • providing additional opportunities to highly-effective teachers (Abdallah, 2009; Beteille et al, 2010; Loeb & Myung, 2010; Sutcher et al, 2016; Wilson, 2009).
Pre-service factors include: • lack of quality teacher preparation (Sutcher et al, 2016).	Recommendations include: • improved models that predict teacher effectiveness (Liston et al, 2008; Loeb et al, 2011).
Personal factors include: • living conditions, • perceptions about teaching, • alternative job opportunities, • proximity to hometown, and • desire to only work in education temporarily (Ashiedu & Scott-Ladd, 2012; Balter & Duncombe, 2007; Berry et al, 2008; Loeb & Myung, 2010).	Recommendations include: • creation of a national teacher job board, • policies that allow increased employment mobility across the country, and • alternative licensure programs (Little & Bartlett, 2010; Sutcher et al, 2016).

A recommendation that can be easily overlooked – perhaps due to some combination of the difficulty associated with identifying and measuring it – is collegiality. Collegiality is defined as teachers working together, supporting each other, caring for each other, enjoying each other's company, creating an encouraging atmosphere, providing shared empathy, sharing

resources and ideas, and creating common goals. Improving collegiality has the added benefits of encouraging risk-taking and the pursuit of leadership positions. These actions in turn improve student outcomes and increase retention rates (Abdallah, 2009).

The most significant factor across the current body of research is the impact that pay has for teacher recruitment and retention. Podgursky and Springer (2011) note that when comparing schools in different countries, higher pay corresponds with higher student achievement. In other words, countries that pay their teachers higher salaries are also the countries with higher performing students. The extrinsic motivation associated with the comparatively low-pay of teaching must be considered at the policy-level for long-term, positive gains in teacher recruitment and retention to be made. This change has started to occur in school districts where teacher strikes have been used to increase teacher pay and improve other aspects of the profession (Hess, 2018). Other law-makers are working to prevent teacher unrest by making changes before they are effectively forced to, such as the proposal by Florida's new governor to significantly raise teacher salaries in his state (Ujifusa, 2019).

A second factor that appears almost as often – and that is found to have a positive relationship with both retention and student achievement – is teacher professional development (Ingersoll & May, 2011; Liston et al, 2008; Little & Bartlett, 2010; Morgan & Kritsonis, 2008; Sutcher et al, 2016; Wilson, 2009). The importance of professional self-efficacy for a teacher's desire to stay in the profession cannot be overlooked as a powerful tool for retention – especially given a school's ability to provide teachers with the opportunity to engage in self-selected professional growth activities chosen to meet their most pressing professional needs (Elliott, Isaacs, & Chugani, 2010; Yost, 2006).

One factor previously assumed to contribute to teacher attrition is the onset of state mandated testing under *NCLB*. Research by Boyd, Lankford, Loeb, and Wyckoff (2005) found that state mandated testing cannot be isolated as a reason for leaving the profession, however it might be a subset of a more general cause of teacher attrition. An example of this general cause could be the role of teacher evaluation on job satisfaction, which has also been found to impact teacher retention (National Council on Teacher Quality, 2019). This line of research is significant, because schools that most often struggle to meet state testing requirement are also schools with high minority student populations. These schools are also often most eager to recruit and retain minority teachers and would therefore also be the most likely group to be adversely impacted by stringent state testing requirements and/or teacher evaluation practices (Ingersoll & May, 2011; Ingersoll & May, 2016; Sutcher et al, 2016).

Minority Teacher Retention

The work of teacher retention is especially important and difficult when focusing on minority teachers. Minority teacher recruitment has been successful at bringing new teachers into the profession, however minority teacher attrition rates have been significantly higher when compared to their white peers (Ingersoll & May, 2011; Ingersoll & May, 2016). While minority teachers leave the profession for many of the same reasons previously listed, specific factors contribute more to minority teacher attrition than others. Research by Ingersoll and May (2011) found that school demographic characteristics, organizational conditions such as collective faculty decision-making influence, degree of individual classroom autonomy, salary, professional development offerings, and lack of classroom resources contribute most to minority teacher attrition.

Hiring and Retaining CTE Teachers

Attracting and retaining highly-qualified and effective CTE teachers also presents its own unique sets of challenges – many of which are included in Table 1 – but also those that go beyond what exists for teachers in core academic subject areas (Grollman, 2008). The Association for Career and Technical Education (ACTE) held a summit to address CTE teacher recruitment and retention in February 2020. The goal of the summit was to develop a common understanding of how to address the recruitment and retention issues that exists in CTE (Association for Career and Technical Education, 2019).

One highly significant deterrent schools must overcome to attract CTE teachers is the postsecondary coursework required to be approved for a teaching license. In response, states have provided alternative licensure programs to attract CTE teachers by removing certain postsecondary coursework requirements (Bowling & Ball, 2018). Other potential barriers for CTE teachers include the lack of CTE-track programs available at colleges and universities (Brand, Valent, & Browning, 2013) and the low perception associated with teaching in vocational disciplines (Grollman, 2008). These barriers are in addition to the factors that limit the number of individuals who are interested in the teaching profession in general, such as the perceptions that teaching is a low-paying career choice when compared to careers in business or industry (Quinton, 2017), the high likelihood of a poor work environment, and the stress level endured to complete the required tasks for teaching (Ashiedu & Scott-Ladd, 2012).

In 2017, Career and Technical Education was ranked fourth on the Virginia Department of Education's *Top Ten Critical Shortage Teaching Endorsement Areas in Virginia* (Virginia Department of Education, 2017). There are not enough new teachers entering the profession to meet the current staffing needs of existing programs, much less grow those programs to meet the

demands of students, schools, employers, and communities. The implementation of alternative licensure programs has provided a degree of help in bringing new teachers into the profession, but has done so without providing new teachers the holistic understanding needed to offer a highly-effective CTE program (Darling-Hammond, Holtzman, Gatlin, & Vasquez Heilig, 2005). Addressing the deficiencies in alternative pathway programs and the missing skills for teachers that enter the profession through these pathways is a necessary task for teacher preparation programs and schools.

CTE Teacher Licensure Pathways

One approach to combat the teacher shortage phenomenon is the use of alternative licensure for individuals who would like to enter the teaching profession without going through a college or university teacher preparation program. This form of licensure is not new to public education (O'Connor, 2012; Walter & Gray, 2002). Prior to the mid-to-late 2000s, the process of granting alternative teacher licensure (ATL) was commonly referred to as "provisional" or "emergency" licensure and was primarily used in CTE for Trade & Industry and/or Health Occupation teachers (Walter & Gray, 2002).

Alternative Teacher Licensure in CTE

The use of ATL is sensible for Trade & Industry and/or Health Occupations, given the job-specific nature of the course content taught in those classes, the subsequent content expertise required of those teachers, and the fact that many Trade & Industry and Health Occupations professionals do not have the four-year college or university degree commonly required for teachers in academic courses or CTE disciplines such as Business & Information Technology or Marketing Education (Gordon, 2009). Providing a route into the teaching profession under these conditions is necessary – otherwise it would be significantly more difficult to have a supply

of knowledgeable and skilled teachers in these valuable fields. However, ATL has become an increasing commonplace strategy for schools and school divisions to use in order to address teacher shortages across all content areas and disciplines, especially for hard-to-staff schools and content areas (Bartholomew, Bullock, & Nadelson, 2018).

Matching Licensure to Necessary CTE Teacher Knowledge and Skills

A report by Gray and Walter (2001) recognized the impact teacher shortages would have on the profession and anticipated many of the resulting factors that currently exist in CTE, including the impact of state testing mandates, industry credentialing for CTE teachers, integrating academics into CTE courses, facilitating work-based learning programs, preparing students for postsecondary education and the workplace, teaching students with disabilities, and the reduction in college and university teacher pre-service programs. The core of the problem, as Gray and Walter (2001) saw it at the time, was a lack of continuity in missional focus for CTE programs. They saw CTE programs as filling two distinct needs: preparing students to enter the workforce – either directly after school or after continuing their vocational training in a one- or two-year postsecondary program – and providing students with the skills needed to apply academic knowledge in a career context. They viewed these two needs as two distinct tracks for teacher credentialing. They argue that CTE teachers who meet the need of preparing students to enter the workforce should have one set of licensure requirements while CTE teachers who prepared students to apply academic knowledge in an occupational setting would need to meet a different set of requirements.

While the goal of education continues to be to prepare students for postsecondary education and the workplace, the tracking system proposed by Gray and Walter (2001) has largely been shifted to an approach that prepares all students for success in both postsecondary

education and the workplace – operating under the assumption that the majority of students will need to be prepared to succeed in both environments (United States Department of Education, 2018). One of the aspects of their report that has remained continually relevant to this day is the licensure requirements for CTE teachers who they argued should merge the goals of workplace preparation with academic rigor. Gray and Walter (2001) identified five areas of teacher preparation that a successful CTE teacher needs to possess in order to succeed in the profession. Of those five, four are commonly identified as significant factors for teacher quality: subject-matter knowledge, academic credentials, pedagogy, and assessment techniques (Bartholomew, et al, 2018; Berry, et al, 2008; Fletcher & Zirkle, 2011; Gordon, 2009; Stephens, 2015). These four factors serve as a foundation for many state education ATL requirement models and programs designed to support candidates seeking ATL.

Alternative Licensure Requirements for CTE Teachers

Even though ATL is a common licensure approach for state education departments throughout the United States, the specific requirements within each state can vary greatly. In Oregon, ATL candidates in CTE must demonstrate proficiency integrating literacy and math skills into their instruction during an initial three-year probationary period. They accomplish this by participating in a workshop or taking an online class through Oregon's public university system. In Idaho, ATL candidates in CTE can work towards licensure in one of two ways: an industry-based model that requires work experience and industry certifications or a standard secondary certificate with a technical endorsement (Meeder & Suddreth, 2012). In Michigan, ATL candidates in CTE are able to teach without participating in a teacher certification program if they have academic credentials and extensive work experience (Stephens, 2015). In Virginia, ATL candidates in CTE can participate in the *Career Switcher Alternative Route to Licensure*

Program, apply for a technical professional license if the candidate has sufficient job experience and nine hours of education coursework, or have a school division who is willing to hire the teacher apply for a three-year, non-renewable provisional license (Virginia Department of Education, 2018). Each of these pathways are in contrast to a country like Finland where all CTE (in Finland CTE is commonly referred to as either VET or TVET) teachers must have both industry experience and a degree or post-graduate license that provides training in research-based pedagogical methods and practices (Martino & Lasonen, 2018).

Teacher Quality and Student Outcomes

The existing body of research on the impact of teacher licensure on teacher quality and student outcomes provides a wide range of perspectives and findings on the topic. Much of the early research focuses on teacher self-efficacy and the differences between teachers from traditional teacher pre-service programs and alternatively licensed teachers. Other research found that there is no difference in self-efficacy between the two groups (Rocca & Washburn, 2006). More recent studies found that teachers who come through a teacher preparation program feel better prepared to teach than an alternatively licensed teacher (Bowling & Ball, 2019; Duncan, Cannon, & Kitchell, 2013; Jang & Horn, 2017). Other researchers focused on content and pedagogical knowledge and found that traditionally trained teachers possess greater pedagogical knowledge and administered more authentic assessments while alternatively licensed teachers possess greater content knowledge and work experience (Fletcher & Zirkle, 2011; Stephens, 2015).

Research by Bartholomew, et al (2018) found that principals believe alternatively licensed teachers are less prepared than teachers from traditional pre-service programs, however they are none-the-less willing to hire them and work with them if the alternative is not being able

to hire a teacher for a hard-to-staff position. Overall, there seems to be more evidence that teachers who entered the profession through ATL are less effective than traditionally licensed teachers, but the licensure pathway is helping provide a partial solution to the lack of teacher supply (Berry, et al, 2008; Henry, Putrell, Bastian, Fortner, Thompson, Campbell, & Patterson, 2014).

Impact on Teacher Retention Rates

Statistics on retention rates for teachers who, when all other factors are held constant, enter the profession through ATL show that this group of teachers is 25% more likely to leave the profession after only one year of teaching (Carver-Thomas & Darling-Hammond, 2017). A seven-year longitudinal study of teachers in North Carolina by Zhang and Zeller (2016) found the seven-year retention rate for teachers who enter the professional through a traditional pre-service program to be 86.36%. This compares favorably to the 35.00% retention rate for teachers who entered with an alternative license and no pre-service training, as well as to the 66.67% retention rate for teachers who entered with an alternative licensure who completed a teacher residency program.

A longitudinal study on teacher retention for CTE teachers in Ohio tracked teacher cohorts who entered the profession through an alternative license after completing a summer workshop. The study includes yearly cohort groups starting with the 2002/2003 school year through the 2017/2018 school year. Data from the study highlights a trend in CTE teacher retention rates. CTE teachers who completed the program and remained in the profession for at least three years did so at a rate between 86% and 92%. As the number of years in the profession increased, retention rates decreased. The retention rate for teachers who stayed between four and six years was between 68% and 72%. The Retention rate for all teachers from the program who

stayed in the profession longer than six years was 47% (Zirkle, Jeffery, & Shrewe, 2019). Data from the National Center for Education Statistics (2018) highlights the fact that CTE teachers enter the profession through ATL at a rate, 37%, that is slightly more than double the rate for all teachers, 18%. Taken together, the trend of large percentages of CTE teachers using ATL to enter the profession along with the trend of high attrition rates for alternatively licensed CTE teachers, provides evidence that there is more work that needs to be done to improve ATL pathways for CTE teachers.

Preparing Alternatively Licensed Teachers

The increasing level of complexity associated with teaching, especially in the CTE disciplines, only compounds the difficulty for ATL teachers. O'Connor (2012) notes that the work of a CTE teacher is not to simply train students in job-specific skills. Instead, a CTE teacher must guide students along individual career development pathways, promote academic achievement, teach higher order thinking skills, stay familiar with current curriculum topics, and use new technologies associated with related industries. Ozfidan and de Miranda (2017) highlight the difficultly of staying abreast of content knowledge in a specific CTE discipline. For example, a Technology Education teacher might be well versed in the use of three-dimensional renderings, but lack knowledge related to robotics and programing required to teach courses with a curricular focus in those areas.

Given the juxtaposition of an increased need for teachers to enter the profession through ATL and the clear deficiencies in the knowledge and skills of those teachers, the need for improved ATL programs and/or increased professional development opportunities becomes readily apparent. Instead of simply denouncing the availability of ATL, it's important to recognize that the choice schools must make is not between traditionally trained/licensed teacher

and alternatively licensed teachers – it's between having a teacher and not having a teacher. Recognizing the value of effective ATL programs and approaches can help create better schools, stronger programs, and improve student outcomes.

Two groups offer a promising supply line for future CTE teachers through the ATL path: second career teachers – professional who wish to transfer into the teaching profession – and teachers of traditional academic courses who wish to transition away from teaching the academic subject of their initial licensure in order to teach a CTE discipline after earning licensure requirements in that discipline (Castro & Bauml, 2009; O'Connor, 2012). Successfully helping members of each of these groups transition to leading a CTE program requires a holistic approach adopted by both the ATL training program and schools. The approach needs to ensure teachers have the content-knowledge, pedagogical skills, practical teaching and work experience, conceptualization of programmatic purpose, and assessment strategies needed to enter the profession and prepared to function and grow as a teacher. This work is especially important in a state like Virginia, where CTE teachers are tasked with integrating the state Standards of Learning (SOL) into their lessons and helping prepare students for state mandated end-of-course tests on the SOLs (Zinth, 2013). Fortunately, a variety of options can be used to meet this goal.

Supporting New CTE Teachers

Stephens (2015) recommends the use of a dedicated mentoring and induction program to assist the teacher in his/her early years of teaching. An effective mentoring program will pair a mentee with a mentor who is an experienced classroom teacher and industry professional. While many schools require first year teachers to work with a mentor, the quality of these programs is often limited by the effort of the mentor and/or mentee and limited by the other requirements placed on both staff members. Providing regular, dedicated co-planning time, reducing the

mentee teacher's class load, creating a community of mentors and mentees, and offering targeted professional development are all approaches that can improve teacher induction (Ingersoll & Smith, 2004).

A second approach is the use of co-teaching arrangements where a teacher seeking alternative licensure teaches alongside a fully licensed teacher. This approach can be effective for perspective teachers with significant industry experience but little-to-no pedagogical knowledge or practical teaching experience (Advance CTE, Center of Great Teachers, & American Institutes for Research, 2016).

A third approach could be to use a hybrid approach that connects school divisions with universities to establish a collaborative training program, such as those in UTR and/or PDS. This allows for practical experience under the oversight of an experienced and highly-effective teacher to happen simultaneously with instruction in pedagogy and assessment commonly done through college or university pre-service programs (Berry, et al, 2008).

Finally, a fourth idea that is currently gaining traction in the field of education and training is the use of micro-credentials. This approach allows teachers to demonstrate specific skills in order to earn task-specific credentials or "badges" which demonstrate proficiency with specific skills needed for success in the profession. This approach can also be extended into the workplace experience of the teacher as he/she continues to grow professionally and learn new skills (BloomBoard & American Institutes for Research, 2019).

Impact of Teacher Professional Development

Professional development (PD) is an important part of the teaching profession for reasons beyond recruitment, retention, and renewal of licensure. A body of research exists that suggests teaching quality is the most important factor for student learning (Koellner & Greenblatt, 2018).

Guskey (2002) notes PD that leads to positive changes in teacher practice and is ubiquitous with school improvement. Research by Fischer, Fishman, Levy, Eisenkraft, Dede, Lawrenz, Jia, Kook, Frumin, & McCoy (2016) found that PD is one of three contributing factors that increased student achievement on AP Science examinations in urban school settings and can be a better predictor of AP scores than PSAT scores – a commonly used predictor of student success in advanced coursework. Teachers and administrators need to continually grow in order to improve student outcomes which makes creating a systematic professional development program for teachers a core function for individual teachers, departments, schools and school divisions.

Teacher Professional Development Research

The value of PD for teachers and students in public schools has been recognized for over 80 years (Hammel, 2007). Despite a limited view of PD that only included college faculty-led teacher training in collaborative workshops, Erwine and Fordyce (1943) reported "The possibilities of mutual profit and growth for college and public school offered by the workshop plan seem to be almost unlimited." Indeed, the variety that exists for the mode and type of PD offerings for modern day teachers is extensive. However, today's varied PD landscape provides its own issues that need to be addressed in order for PD to truly impact the day-to-day work of teachers and the students they serve (Borko, 2004; Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009; Hammel, 2007).

Despite the long history of teacher PD research, PD offered and provided to teachers does not always produce the intended impact. Kennedy (2016) notes that one major cause of the disconnect between researched best practices and actual PD offerings is the fact that many PD research models "mask" the fundamental purposes of any PD, which are to improve teacher knowledge and change teacher actions in the classroom. Improving teacher knowledge and

changing teacher actions should go towards improving student outcomes, however it is overly simplistic – and often erroneous – to assume that a change in student achievement is a direct result of effective teacher PD. Tobe (2009) argues that study design can separate teacher effect from student effect through the use of longitudinal value-added measurements which can also show the impact of teacher growth through PD and experience. This model, as well as others that seek to separate the impact of PD from other factors, can be used to develop a larger body of high-quality PD research currently needed (Desimone, 2009; Lasley, Siedentop, & Yinger, 2006).

To create this larger body of PD research, more effective approaches to evaluating teacher PD are necessary (Ebert-May, Derting, Hodder, Momson, Long, & Jardeleza, 2011). Evaluating PD requires researchers to examine a complex mix of factors related to the teacher, the school environment, and the PD activity (Opfer & Pedder, 2011). Using data from TALIS 2013 – which includes 35 educational systems – Barrera-Pedemonte (2016) found that PD which includes high level of teacher collaboration, active learning through participation, and is done over an extended period of time is most likely to result in changes to a teacher's classroom practice. Conversely, Barrera-Pedemonte (2016) also found that short, single-session PD lead by teacher colleagues were detrimental to changing teacher instructional practice.

One practical approach for improving the existing and future body of research on PD is to create a "clearinghouse" of researched best practices for PD based on high-quality research – which is defined here as research that evaluates how well PD improves the teacher's knowledge and/or changes teacher instructional actions (Cordingley, Higgins, Greany, Buckler, Coles-Jordan, Crisp, Saunders, & Coe, 2015). Another approach for PD research could be to use a meta-analysis of research on effective instructional approaches, such as is seen in Hattie's (2008)

book *Visible Learning*. The creation of a universally respected body on research used to guide PD practices could significantly improve the quality of mandatory training teachers must receive in order to remained licensed to teach, but also improve the quality of the teacher workforce and in turn support improved student outcomes.

Planning Teacher Professional Development

Planning PD goals for teachers is both practical and necessary for aligning teacher skills with those needed to be successful in the profession as it is oriented today and will be in the future. Wasonga, Wanzare, and Dawo (2015) note that even high-quality pre-service programs are insufficient for preparing students for the unique teaching environment they will enter as first-year teachers. Other pre-service programs will sometimes lack core skills teachers need when they enter the profession, such as classroom management strategies and techniques for parent interaction (Melnick & Meister, 2008). The result is an immediate need for PD to fill in these missing skill and knowledge gaps.

Administrative Support for Professional Development

School administrators also need to consider the role PD plays in teacher observations and the overall evaluation process (Gerber, 2019; Putnam, Ross, & Walsh, 2018; Ross & Walsh, 2019). Heafner (2019) recommends the creation of a holistic teacher portfolio that includes: a teacher training profile with information about content knowledge, pedagogical knowledge, licensure, and college degree; a teaching practice profile that outlines teaching experiences; a pedagogical practice profile with artifacts related to assessment, instructional practice, purpose of education, and pedagogical theory; a professional development profile with a record of PD activities and learning goals; and a student achievement profile providing details about student performance on assessments, including standardized test scores where appropriate. Using a

portfolio for teacher evaluation changes the focus of the evaluation process from one that simply gives credit and/or places blame to one that looks to build on teacher strengths in the pursuit of continued growth. This model also gives teachers additional control over their PD choices – allowing teachers to self-select activities that align with their personal learning goals based on their various profiles and thus increase the probability of a positive impact as a result of the PD (Lopes & Cunha, 2017) – while enabling school administration to oversee the teacher's plan and provide important feedback based on the administrator's expertise and experience.

Teacher PD needs to be understood as a journey towards an end goal, as opposed to window shopping in a strip mall. When working towards an end goal, every step taken along the way is intended to progress closer to the goal. Window shopping in a strip mall provides a preview of many different available resources, but it only gives an overview of what's available instead of giving direction towards a more fulfilling end. When selecting and planning a PD pathway, Desimone (2009) suggests looking for the following features in each PD activity: (1) content focus, (2) active learning, (3) concept coherence, (4) duration of activities – Tabernik (2008) found that a minimum of 90 hours of PD are needed on a single topic to have a positive impact on standardized test scores, (5) collective participation, (6) goal oriented, such as increased teacher knowledge or skills, change in attitudes or beliefs, change in instructional practice, and/or improved student outcomes, (7) contextualized training, such as alignment with student, school, and district characteristics, alignment with teacher knowledge, beliefs, and attitude, and alignment with policy constraints, (8) high expectations for professional development facilitators, and (9) opportunity for teacher reflection.

Providing Professional Development Opportunities

Departments, schools, and school divisions must also consider the role they play in

providing high quality PD opportunities for teachers. Bonds and Blevins (2019) note that combining systems thinking with social learning theories – such as those defined by Bandura (1977) – has the potential to help school leaders identify the most relevant learning needs of teachers and offer related PD opportunities. Teacher leaders provide important information for this planning phase by identifying their own PD needs, as well as the needs of their fellow teachers, and by acting as a resource to provide personalized PD in the form of mentor or peer support (Boylan, 2018). To get the best return on the effort put into PD planning, a PD model that includes sustained efforts for mentoring, a focus on student-centered teaching practices, workshops related to student-centered teaching practices, expert PD evaluation, peer mentoring, observation and evaluation aligned with PD goals, and teacher participation in planning and project committees should be used (Lockwood, Miller, & Cromie, 2014).

Professional Development That Improves Practice

A segment of the research on teacher PD focuses on the impact PD has on teacher self-efficacy. As a consequence, many researchers focus on PD's impact on self-efficacy related to content knowledge, pedagogical knowledge, teaching practice, and a teacher's confidence and desire to help students learn (Blonder, Benny, & Jones, 2014). Other researchers argue that self-efficacy should not be used as a measurement tool for PD, due to the fact it does not necessarily relate directly to student learning outcomes (Ebert-May, et al, 2011). Regardless of the directness of the relationship, it is reasonable to operate under the premise that improving teacher efficacy on a given topic is an important step in changing teacher action. As such, content specific teacher PD programs cover a wide variety of topics – some of which are general to all teachers and others which are more content specific.

An example of PD needed in a topic that is general to all teachers is classroom

management. Eisenman, Edwards, and Cushman (2015) note that classroom management is an important skill necessary for all teachers and also one that is underutilized as a PD offering. PD for a specific purpose can focus on training teachers to use a specific curriculum or tool. Examples include PD designed to train teachers to use third-party curriculum that prepares students to think like historians (VanSledright, Maggioni, & Reddy, 2011), computer system-based curricula that teaches complex biological systems (Yoon, Anderson, Koehler-Yom, Evans, Park, Sheldon, Schoenfeld, Wendel, Scheintaub, & Klopfer, 2016), or a computer-based course on inference statistics and probability (Biehler, 2016). Other specific PD offerings focus on teaching methodologies, such as teaching in health sciences academy (Notebaert, Barnard, Meyer, Dehon, Compretta, Allen, Stray, Taylor, Sullivan, & Rockhold, 2018), using a blended learning approach (Hillard, 2015), co-teaching (Shaffer & Thomas-Brown, 2015), using Understanding by Design (UbD) within an English language learner (ELL) classroom (Yurtseven & Altun, 2017), implementing engineering design in a technology sciences class (Grubbs, Love, Long, & Kittrell, 2016), or using a mathematics discussion approach in upper-elementary (Garcia, Shaughnessy, Prawatt, Pfaff, Mortimer, Cirino, Blunk, & Robinson, 2018). PD can also help teachers learn to navigate politically and culturally sensitive topics, such as teaching evolution (Fredrichsen, Linke, Barnett, 2016).

CTE Teacher Professional Development Competencies

PD plays an important role in the process of teacher improvement, job satisfaction, and retention for all teachers. However, an argument can be made that the value of PD for CTE teachers is significantly more important than it is for non-CTE teachers (Omar, Cole, & Self, 2017). CTE teachers need to possess a wide variety of skills that include and go beyond those possessed by general education teachers of academic courses (Brand, et al, 2013). These skills

include use of pedagogical strategies that: (1) increase student knowledge in both academic and occupational arenas (Mukuni & Price, 2016; Rose, Shumway, Carter, & Brown, 2015; Tenuto, Cannon, & Kitchel, 2013), (2) improve each student's ability to perform job-related tasks that meet current industry standards (Center on Standards & Assessment Implementation, 2019; Golden, 2013), (3) prepare teachers to implement and manage diverse and complex programs that incorporate community-based learning activities, CTSOs, WBL opportunities, and promotional activities, as well as plan program course sequences that prepare students to enter the workforce and institutions of postsecondary education through curriculum that is aligned with current academic and industry best practices (O'Connor, 2012; Xing & Gordon, 2017), and (4) work with diverse student populations (Kerna, 2012; Ruhland & Bremer, 2002).

Professional Development for Pre-Service and Early-Career CTE Teachers

The importance of PD for early-career CTE teachers becomes even more important in light of the increasing number of CTE teachers who are entering the profession through alternative licensure programs (Blevins, 2016; Bowling & Ball, 2018; Ruhland & Bremer, 2002) and because of the decreasing number of colleges and universities that offer specialized training programs for CTE teachers that resulted from a change in the Perkins funding formula that occurred with Perkins II (Fletcher, et al, 2015; Manley, 2011). In Virginia, 19 new CTE teachers completed a traditional teacher education program in 2018 while 81 new CTE teachers completed an alternative licensure program (United States Department of Education, 2019). This does not include new CTE teachers who entered classrooms on an alternative license at the request of a local school division due to a lack of highly-qualified applicants. The 19 new CTE teachers completed traditional programs at one of seven colleges or universities in Virginia while

the 81 new CTE teachers who entered on an alternative license completed a program at one of three institutions of higher education (IHE) or through a non-IHE program (United States Department of Education, 2019).

The resources and opportunities offered to aspiring teachers through pre-service programs in Virginia provide the foundational skills needed to succeed in the profession, such as a basis in pedagogy, effective instructional practices, classroom management techniques, program management and operational skills, preparation to work with diverse student populations, practice lesson planning with an effective, experienced teacher, and experience teaching in a classroom (Professional Studies Requirements for Prek-12, Special Education, Secondary Grades 6-12, and Adult Education Endorsements, 2018).

When new teachers entering the profession lack one or more of these skills, the work of equipping teachers through in-service training falls to the individual teachers, CTE departments, schools, school divisions, state departments of education, CTE teacher education programs, and CTE teacher professional associations. This will often be in addition to in-service training provided that situates new teachers to work effectively in the unique environment and context of the school they are hired to teach in (Zirkle, Fletcher, Sander, & Briggs, 2011). For PD to positively impact the work done by CTE teachers, the PD must provide the appropriate rigor, relevance, and frequency needed by the teacher to acquire the new skill and/or knowledge. This on-going support for teacher improvement is a critical element in the efforts of schools to support and retain teachers, as well as improve student outcomes (Davis, 2015).

Professional Development Needs of Alternatively Licensed Teachers

Given the long history of alternative teacher licensure in CTE, much of the available research on professional development needs for CTE teachers focuses on the differences between

teachers who went through a pre-service program and teachers who entered through alternative licensure. This comparison can be very beneficial for identify skills CTE teachers would most benefit from gaining through in-service professional development. Heath-Camp, Camp, Adams-Casums, Talbert, and Barder (1992) assert that teacher development happens in three stages – preservice, induction, and continuing development – and that teacher professional development needs to be viewed as a long-term developmental process. CTE teachers who enter the profession through traditional programs are likely to start out at a different stage than those who enter through alternative licensure due to their experiences in the pre-service program.

Research by Bowen, Williams, Napoleon, and Marx (2019) found that technology education teachers from traditional programs and alternative licensure routes feel the same level of preparedness to enter the profession, however teachers from the alternative licensure programs feel less prepared to manage student behaviors, including discipline issues, than do teachers from a traditional program. Other researchers have encountered similar results when comparing the preparedness levels of CTE teachers from traditional teacher training programs to those who enter through an alternative licensure route (Bowling & Ball, 2018; Devier, 2019; Jeffery & Zirkle, 2020). This difference points to a need for training in effective classroom management – either through a pre-service or in-service PD program. On the other hand, alternative licensed teachers who enter the profession after years in industry are more likely to feel equipped to prepare students for the demands of the workforce than teachers who lack industry experience (Fletcher, 2014; Moore, Green, & Clark, 2015; Ruhland & Bremer, 2003). Given the diverse skillsets required by CTE teachers (Gordon, 2009; Fletcher & Zirkle, 2011; O'Connor, 2012), these differences can be used to develop sets of teaching standards and/or teacher competencies needed to be effective in the classroom.

Selecting Professional Development Topics

A significant issue in CTE teacher PD is the potential for PD topics to be selected based on limited observation or a trendy topic instead of using research-based data to inform PD topic selection (Ahn & Rose and Associates, Inc., 2017; Heath-Camp, et al, 1992). As a result, the needs of CTE teachers are not being met with the level of fidelity they might otherwise be if the PD provided aligned with known CTE teacher competencies and teaching standards. Fortunately, standards for CTE teacher quality already exist. Unfortunately, there are many sets of standards and/or competency lists to pick from.

The competency list used for this study is from a Delphi study conducted by Manley and Zinser (2012). A full description of the competency list developed by Manley and Zinser (2012) is provided later in this section. One of the most commonly referenced sets of standards is the National Board for Professional Teacher Standards (NBPTS) (2014), more commonly referred to as simply National Board Standards, which currently includes ten standards: (1) knowledge of students, (2) responding to diversity, (3), knowledge of content, (4) learning environment and instructional practices, (5) assessment, (6) postsecondary readiness, (7) program design and management, (8) partnerships and collaborations, (9) leadership in the profession, and (10) reflective practice. While the NBPTS are more general – and can therefore encompass more specific competencies within their broad categories – other sets of standards identify specialized skills CTE teachers must possess to be effective.

Research by Fletcher and Zirkle (2011) identified pedagogical knowledge, pedagogical content knowledge, content knowledge, professional knowledge, and work experience as necessary for teacher professional development. O'Connor (2012) identified curriculum design, history and philosophy of CTE, current issues in CTE, classroom safety, course marketing,

content knowledge, lab management, advisory committees, articulation to postsecondary education and the workforce, CTSOs, teamwork, classroom management, pedagogy, assessment, WBL, and collaborating with employers. Xing, Shaw, and Gordon (2017) note that 38 states use the ACTE Quality CTE Program of Study Framework 4.0, which includes knowledge and skills CTE teachers should possess in the areas of curriculum, partnerships, sequencing, instruction, career development, data and program management, administration support, CTSOs, facilities, WBL, access and equity, assessment, and legislation. Virginia does not currently use the ACTE Quality CTE Program of Study Framework.

Identifying Professional Development Needs

A series of studies using data collected from CTE teachers in Idaho used 35 teaching and learning competencies (Cannon, Kitchel, & Duncan, 2012). The original study included a survey instrument provided to 725 Idaho CTE teachers across all CTE disciplines. A total of 446 (61%) responses were collected and analyzed using a mean-weighted discrepancy score for teacher perceived importance and self-confidence. Subsets of data from the original study were then used to determine differences amongst CTE teaching disciplines (Cannon, Kitchel, & Duncan, 2010; Cannon, Kitchel, Duncan, & Arnett, 2011; Kitchel, Arnett, Cannon, & Duncan, 2010; Kitchel, Cannon, & Duncan, 2010) and compared to data collected from Idaho superintendents and principals using the same survey instrument (Cannon, Kitchel, & Tenuto, 2013; Tenuto, Cannon, & Kitchel, 2013). Findings from this research is instructive for planning the PD CTE teachers need to improve and grow professionally.

To bridge the knowledge and skills gap that exists for new teachers, schools utilize a variety formal and informal PD practices. Table 2 identifies PD practices commonly used by

departments, schools, and school divisions as well as the knowledge and skills that could be gained through participation in the practice.

Table 2
Professional Development (PD) Practices to Support Early Career CTE Teachers

PD Practice Description	Potential Objectives of PD Practice
New Teacher Induction: Kaufmann (2007) states that teacher induction programs are "comprehensive initiations or introductions to a position that provide inexperienced teachers with the necessary models and tools for beginning their teaching careers, as well as specific guidance aimed at helping them meet performance standards."	• Orientation to school and division practices • Pedagogy practices aligned with school and division initiatives for instruction, assessment, and classroom management (Avant, 2015; Blevins, 2016; Bottoms & McNally, 2005; Camp & Heath-Camp, 1991; Joerger & Bremer, 2001; Movit, Sugar, Moore, Fedele-McLeod, Green, Jones, Miller, & Hector-Mason, 2014; Ruhland & Bremer, 2002; Wonacott, 2002)
Mentoring: The American Institutes for Research (2015) describes a mentorship relationship as "one in which one colleague supports the skill and knowledge development of another, providing guidance to that individual based on his or her own experiences and understanding of best practices."	• Improved self-efficacy for all areas related to working as a CTE teacher in the specific school setting (Avant, 2015; Blevins, 2016; Camp & Heath-Camp, 1991; Movit, et al, 2014; Reese, 2010; Ruhland & Bremer, 2002; Ruhland & Bremer, 2003; Wonacott, 2002)
Collaborative Teaching Groups / Professional Learning Communities: Pirtle and Tobia (2014) describe effective collaborative teaching groups, or professional learning communities (PLC), as meetings that engage "teachers in ongoing conversations about teaching and learning that are directly related to their daily work with students."	• Develop effective strategies for instruction and assessment • Plan differentiated instruction for diverse student populations • Improve self-efficacy of teaching ability (Blevins, 2016; Bowling & Ball, 2018; Camp & Heath-Camp, 1991; Movit, et al, 2014; Omar, Cole, & Self, 2017; Tenuto, et al, 2013)

Table 2 (continued)
Professional Development (PD) Practices to Support Early Career CTE Teachers

PD Practice Description	Potential Objectives of PD Practice
Peer Coaching: Robbins (1991) defines peer coaching as a "confidential process through which two or more professional colleagues work together to reflect on current practices; expand, refine, and build new skills; share ideas; teach one another; conduct classroom research; or solve problems in the workplace."	• Address specific needs of the new teacher as identified by either the new teacher or the peer coach • Improved self-efficacy for all areas related to working as a CTE teacher in the specific school setting (Bottoms & McNally, 2005; Camp & Heath-Camp, 1991; Ruhland & Bremer, 2002; Wonacott, 2002)
Clinical Teacher Supervision and Administrator Mentoring: Roberts and Pruitt (2003) describe clinical teacher supervision as a three-phase process used to promote learning for both the teacher and the supervisor and subsequently promote professionalism in the relationship, improve student outcomes, and the overall school environment.	• Align classroom management, instruction, and assessment practices of the new teacher with best practices used by the school and within the CTE teaching discipline • Address specific needs of the new teacher as identified by either the new teacher or the peer coach • Promote a positive and collaborative relationship between the new teacher and school administrator (Bottoms & McNally, 2005; Camp & Heath-Camp, 1991; Jacques & Ptemski, 2014; Moore, et al, 2015; Movit, et al, 2014; Ruhland & Bremer, 2003)
Workshops: Koellner and Greenblatt (2018) define teacher in-service workshops as "any learning opportunity for practicing teachers." In-service workshops typically focus on a single topic addressed in a single meeting lead by a topic expert, however workshops can also be structured to allow for teacher collaboration and peer-facilitation.	• Introduction to new strategies for any topic related to working as a CTE teacher and opportunity to envision the application with fellow teachers (Bottoms, Egelson, Sass, & Uhn, 2013; Camp & Heath-Camp, 1991; Ruhland & Bremer, 2002; Wonacott, 2002)

Table 2 (continued)
Professional Development (PD) Practices to Support Early Career CTE Teachers

PD Practice Description	Potential Objectives of PD Practice
Conferences: Wiessner, Hatcher, Chapman, & Storerg-Walker (2008) explain that conferences "offer attendees opportunities to share and receive information, stimulate creative thinking, rekindle or establish contacts, and a myriad other personal and professional objectives."	• Gain exposure to ideas and practices outside of the current teaching context • Learn new strategies for instruction, assessment, technology integration, best practices in program management, and working with diverse student populations
Industry-Based Skills Training: CTE teachers need to possess experiences from industry in order to prepare students for the workplace. Providing CTE teachers opportunities to work in those settings helps them connect the workplace skills to related classroom learning activities (Moore, et al, 2015)	• Hands-on training to learn the technical skills associated with a specific occupation • Development of lessons and activities to better align classroom practice with required workplace skills (Moore, et al, 2015; Stevens, 2018; Tenuto, et al, 2013)
Academic Coursework: Courses offered by a college or university, possibly for credit, which provides a deep theoretical grounding in the application of a specific topic related to teaching (Reese, 2010).	• Theoretical training in the application of a specific topic related to teaching, such as classroom management, reading strategies, instructional design, etc. • Coursework can be completed to fill in knowledge gaps that exist due to alternative licensure or an inadequate pre-service program (Bottoms & McNally, 2005; Reese, 2010)

New teacher induction programs are used for teachers new to the profession and for veteran teachers new to a school. These programs are commonly delivered through the use of multiple PD delivery methods, including mentoring, collaborative teaching groups, peer coaching, clinical supervision, and workshops. Doing so allows for the advantages of each PD practice to be leveraged, such as the long-term relational work done through mentoring, collaborative teaching groups, and peer coaching; addressing specific learning needs through

workshops; and using clinical observation to make recommendations for future PD practices, such as conference, industry-based skills training experiences, and academic coursework.

Since the goal of PD is to equip CTE teachers with the knowledge and skills necessary to successfully run a CTE program, the plan used for each individual CTE teacher will necessarily need to be personalized based on that teacher's learning needs and should be developed in consultation with an administrator, mentor, and/or collaborative teaching group (Manley & Zinser, 2012; Martel, 2015). These personalized plans should address the teacher's needs within the context of their teaching role, school environment, and professional characteristics (Desimone, 2009). Given the complexity of the teaching profession, PD practices need to provide teachers with research-based skills connected to the teaching discipline.

CTE Teacher Competencies

As addressed previously, the research for CTE teacher competencies covers a wide range of topics and could likely benefit from a national effort to create an updated list of competencies aligned with current research needs for the CTE teaching profession (Lambeth, Joerger, & Elliot, 2018). Until the time such an effort occurs – and in order to identify the PD needs of CTE teachers in Virginia – this study will use the competency list developed by Manley and Zinser (2012), which consists of 136 teaching competencies across 13 categories of standards. The 13 categories used were based on the National Board for Professional Teaching Standards competency list for CTE developed in 1997. The list of 13 categories is provided here, while the full list of standards can be found in Appendix B.

- Category A – Program planning, development and evaluation
- Category B – Instructional planning
- Category C – Instructional execution
- Category D – Instructional evaluation

- Category E – Instructional management
- Category F – Guidance
- Category G – School-community relations
- Category H – Career and technical student organization
- Category I – Professional role and development
- Category J – Coordination of cooperative education
- Category K – Serving student with special needs
- Category L – Assisting students in improving their basic skills
- Category M – Teaching adults

This list of competencies was selected because of its breadth and connectivity to other lists of CTE teacher competencies and/or quality teaching standards for CTE teachers. Table 3 provides a crosswalk that identifies other lists of teaching standards, many of which were described previously, and notes how those standards fit within the competency list used by Manley and Zinser (2012).

Table 3
CTE Teaching Standards Crosswalk

Research Reference	Competency/Standard List	Category in Manley & Zinser (2012)
Analysis of subject matter topics presented at AERA's CTE annual meeting (Gordon, et al, 2019). (cont.)	• Assessment	• Category D
	• Post-secondary transition	• Category A
	• Academic integration	• Category B & C
	• Alignment with federal education policy	• Category A
	• Best practices	• Categories A – M
	• Professional presentation	• Category I
	• Instructional strategies	• Categories B, C, & E
	• Economic impact of CTE	• Category A
	• Curricula designs	• Categories B & E
	• Workforce standards	• Categories B, C, D, E, & J
	• Future CTE content	• Category A
	• Programs of study	• Category A
	• STEM and technology integration	• Categories B, C, D, & E
	• Equity and diversity	• Category K
	• International CTE	• None
	• Career Exploration and Guidance	• Category F

Table 3 (continued)
CTE Teaching Standards Crosswalk

Research Reference	Competency/Standard List	Category in Manley & Zinser (2012)
Perceptions of career and technical education (CTE) teachers on indicators of teaching quality (Chenven, 2018).	• Knowledge of content and structure of discipline • Integrity and ethical conduct • Knowledge of prerequisite relationships • Expectations for learning and achievement • Importance of content and learning • Safety and accessibility of physical environment • Student interactions with other students including words and actions • Student pride in work • Communicating directions for activities • Teacher interactions with students, including words and actions	• Categories B & E • Category I • Category B • Categories B & D • Categories A & B • Category E • Category L • Category D • Categories B & C • Category C
Teaching preparedness and the professional development needs of novice career and technical education (CTE) teachers in the United States (Zulkifli, 2018).	• Planning and preparation • Classroom environment • Instruction • Professional responsibilities	• Category B • Category E • Category C • Category I
High quality career and technical education: Implications for Nevada (Xing & Gordon, 2017).	• Rigorous programs and curriculum • Effective pedagogy including WBL and dual enrollment • Integration of education and industry	• Categories A & B • Categories B, C, M, & J • Categories A, B, C, M, H, & J

Table 3 (continued)
CTE Teaching Standards Crosswalk

Research Reference	Competency/Standard List	Category in Manley & Zinser (2012)
Quality indicators guiding secondary career and technical education programs of study (Xing, et al, 2017).	• Curriculum • Industry partnerships • Course sequencing • Instruction • Career development • Program data • Administration support • CTSO • Facilities • WBL • Access and equity • Assessment • Legislation	• Category B • Category G • Category B • Categories C & D • Category F • Category A • Category A • Category H • Category E • Category J • Category B • Category D • Category A
What really works in teacher preparation programs: Teachers' self-efficacy and perceived successful methods after participation in Mississippi's career and technical education alternate route program (Pannell, 2016).	• Best practices • History and philosophy of CTE • Instructional materials • Instructional planning • Instructional strategies • Classroom assessment • Classroom management • Program development • Portfolio completion • Mentor relationships • Administrator relationships	• Categories A – M • Category A • Category B • Category B • Category C • Category D • Category E • Category A • Category D • Category I • Category A
What career and technical education teachers really want for professional learning (Moore, et al, 2015).	• Planning and organization • Instructional skills and strategies • Technical skills and strategies • Technology integration • Assessment and evaluation of student learning	• Categories A & B • Categories B & C • Categories C & L • Categories B & C • Category E

Table 3 (continued)
CTE Teaching Standards Crosswalk

Research Reference	Competency/Standard List	Category in Manley & Zinser (2012)
Identifying characteristics of technology and engineering teachers striving for excellence using a modified Delphi (Rose, et al, 2015).	• Pedagogical competence • Evaluation and assessment • Interpersonal competencies • Personal competence • Technological competence	• Categories B & C • Category D • Categories I & L • Category B • Category B
Improving the quality of technical alternative teacher preparation: An induction model of professional development and support (Bottoms, et al, 2013).	• Lesson planning • CTSOs • Classroom management • Time management • Pedagogy • Curriculum • Program • Systems • Struggling students • Students with diverse and special needs • School culture • Community	• Category B • Category H • Category E • Category B • Category C • Category B • Category A • Category A • Category K • Category K • Categories A & G • Category G
Perceived teaching and learning professional development needs of Idaho secondary career and technical education teachers (Cannon, et al, 2012).	• Teaching students to think critically and creatively • Motivating students to learn • Designing and developing digital-age learning experiences • Designing and developing digital-age learning assessments • Utilizing website development software	• Category L • Category E • Category B • Category D • Category G

Table 3 (continued)
CTE Teaching Standards Crosswalk

Research Reference	Competency/Standard List	Category in Manley & Zinser (2012)
Help wanted: Professional development and training for career and technical education faculty (Kerna, 2012).	• Knowledge and skills in related academics • Communications • Information technology applications • Safety, health, and environment • Leadership and teamwork • Ethics and responsibilities • Employability and career development • Technical skills	• Category B • Categories C & G • Category B • Category E • Category I • Category I • Category F • Categories B & C
The professional development needs of academic teachers adding career-technical education licenses (O'Connor, 2012).	• Content standards • Instructional techniques • Assessment variety • WBL • CTSO • Teamwork • Safety procedures • Lab management • Eliminating harassment • Upholding student laws • Program marketing • Preparing students for work • Collaborating with job sites • Advisory committees • Articulation	• Categories A & B • Categories B & C • Category D • Category J • Category H • Category L • Category E • Category E • Category E • Category E • Category G • Categories C, D, & J • Category J • Category A • Categories F & G

Table 3 highlights the comprehensive nature of the categories and competencies identified by Manley and Zinser (2012). Teaching competencies in other studies used for this dissertation identify only one teaching competency – awareness of international CTE programs (Gordon, et al, 2019) – that is not a competency listed by Manley and Zinser (2012). It could be argued that knowledge of other CTE programs is related to Category A – Program planning,

development and evaluation, however since it is not directly stated no connection can be assumed.

The study by Gordon, et al (2019) identified topics presented at a national conference on research topics in CTE. The inclusion of international trends is not surprising in that context. The role that knowledge of international CTE plays in the work of CTE is an emerging topic that future research should address – especially as it relates to program planning, development, and evaluation at the federal, state, and division levels. Since the focus of this study is on known CTE teacher competencies related to successful CTE programs, the topic of international CTE programs will not be addressed in the study design.

Theoretical Framework

The purpose of this study is to determine the professional development needs of public school CTE teachers in the state of Virginia. Identifying these PD needs is an early step in the larger process of improving teacher quality and student outcomes in CTE classrooms across the state. This study is built on two major premises.

The first is the concept that higher levels of teacher quality lead to improved student outcomes (Stronge & Hindman, 2003). This relationship was conceptualized by John Dewey (1938). Dewey believed that the work of teachers was to help students acquire the skills needed for modern life (Dewey, 2010). To accomplish this goal, teacher training programs must prepare teachers to be students of the profession (Dewey, 1904). In doing so, teachers will possess a passion for learning about their subject matter, about how children learn, teaching methods, and classroom management (Dewey, 2010). According to Dewey, teaching quality can be observed in the way the teacher responds to a student's evidence of learning. Great teachers are able to understand how students are engaging with content and redirect their thinking as needed (Dewey,

2010). Acquiring this skill comes from the life-long desire to grow professionally as a teacher (Dewey, 1904).

The second premise of this study is the concept that teacher PD can improve teacher quality. Guskey (1986) provides a four-phase model used to promote teacher change and improve student achievement. The first step is the application of a professional development activity. This activity changes teacher behavior. In response to the change in teacher behavior, student achievement is, ideally, increased. The observation by the teacher that student achievement has increased changes the teacher's attitudes and beliefs about the practice. This model of change is supported by Knowles' (1970) andragogy, which argues that adult learning occurs when the activity is grounded in experience.

Additional research related to the impact of teacher PD presented in this chapter generally accepts that well-constructed PD can improve teacher quality (Guskey, 2002), however meta-analytical research also notes that not all PD teachers receive is effective or research-based (Kennedy, 2016). It is therefore important to recognize the role adult learning theories play in improving the effectiveness of teacher PD as a means for improving teacher quality and student outcomes. Accordingly, Knowles' andragogy and Dewey's constructivism, as it relates to adult learners, also serve as important foundations for justifying the idea that high-quality teacher PD can change teacher quality.

Dewey and Constructivist Learning Theory

The premise that teachers know what they need to learn in order to improve their practice is grounded in constructivist learning theory. While constructivist learning theory, or constructivism, has many different variations, the basic premise shared by each is that individuals use previously constructed knowledge and experiences to make sense of their reality

(Elliott, Kratochwill, Littlefield Cook, & Travers, 2000). According to McLeod (2019), constructivism consists of five core principles: (1) knowledge is constructed as opposed to being innate to an individual or passively obtained, (2) learning only occurs through an active process, (3) social context impacts how knowledge is obtained, (4) knowledge is unique to an individual, and (5) knowledge exists in an individual's mind as opposed to being universally true. Given the unique context of each teacher's classroom and the wide variety of experiences CTE teachers have had, constructivist learning theory provides a strong framework for planning CTE teacher PD.

Origins of Constructivism

Constructivist learning theory has its roots in the work of Jean Piaget. Piaget's individual cognitive constructivism asserts that learning happens through the processes of adaptation and organization – where new knowledge is assimilated to work alongside prior knowledge and constructs for understanding are adjusted to accommodate the interweaving of both new and prior knowledge (Lamon, 2019). Later, Vygotsky built on the work of constructivism and developed a new form known as social constructivism. Social constructivism places a greater emphasis on the role of social constructs passed down to the individual. The result is that knowledge is constructed both through social norms and through individual interactions with the surrounding environment (McLeod, 2019). Radical constructivism, developed by Ernst von Glasersfeld, espouses the role of existing knowledge as a base for future learning in the same way Piaget's and Vygotsky's versions do, but goes one step further to argue that all knowledge is situated within individuals and therefore cannot reveal anything about the true nature of reality (McLeod, 2019).

Dewey's Constructivism

Constructivism provides a framework for understanding how individuals learn. Understanding how people learn is important for planning how to teach new knowledge and skills. The purpose of this study – understanding the PD needs of CTE teachers in Virginia – supposes that PD will be delivered, or taught, once the learning needs are identified (although the planning and actual delivery of PD is outside the scope of this study). By asking CTE teachers to identify their self-perceived most important PD needs, this study presupposes an individual's prior experience is both valuable and necessary for learning. Using constructivist learning theory as a framework for teaching and learning is grounded in the work of John Dewey – one of the most influential educational thinkers of the 20th century (Hildebrand, 2018).

Dewey's version of constructivist learning theory focuses on group problem-solving as a means of learning. Learners work collaboratively to test a variety of hypotheses in order to determine the outcome that occurs as a result of each set of applied factors. Importantly, the problems groups of students work to solve need to be authentic problems as opposed to contrived. The "real-world" nature of problems in Dewey's constructivism is important for teaching and learning because it requires an approach that eschews the "carte blanche" view of adult learners – in other words, "blank slates" ready to receive and internalize any information – in favor of one that grounds learning in experiences (Hildebrand, 2018; Lamon, 2019, Nebeker, 2002).

Dewey's vision for constructivist learning theory extends beyond the nature of schools as a platform for teaching and learning. Dewey's work is more a philosophy than it is an approach to teaching and learning – although his work in the area of education remains important in that area (Olusegun, 2015). In *Democracy and Education*, Dewey (1916) presents education as a

core feature of a democratic society due to its role in preparing students to participate in civic responsibilities that move all of society towards the common good. Due to the wide-ranging nature of Dewey's thoughts and works, his ideas are often cited as a foundational to the work of other education authors and researchers (Hildebrandt, 2018, Levine, 2016).

In a comparison of the application of different epistemologies in modern context, Glassman (2004) highlights Dewey's significance in shaping the discussion for the field of psychology – the field from which education was born. Understanding Dewey's original work on the relationship between learning and progress in a democratic society is another topic that modern scholars have revisited and analyzed in recent years (Garrison, 2008; Kivinen & Ristela, 2003). Others have examined how Dewey's work influences our modern views on developing a just society (Weber, 2010) and governing individual conduct (Popkewitz, 1998).

Dewey's Influence in Education Research

In the education realm, Dewey's work has been widely used as a framework for research design. Vanderstraeten (2002) examined how an overall educational program would need to be designed if Dewey's approach to constructivist learning was used as a framework for that program. Liu and Chen (2010) evaluated Taiwan's national mathematics program relative to the ideals of Dewey's constructivism in order to make recommendations to improve program outcomes. Dodd-Nufrio (2011) conducted a comparison of elementary school models relative to their use of Dewey's constructivism. Rutherford-Hemming (2012) examined the use of simulations for nursing school students based on the principles of Dewey's constructivism. Instructional strategies, such as design thinking (Scheer, Noweski, & Meinel, 2011), problem-based learning (Savery & Duffy, 1996), the integration of technology tools (Anderson, 2016), developing constructivist-centric online courses (Huang, 2002), and improving learning

outcomes in online courses (Hyslop-Margison, 2004) have also been examined in light of Dewey's work. Dewey's work also influences the design of postsecondary teacher training programs (Reich, 2007) and researchers (Postholm, 2008).

The Teacher's Role in Learning

Dewey's view of teaching requires a complex mixture of student-centered pedagogy, content-knowledge expertise, and inquiry-based instructional practices. For Dewey, a quality teacher is one who can balance each of these competing priorities in order to best prepare students with the knowledge and skills they will need to enter into society (Talebi, 2015). Despite Dewey's frustrations with the model of teacher training used by many institutions, he had a great respect for the teaching vocation and highly valued the importance of teacher training for improving the profession (Dewey, 2010). He felt strongly that the role of teacher training should be to promote a passion for the continued growth in the skills and specific intelligences required to be a teacher. By continuing to improve, teachers would pass on not only the content knowledge but also a similar attitude of lifelong learning needed by students (Talebi, 2015).

Current research on education and teacher quality commonly acknowledges the premise that teacher quality improves student outcomes (Adnot, Dee, Katz, & Wycoff, 2016; Blömeke, Olsen, & Suhl, 2016; Chetty, Friedman, & Rockoff, 2014; Koellner & Greenblatt, 2018). A synthesis of research by Hattie (2003) found that teacher quality is the most important school-related factor that contributes to student success. Research by Darling-Hammond (2000) found a positive relationship between policy-influenced measures of teacher quality, including pre-service certification requirements and professional development required for recertification, and student achievement. A meta-analysis of existing research by Kini and Podolsky (2016) found that increased teaching experience is positively associated with student achievement, teacher

effectiveness can be increased by a collegial work environment and continued experience in a school or district, and teacher experience benefits students, other teachers, and the entire school. In short, teacher quality matters (Dewey, 2010) and can be increased (Guskey, 2002).

Adult Learning Theory

CTE teachers, as adult learners, learn differently than the students they teach (Kuhn & Pease, 2006). Evidence for this idea is found in the language used to describe the process of providing instruction and activities for the purpose of learning. The term we use for children – pedagogy – is different than it is for adults – andragogy. Merriam, Caffarella, and Baumgartner's (2007) *Learning in Adulthood: A Comprehensive Guide* presents four of the major models of adult learning theory. Each of those four is described here, as well as a commonly used fifth theory, Bandura's social learning theory.

Knowles Andragogy

The first, Knowles' andragogy, outlines six assumptions that need to be made for adult learners: (1) as individuals mature they become less dependent and more self-directed, (2) adults use their lived experiences as a resource for learning, (3) an adult's social role is directly related to their willingness to learn something new, (4) adults are more inclined to learn how to solve a problem than to learn subject matter, (5) adults are more internally motivated, and (6) adults need to understand why they need to learn something. Applying Knowles' andragogy to teacher PD means that PD topics need to be directly related to a self-perceived need of the teacher and allow for self-selected learning options.

Knowles' andragogy is especially important to the design of this study due to its focus on valuing individual experience for the purpose of planning future learning activities. By asking CTE teachers about the knowledge and skills they find most important, as well as those they

most lack, this study values the experience and self-directed approach to learning espoused by Knowles. Additionally, the study assumes that CTE teachers understand the value of improving their knowledge and skills for improving student outcomes – an effect they intrinsically desire. These factors also align this study's design with the assumptions made by Knowles in the development of his model of andragogy.

McClusky's Theory of Margin

The second model is McClusky's theory of margin. This theory posits that individuals experience "load" – which consists of the activities an individual must participate in to meet his/her external responsibilities and achieve self-selected goals – and "power" – the internal skills, attributes, and motivation a person possesses, as well as the external supports available to a person. The theory of margin suggests that when an individual's "load" exceeds his/her "power" he/she possesses a negative margin greatly inhibiting that individual's ability to learn. When "power" exceeds "margin" an individual is empowered to learn new knowledge and/or skills. Applying McClusky's theory of margin to teacher PD results in a need to empower teachers by providing meaningful PD that either reduces "load" or increases "power."

Illeris' Three Dimensions of Learning

The third model is Illeris' three dimensions of learning. Illeris' model makes the case that learning happens simultaneously within three contexts – cognitive, emotional, and societal/environmental. For learning to happen in this model, the learning task and corresponding instructional activities must be cognitively understood, create a positive emotional connection, and must be necessary for an external (societal/environmental) purpose. Illeris' model has similar application principles for teacher PD to Knowles' andragogy in that the learning must be useful to the teacher, however, it differs in that it adds importance to the

creation of a positive emotional experience and the use of the learning as a method of improving the school overall instead of only the teacher.

Jarvis' Learning Process

The fourth model is Jarvis' learning process. Jarvis' learning process focuses on the previous learning experiences of an adult. Jarvis' model centers on the manner in which the learner experiences the world around him/her and suggests that past experiences influence the manner in which an individual internalizes new experiences. Jarvis' model, more so than any other model presented, situates learning in a social context. Jarvis' model highlights the need for teacher PD to be an ongoing process that includes many different learning experiences, including the teacher implementing new practices with students, over an extended period of time.

Bandura's Social Learning Theory

A fifth model of learning, not presented in *Learning in Adulthood: A Comprehensive Guide,* is Bandura's (1971) social learning theory. Bandura's social learning theory proposes that individuals learn primarily through direct experience and by observing others through a process Bandura refers to as modeling. Social learning theory explains how people learn by examining the way people behave in response to their environment and the environment's response to people's actions. Bandura (1986) called this dynamic interaction between people and their environment "reciprocal determinism." Bandura's theory of social learning suggests that teacher PD needs to be responsive to the environment the teacher works within and provide the teacher strategies to impact his/her environment in order to improve student achievement.

Adult Learning Theory and Teacher Professional Development

The five models presented espouse important differences related to how adults learn, however each of the five models presented has at its core a focus on the role of experience for

learning. Experience is an important aspect of effective teacher PD, because it impacts learner motivation, influences how we understand and internalize new experiences and information, and provides a context within which learners can situate new learning.

The focus on experience is especially important for this study. Asking CTE teachers for their opinion on their most important PD needs assumes that CTE teachers' experiences enable them to recognize how they need to improve their practice. If CTE teachers are not able to make informed decisions on their PD needs, this study could not produce findings capable of improving teacher effectiveness and, in turn, student achievement. The principles of adult learning theory presented assume that past experience is necessary for future learning to produce change. When aligned with theories of adult learning, teacher PD provides new experiences that result in new knowledge, skills, and understandings needed to change teacher practice.

Borich Needs Assessment Model

The Borich Needs Assessment Model (BNAM) is a five-step process devised to assess the effectiveness of a training program. Borich (1980) explains that the first step is to develop a list of competencies to be assessed by program participants – in this case teachers. The second step is to survey the target group of teachers to gather their collective opinion about the importance of those competencies and their current level of competency attainment. The third step in the process is to develop a ranking of those competencies through a mean weighted discrepancy score (MWDS). The MWDS evaluates the difference between perceived importance of the competency and competency expertise as self-reported by teachers in the survey (Perkins, Hall, Sorensen, Dallin, & Francis, 2017). This allows for the competencies with the greatest discrepancy between what is important and what can be done to be ranked highest. The fourth step is to compare the competencies with the highest ranking to the competencies

currently provided in training programs. The fifth and final step is to revise the training program to better meet the needs of the teacher participants or to revise the competencies to better align with the training needs reported by teachers. Neither the fourth nor fifth steps will be used in the data analysis for this study. This study seeks to identify the training needs of current CTE teachers in Virginia.

Basis for the Borich Needs Assessment Model

Borich (1977) believed that training should be targeted around providing teachers with the skills, knowledge, and behaviors they most needed to perform the tasks required of them. Borich (1977) felt that needs were better expressed by the teacher – as opposed to administrators and teacher trainers – who are best able to identify the ways in which they need to improve upon their work. Waters and Haskell (1988) note that gathering data from potential trainees and actively involving them in the process of identifying training program goals increases the likelihood of providing meaningful competency training and achieving the desire goals. Saucier and Langley (2017) noted that the BNAM assessed individual competence from three areas: knowledge, performance, and consequences. These three areas combine to inform a teacher's perspective on importance of a teaching competency and need for additional training in that competency.

Borich's model has been adapted by other researchers to allow for different foci and/or research goals. Barrick, Ladewig, and Hedges (1983) used a modified version of the BNAM to collect teacher survey responses in three areas: importance, knowledge, and application. In this version a chi-square is used to determine relative importance instead of the MWDS. This adaptation enabled researchers to include student outcomes (consequences) in their calculation of teacher needs. Other researchers have used the BNAM to provide direction on yet-to-be-

determined teacher PD programs (Cannon, Kitchel, & Duncan, 2010). This model is used more for program planning as opposed to program evaluation and revision as originally envisioned by Borich (1980).

This study uses a version of the BNAM as a tool to identify potential PD teachers needs in a way that makes its purpose most similar to that of Cannon, Kitchel, and Duncan (2010). The BNAM was selected as an appropriate tool for this study specifically because of its previous use in identifying CTE teacher PD needs and more generally because of its wide use in the field of vocational education (Newman & Johnson, 1993).

Prior Uses of the Borich Needs Assessment Model

The BNAM has been widely used in research on competency needs of agriculture educators in the United States and abroad. Examples of this practice from the U.S. include its use to identify training needs of entry-level agriculture teachers in Missouri (Garton & Chung, 1996; Garton & Chung, 1997), Texas (Edwards & Briers, 1999) and Minnesota (Joerger, 2002), technical training needs of teachers in Mississippi (Newman & Johnson, 1993) and Georgia (Peake, Duncan, & Ricketts, 2007), PD needs of veteran teachers in Nevada (Waters & Haskell, 1988), South Carolina (Layfield & Dobbins, 2002), Utah (Sorensen, Tarpley, & Warnick, 2010; Perkins, Hall, Sorensen, Dallin, & Francis, 2017) and Iowa (Smalley, Hainline, & Sands, 2019), to determine Texas teachers' ability to use Computer Numerical Control (CNC) plasma arc cutting (Saucier & Langley, 2017), for the design of PD that prepares teachers to teach more diverse and meaningful curriculum in Georgia (Duncan, Ricketts, Peak, & Uesseler, 2006) and Alabama (Clemons, Heidenreich, & Lindner, 2018), to identify the knowledge, perceived importance, and ability of FAA-connected teacher sponsors to teach 21st century learning skills (Weeks, 2019), to determine the learning needs of Texas teachers in the area of social-emotional

learning (Yopp, McKim, Moore, Odom, & Hanagriff, 2017), and as a means to improve program meeting attendance by Ohio cooperative extension agents (Conklin, Hook, Kelbaugh, & Nieto, 2002).

The BNAM has been used for a wide variety of purposes internationally as well. Abroad, the tool has been used to determine the gap between academics and industries for the purpose of e-commerce training in the United States, Taiwan, and Japan (Li, 2017), Korean university student perceptions and attitudes towards character education – specifically corporate social responsibility, ethics, self-reflection, and control concerns (Park & Huh, 2019), the needs of Nigerian agriculture extension agents to help farmers improve their livelihood opportunities (Alabi & Ajayi, 2018), the training needs of Bangladeshi shrimp farmers who need to adjust to changes in environment due to climate change (Ahsan, Akber, Islam, Rahman, & Rahman, 2017), sustainability training needs of Iranian extension agents (Alibaygi & Zarafshani, 2008), training needs of agriculture extension workers by province in Iraq (Man, Saleh, Hassan, Zidane, Nawi, & Umar, 2016; Saleh, Sahih, Hassan, Nawi, Mohammed, 2016; Saleh, Man, Muktar, Zidane, & Mohammed, 2017; Saleh & Man, 2017), the impact of training on job satisfaction for agriculture workers in Iraq (Saleh, 2018), and competence level and training needs of Iranian farmers with pest management practices (Hashemi, Hosseini, & Damalas, 2009).

Given the use of the BNAM to determine training needs in a wide variety of disciplines, including the business, marketing, family and consumer sciences, and technology education disciplines for CTE teachers in Iowa (Cannon, Kitchel, & Duncan, 2010), the tool is well suited to appropriately assess the self-perceived PD needs of Virginia CTE teachers. By evaluating the discrepancy between perceived importance and teacher competency, appropriate PD can be designed to improve teacher competency in the defined target areas.

Summary

The idea that modern day CTE programs are significantly different than the apprenticeship guild models that began in the middle ages – as well as the more recent vocational training model designed for jobs created during the industrial revolution – is one that most educators, economists, employers, and legislators would agree with. What is less clear to many is the most appropriate role of CTE programs in preparing students for the workplace and lifelong learning activities that happen after high school. The postsecondary paths available to students are the most varied they have ever been. The idea that obtaining a college degree is the only path to success and that anything less than that leads to workplace and economic hardship is an antiquated idea that no longer aligns with the current reality. The demand and accompanying opportunities for personalized customization of those paths means that schools and teachers need to have a wider variety of skills than ever before.

Additionally, the current state of teacher recruitment and retention efforts means that training opportunities for CTE teachers are more important than they ever have been. There is currently a high percentage of CTE teachers entering the profession through alternative licensure programs, resulting in significant training needs that address topics those teachers did not learn during their preparation programs – especially those that use condensed program training models commonly found in ALT. As more teachers enter the classroom underprepared to be successful teachers, the result will be increased turnover rates and decreased student outcomes – especially for teachers and schools with the most at risk student populations.

The need that currently exists to support the work of CTE teachers is great. Providing a coordinated effort to create customized PD that addresses the specific needs felt by Virginia CTE teachers can positively impact the teaching profession, student academic and workforce

outcomes, local business and industry, and the nation's economy. By identifying the professional development needs of CTE teachers across the state of Virginia, this study is intended to be a first step in that process. The study uses survey results from current CTE teachers in Virginia to determine their self-reported perceived importance of and current ability to utilize a wide range of teacher competencies as identified in research by Manley and Zinser (2012). A detailed description of the methods used for this study can be found in Chapter Three.

CHAPTER THREE

METHODOLOGY

Chapter three begins with the statement of the problem, a brief review of its purpose, and the research questions to be answered by conducting the study. It then provides a detailed description of the study's research design, sampling method, survey instrument, data collection procedures, and data analysis approach.

Statement of the Problem

At present, the CTE teaching profession suffers from a shortage of qualified teachers entering the profession. Additionally, research by the American Institutes for Research (2015) found that experienced CTE teachers report needing additional training in order to operate their programs. Under ESSA and Perkins V, school divisions are responsible for preparing all students for college and career success. Running a CTE program requires a combination of knowledge-bases and skill-sets aligned with the college- and career-readiness goals of the school division and CTE best practices. Given the wide variety of ways that CTE teachers enter the profession, as well as the varying demands associated with the different CTE disciplines and the individual complexities of the diverse school contexts across the state of Virginia and the country, it goes to reason that not all CTE teachers possess the same knowledge-bases and skill-sets nor do they necessarily possess the knowledge-bases and skill-sets needed for their CTE program. Therefore, the problem to be addressed in this study is to identify professional development topics that CTE teachers in Virginia believe they need training in, so that they are better prepared to provide comprehensive and high quality CTE programs.

Purpose of the Study

There are currently multiple licensure routes available for individuals interested in

becoming a CTE teacher. Increasingly, CTE teachers are entering the profession through alternative teacher licensure (ATL) programs. These programs often require some amount of industry experience, but often do not provide a foundation in one or more important aspects related to running and managing a CTE program (Darling-Hammond, Holtzman, Gatlin, & Vasquez Heilig, 2005). The other prominent entry route into the teaching profession for CTE teachers is directly from a teacher pre-service training program. Teachers who enter through this route often lack the work and industry experiences that enables teachers to help students make connections between the work done in the classroom and the work performed as a member of the workforce (Moore, Green, & Clark, 2015).

Experience working as a CTE teacher can help novice teachers gain the knowledge and skills they lack when they enter the profession, but that necessitates working in an environment that provides those opportunities. Unfortunately, many CTE programs and departments lack important program components at an institutional level (Alfed, et al, 2007; Threeton, 2007). These missing components make it difficult for novice CTE teachers to learn new knowledge and skills that would benefit their programs. Therefore, the purpose of this study is to identify and prioritize the self-perceived PD needs of CTE teachers in Virginia.

Research Questions

The study is guided by seven primary research questions.

1. What knowledge-bases and/or skill-sets do CTE teachers in Virginia identify as those most important to the CTE program they currently work within?

2. What professional development topics do CTE teachers feel are most needed relative to the knowledge-bases and/or skill-sets identified as most important to their program?

3. What relationship do demographics, including gender, ethnicity, and intention to stay in the teaching profession, have with the teacher's perceived professional growth needs?

4. What relationship does the CTE program area a teacher works within have with the teacher's current perceived professional growth needs?

5. What relationship does the number of years of experience a CTE teacher possesses have with the teacher's perceived professional growth needs?

6. What relationship does the school division a teacher works within have with the teacher's current perceived professional growth needs?

7. What relationship does the type of pre-service training a CTE teacher received have with the teacher's current perceived professional growth needs?

Research Design

This study used survey research and voluntary sampling to collect and analyze data related to the study's purpose and associated research questions. Survey research uses a non-experimental design that "provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population" (Creswell & Creswell, 2018, p. 12). This study used a cross-sectional, electronic survey distributed to Virginia public school CTE teachers via email. The use of data collected from a cross-sectional survey allows the researcher "to make inferences about a population of interest (universe) at one point in time" (Lavrakas, 2008). The electronic dissemination method allows for the survey to be delivered to a large number of potential respondents simultaneously. Surveys are also known to be a cost efficient method of collecting data (West, 2019).

Given that the survey for this study was distributed to all public school CTE teachers in Virginia, it cannot be expected that all potential respondents completed the survey. Therefore, the sample from the overall population was drawn through voluntary sampling. Voluntary sampling is a form of non-probability sampling. This form of sampling selects members from the potential respondents for the final sample based on the respondent's willingness to complete the survey (Murairwa, 2015). Murairwa (2015) presents a model for conducting a five-step voluntary survey. Those steps include: (1) determine the research problem and objectives, (2) identify the target population, (3) publish intent to survey and invite volunteers, (4) conduct a

trial run sampling, and (5) implement voluntary sampling design. This study utilized the model presented by Murairwa (2015). The research problem and objectives are presented at the beginning of this chapter. The four remaining steps are presented throughout the duration of this chapter.

Survey response data were used to determine mean-weighted discrepancy scores (MWDS) and to disaggregate MWDS based on teacher demographic data. MWDS calculate the mean of all survey respondents for each of the two categories, (1) relevant for success as a CTE teacher and (2) current attainment level, then subtracts the mean of factor one (1) from the mean of factor two (2). A large MWDS shows that the teacher feels the competency is more important than their current level of ability. A small, or negative, MWDS shows that the teacher feels the competency importance either matches or is exceeded by their ability (Borich, 1980).

Data collected with the survey identifies professional development needs of CTE teachers in Virginia as a whole and within various groups as outlined in research questions three through seven. Strata were defined by the demographic data collected in the survey. This includes gender, ethnicity, anticipation to remain in the teaching profession, CTE program area, years of teaching experience, school division, VDOE region, and type of preservice training / initial teacher licensure.

Population Sample

This study used voluntary sampling to collect data from study respondents. The sample were selected from current CTE teachers working in Virginia public schools. During the 2020 Virginia Association for Career and Technical Education Professional Development and Leadership Seminar, Jones and Smith (2020) shared that there are currently 6,164 CTE teachers working in Virginia Public Schools. Surveys will be distributed to CTE teachers through school

district CTE administrators and VDOE CTE program specialists. Teachers who voluntarily participate in the study will be included in the sample.

Instrumentation

The survey instrument used in this study consists of two parts, both of which were developed using Qualitrics© online survey software. Part one of the study instrument includes seven demographic questions. Questions in part one cover the topics addressed in research questions three through seven: gender, ethnicity, desire to remain in the teaching profession, current CTE program area teaching assignment, number of years of teaching experience, current school division and VDOE region, and type of pre-service training. The second part of the instrument uses a five-point Likert-type scale to collect data on the ratings for teaching competencies that Virginia CTE teachers (1) feel are most important to their success as a CTE teacher and (2) identify as their current level of ability for that competency. The survey includes the 136 teaching competencies, broken up into 13 categories, identified by Manley and Zinser (2012). Qualitrics © estimates the survey will take 30 minutes to complete.

Validity

Validity refers to the ability of an instrument to accurately measure what it is intended to measure. Research that sought to determine the PD needs of CTE teachers in the state of Iowa conducted by Cannon, Kitchel, and Duncan (2012) identified face, content, and construct validity as important to their study. Face validity asks if "a measure reflects what it is intended to measure" (Hardesty & Bearden, 2004). Content validity asks if "items measure the content they were intended to measure" (Creswell & Creswell, 2018, p. 153). Construct validity asks if "items measure hypothetical constructs or concepts" (Creswell & Creswell, 2018, p. 153).

Face validity for this survey was assessed through the use of peer-review. The survey

was sent to a group consisting of current university faculty, Ph.D. candidates in Curriculum and Instruction with experience in the field of CTE, current public school CTE teachers, and pre-service CTE teachers. Content and construct validity have been previously assessed for the competencies used in this study through subject matter experts (SMEs), a method used to assess validity in previous research on the professional development needs of CTE teachers (Cannon, Kitchel, & Duncan, 2012; Drage, 2010). The 136 teaching competencies used for this study were developed from the results of a Delphi study conducted by Manley and Zinser (2012). Given the use of the Delphi method to create the list of items used for this survey, a validity check through the use of SMEs has already occurred.

Reliability

Reliability is concerned with the consistency of results when the instrument is administered repeatedly. Previous research that sought to assess the reliability of a survey instrument used to determine PD needs of CTE teachers used Cronbach's alpha to test for reliability (Cannon, Kitchel, & Duncan, 2012; Drage, 2010). A pilot test was used to collect data to determine the reliability of the survey instrument through a measurement and calculation of Cronbach's alpha. Cronbach's alpha was calculated from the data in the full study.

Pilot Test

A pilot test was administered to help assess the validity and reliability of the new instrument and also enhance the instrument's credibility and usability in the full study. The pilot study was sent to a group of Ph.D. candidates in Curriculum and Instruction with experience in the field of CTE, current public school CTE teachers, and pre-service CTE teachers. Primarily, the pilot study was used to determine what changes, if any, needed to be made to the survey instrument to improve the clarity and usability of the instrument before the full survey was sent

out to be completed. Additionally, data collected in the pilot study was used to calculate Cronbach's alpha for reliability. Responses to the pilot study were used to determine if all necessary data was collected in order to perform the data analysis for the study. This process required entry of all pilot study data into Excel in order to determine the MWDS scores for the pilot study sample and disaggregate the data to calculate MWDS scores based on respondents' demographic data.

Data Collection

Prior to distribution of electronic surveys, email invitations were sent to school division CTE directors asking for their support distributing the survey (Appendix C). Sending communication through local CTE directors was done to help ensure the survey was distributed to as many of the 6,164 Virginia CTE teachers as possible. Once the study received dissertation committee and IRB approval, as well as went through the pilot study process, the survey instrument was distributed. An email containing a brief statement of purpose for the survey, an explanation of anonymity provided for the survey respondents, directions for completing the survey, and a link to the survey were sent to the CTE directors to distribute to CTE teachers in their school divisions and program areas respectively (Appendix E).

The email communication provided to the CTE directors was sent one month prior to the distribution deadline. CTE directors were asked to include the researcher as a cc or bcc on the email distribution to CTE teachers in order to confirm the survey had been distributed. CTE directors who would prefer the email communication to come directly from the researcher were given the option to share their distribution list with the researcher in order for the original email to come from him instead of sending the email themselves. A reminder email was sent to CTE

directors who did not confirm distribution of the survey one week prior to the distribution deadline (Appendix E).

The survey link was generated from Qualtrics©, the program used to develop and deliver the survey (Appendix F). The survey was completed by CTE teachers through the use of a Web browser on their internet-enabled electronic device. Respondents were taken to the survey by clicking on the link provided in the email. Upon completion of the survey, respondents were provided with a "thank you" message on the final screen. Data was collected in real-time through Qualitrics© and exported for analysis via statistical software at the close of the survey window.

Data Analysis Procedures

To analyze the data collected, this study used a mean-weighted discrepancy score (MWDS) to calculate the difference between the mean scores for (1) a competency's importance for the work of the CTE teacher and (2) the teacher's current ability level for the specific competency. The MWDS was calculated for each of the 136 competencies. The data was then be disaggregated based on demographic data collected, including: (1) gender, (2) ethnicity, (3) anticipation to stay in the teaching profession, (4) current CTE program area, (5) years of teaching experience, (6) school division, (7) VDOE region, and (8) type of preservice training / initial teacher licensure type. Comparisons of groups within each demographic subgroup category were done through the use of Kruskal-Wallis one-way analysis of variance test by ranks for three or more subgroups and through the use of Mann-Whitney U testing to compare two groups. Kruskal-Wallis one-way analysis of variance test by ranks and Mann-Whitney U testing are non-parametric tests similar to ANOVA testing and Student t-tests, respectively. Non-parametric testing was used to compare subgroup categories due to fact that competency

rankings were being compared resulting in a non-Gaussian distribution and the use small datasets for many of the subgroups (Motulsky, 1995). Data analysis was conducted using statistical tools in Microsoft Excel.

Summary

This chapter detailed the research design, population sample, survey instrument, data collection procedures, and data analysis used for the study. Descriptions of the target population, procedures used to the address the research questions posed, and data analysis procedures used to answer each research question are included.

CHAPTER FOUR

RESULTS

Since their inception with the Smith-Hughes Act in 1917, Career and Technical Education (CTE) programs have regularly changed and adapted to meet the needs of both students and employers. The mindset guiding the mission of today's secondary CTE programs is grounded in the need to prepare students for both postsecondary education and the workforce since all students will need to matriculate to at least one of those areas after completing secondary education, although the majority will need to enter both at some point in their adult lives (Baum, Kurose, and McPherson, 2013; Dellarocas, 2018). Working towards accomplishing this goal means that secondary CTE programs must regularly adapt to the shifts that occur within the economy, workforce, and with postsecondary education providers (Heyward, 2019).

Creating and maintaining the highly adaptable programs that prepare students to achieve the high expectations required for postsecondary education and the workforce is only accomplished by equipping CTE teachers with the necessary knowledge and skills to do so. For CTE teachers, regular professional development is a necessary part of their work. Well planned and executed professional development can be effective for improving teacher practice and improving student outcomes (Kennedy, 2016). Unfortunately, teacher professional development often lacks strategic principles. The result is ineffective training that does not meet the needs of teachers (Rucker, 2018).

The purpose of this study was to identify the self-perceived professional development needs of CTE teachers in the state of Virginia. This analysis is intended to provide useful guidance to CTE leaders at the state and local levels, as well as to schools and other professional development providers as they plan for future professional development offerings. The study

used the Borich Needs Assessment Model (BNAM) to generate a ranking of the professional development topics most in demand for Virginia CTE teachers based on an existing list of CTE teacher competencies developed by Manley and Zinser (2012). The study uses a quantitative approach to answer its research questions. This chapter provides the results of the data analysis and findings for the study relative to the stated research questions.

Research Questions

The study was guided by the following research questions:

1. What knowledge-bases and/or skill-sets do CTE teachers in Virginia identify as those most needed to improve the CTE program they currently work within?

2. What professional development topics do CTE teachers feel are most needed relative to the knowledge-bases and/or skill-sets identified as most important to their program?

3. What relationship do demographics, including gender, ethnicity, and intention to stay in the teaching profession, have with the teacher's perceived professional growth needs?

4. What relationship does the CTE program area a teacher works within have with the teacher's current perceived professional growth needs?

5. What relationship does the number of years of experience a CTE teacher possesses have with the teacher's perceived professional growth needs?

6. What relationship does the school division a teacher works within have with the teacher's current perceived professional growth needs?

7. What relationship does the type of pre-service training a CTE teacher received have with the teacher's current perceived professional growth needs?

Pilot Study

A pilot study was conducted in June 2020. The pilot study included a ten-member respondent group made up of university faculty working in the area of CTE, pre-service secondary CTE teachers, graduate students studying CTE, and current CTE teachers. This group size and composition is similar to other studies which used the BNAM to identify professional development needs of CTE teachers (Cannon, et al, 2011; Drage, 2010). The instructions

provided, approach used to collect demographic data, and format of the survey did not present any issues for respondents of the pilot study. Data collected for the pilot study resulted in a Cronbach's alpha of .645. The pilot study took participants 21 minutes and 46 seconds on average to complete. No changes were made to the survey instrument based on results from the pilot study.

Study Respondents

Study respondents were CTE teachers from Virginia public school divisions. Respondents represent teachers from 28 of 133 school divisions in Virginia and include teachers from each of the eight CTE content areas identified in the state of Virginia as well as teachers from JROTC programs which are often included under CTE program supervision in many Virginia school divisions.

On Monday, August 3, 2020, the survey instrument was opened to school divisions and a link to the Qualtrics© survey was distributed to school division CTE directors across the state. CTE directors in school divisions that opted not to participate in the study were not included in the email. Issues related to the COVID-19 pandemic, shifting to online and hybrid learning models, and trying not to ask any more of teachers were reasons given by school divisions who opted out of the study. School divisions who opted not to participate included Arlington Public Schools, Chesterfield County Public Schools, Fairfax County Public Schools, Frederick County Public Schools, Gloucester County Public Schools, Hanover County Public Schools, Loudon County Public Schools, and Prince William County Public Schools. School division CTE directors were made aware of the study through an email sent on July 14, 2020. The survey remained open for teachers to complete between Monday, August 3, 2020 and Friday, October 23, 2020. No incentives were offered by the researcher for study participation.

Survey Response Collection

Respondents completed the survey using Qualtrics© online software. Data collected in Qualtrics© was downloaded as a .csv file and opened using Microsoft Excel spreadsheet software. Incomplete survey responses were removed from the dataset. The resulting dataset included demographic data, as well as importance scores and ability scores for each of the 136 competencies presented by the survey. A total of 102 (*n*) completed responses were recorded and used in the data analysis for this study. An additional 78 responses were started but not completed and therefore were not used in the data analysis. Cronbach's alpha for the completed responses was .964, indicating strong internal validity.

Responses from 102 Virginia CTE teachers represents a 2% response rate given a population of 6,164 (*N*); however, given the known number of schools who opted out of study participation and the unknown number of CTE teachers who were never provided with the opportunity to participate due to their division's CTE director not sharing the survey, the actual number of possible participants is likely considerably smaller than 6,164. As a reference point, the total secondary student population for the schools that opted-out of the study represents 38% of the secondary student population in Virginia (Virginia Department of Education, 2020). The percentage of all secondary students in the state of Virginia represented by school divisions that had at least one participant and did not opt out was 14%.

Demographic Data

Table 4 presents the demographic data collected from the survey respondents.

Table 4
Demographics of Virginia CTE Teacher Survey Respondents

Demographic Category	*n*	%
Gender		

Female	65	64%
Male	37	36%
Ethnicity		
Black or African American	14	14%
Hispanic or Latino	1	1%
Other	2	2%
White	85	83%
Expectation to Stay in the Teaching Profession		
Anticipates Leaving Teaching in Next Five Years	4	4%
Anticipates Remaining in Teaching for Next Five Years	85	83%
Unsure About Remaining in Teaching for Next Five Years	13	13%
CTE Content Area		
Agriculture Education	7	7%
Business & Information Technology	21	20%
Career Connections	1	1%
Family & Consumer Science	20	19%
Health & Medical Science	5	5%
JROTC	2	2%
Marketing Education	17	17%
Technology Education	15	15%
Trade & Industrial Education	14	14%
Virginia School Division Region		
Region One	8	8%
Region Two	13	13%
Region Three	10	10%
Region Four	13	13%
Region Five	11	11%
Region Six	30	29%
Region Seven	14	13%
Region Eight	3	3%

Note. Virginia CTE teacher population (N = 6164). Survey sample (*n* = 102).

Table 4 (continued)
Demographics of Virginia CTE Teacher Survey Respondents

Demographic Category	*n*	%
Years of Teaching Experience		

0-3	17	16%
4-9	14	14%
10-14	16	16%
15+	55	54%
Teacher Preservice Training Route		
Alternative Licensure Program	14	14%
College or University Preservice Training Program	45	44%
Reciprocity from Another State	8	8%
Technical Professional License	17	17%
Three-Year Provisional License	18	17%

Note. Virginia CTE teacher population (N = 6164). Survey sample (*n* = 102).

Results from the BNAM Survey Data

The Borich Needs Assessment Model (BNAM) uses respondent scores for two factors on the same topic to calculate a Mean Weighted Discrepancy Scores (MWDS). For this study, the topics were the teacher competencies presented and the two factors were importance to teaching practice (importance) and teacher ability to implement (ability).

Importance & Ability

Table 5 presents the mean average importance score and mean average ability score for each of the 136 teaching competencies used for this study.

Table 5
Importance and Ability Means for CTE Teacher Competencies

CTE Teacher Competency	Importance			Ability		
	n	Mean	S.D.	*n*	Mean	S.D.
Category A: Program planning, development and evaluation						
Develop program goals and objectives (A.1)	102	4.67	0.63	100	4.35	0.78
Conduct a course of study based on industry or state standards (A.2)	98	4.46	0.75	97	4.11	0.92
Develop long-range plans (A.3)	102	4.44	0.73	100	4.01	0.95
Evaluate CTE programs (A.4)	100	4.22	0.99	98	3.88	1.07
Collaborate with other CTE teachers and administrators to plan, develop, and evaluate a CTE program (A.5)	102	4.50	0.77	100	3.95	1.15
Organize and maintain an occupational advisory committee (A.6)	102	3.73	1.24	100	3.12	1.37
Search for existing regional employment forecasts (A.7)	101	3.94	1.13	99	3.40	1.32
Conduct an occupational analysis (A.8)	102	3.67	1.13	100	3.14	1.31
Prepare, conduct, and report community survey (A.9)	102	3.40	1.22	100	3.06	1.43
Category B: Instructional planning						
Develop a unit of instruction (B.1)	101	4.74	0.52	102	4.65	0.54
Research and select instructional materials (B.2)	101	4.72	0.57	102	4.52	0.74
Develop student performance objectives (B.3)	101	4.52	0.70	102	4.46	0.75

Note. The range of possible importance and ability means is between 1.00 and 5.00. A mean of 1.00 represents low level of importance and/or ability. A mean of 5.00 represents a high level of importance and/or ability. Importance means range from 4.97 to 2.85 with a mean average of 4.30 and median average of 4.41. Ability means range from 4.71 to 2.90 with a mean average of 3.96 and median average of 4.02.

Table 5 (continued)
Importance and Ability Means for CTE Teacher Competencies

CTE Teacher Competency	Importance			Ability		
	n	Mean	S.D.	*n*	Mean	S.D.
Category B: Instructional planning (continued)						
Determine needs and interests of students (B.4)	100	4.73	0.57	102	4.45	0.77
Prepare teacher-made instructional materials (B.5)	100	4.49	0.81	102	4.47	0.85
Develop a lesson plan (B.6)	100	4.43	0.88	102	4.62	0.66
Integrate academic instruction within CTE courses (B.7)	100	4.36	0.81	102	4.30	0.81
Category C: Instructional execution						
Direct students in applying problem-solving techniques (C.1)	102	4.78	0.44	101	4.33	0.79
Present information using instructional videos (C.2)	102	4.02	0.90	101	4.34	0.83
Employ reinforcement techniques (C.3)	102	4.52	0.61	100	4.33	0.78
Introduce a lesson (C.4)	102	4.62	0.65	101	4.71	0.54
Demonstrate a concept or principle (C.5)	102	4.75	0.48	101	4.64	0.54
Direct student lab experience (C.6)	102	4.63	0.80	101	4.45	0.89
Provide instruction for slower and more capable learners (C.7)	102	4.62	0.69	101	4.09	0.87
Employ oral questioning techniques (C.8)	102	4.55	0.62	101	4.48	0.67
Summarize a lesson (C.9)	102	4.51	0.71	101	4.56	0.62

Note. The range of possible importance and ability means is between 1.00 and 5.00. A mean of 1.00 represents low level of importance and/or ability. A mean of 5.00 represents a high level of importance and/or ability. Importance means range from 4.97 to 2.85 with a mean average of 4.30 and median average of 4.41. Ability means range from 4.71 to 2.90 with a mean average of 3.96 and median average of 4.02.

Table 5 (continued)
Importance and Ability Means for CTE Teacher Competencies

CTE Teacher Competency	Importance			Ability		
	n	Mean	S.D.	*n*	Mean	S.D.
Category C: Instructional execution (continued)						
Employ the project method (C.10)	102	4.45	0.67	101	4.39	0.81
Direct field trips (C.11)	102	4.05	1.09	101	3.97	1.27
Employ simulation techniques (C.12)	101	4.38	0.85	101	4.12	0.96
Present information using a variety of internet resources (C.13)	102	4.30	0.78	100	4.48	0.69
Demonstrate a manipulative skill (C.14)	102	4.33	0.94	101	4.30	0.84
Individualize instruction (C.15)	102	4.54	0.70	101	4.02	1.01
Guide student study (C.16)	101	4.24	0.85	101	3.95	0.98
Use subject matter experts to present information (C.17)	102	4.23	0.91	101	3.81	1.14
Present information using a variety of electronic media (LCD projector, tablet, document camera, interactive whiteboard, clickers, etc.) (C.18)	102	4.41	0.72	101	3.95	0.86
Direct students in instructing other students (C.19)	101	4.43	0.74	101	4.10	0.95
Present information with models and real objects (C.20)	101	4.59	0.70	101	4.35	0.88
Present information using presentation software (PowerPoint, Keynote, etc.) (C.21)	100	4.27	0.99	99	4.59	0.69

Note. The range of possible importance and ability means is between 1.00 and 5.00. A mean of 1.00 represents low level of importance and/or ability. A mean of 5.00 represents a high level of importance and/or ability. Importance means range from 4.97 to 2.85 with a mean average of 4.30 and median average of 4.41. Ability means range from 4.71 to 2.90 with a mean average of 3.96 and median average of 4.02.

Table 5 (continued)
Importance and Ability Means for CTE Teacher Competencies

CTE Teacher Competency	Importance			Ability		
	n	Mean	S.D.	*n*	Mean	S.D.
Category C: Instructional execution (continued)						
Present an illustrated talk (C.22)	100	3.93	0.97	100	3.89	1.10
Conduct group discussions, panel discussions, and symposiums (C.23)	101	3.97	0.95	101	3.79	1.10
Present information with televised and videotaped materials (C.24)	101	4.35	1.07	100	4.15	0.98
Employ the brainstorming technique (C.25)	101	3.83	0.82	101	4.19	0.91
Employ a team-teaching approach (C.26)	100	4.01	1.03	100	3.83	1.20
Prepare programmed instruction (C.27)	101	3.94	1.03	98	3.89	1.03
Prepare bulletin boards and exhibits (C.28)	101	3.48	1.26	101	3.90	1.23
Present information with the whiteboard (C.29)	101	3.77	1.16	101	4.20	0.94
Present information with overhead and opaque materials (C.30)	101	2.85	1.60	101	3.32	1.63
Present information with audio recordings (C.31)	100	3.47	1.31	100	3.85	1.23
Employ the question box technique (C.32)	101	3.17	1.29	101	3.28	1.44
Employ the buzz group technique (C.33)	101	2.90	1.32	101	2.90	1.43
Present information with a flip chart (C.34)	101	2.85	1.40	100	3.37	1.48

Note. The range of possible importance and ability means is between 1.00 and 5.00. A mean of 1.00 represents low level of importance and/or ability. A mean of 5.00 represents a high level of importance and/or ability. Importance means range from 4.97 to 2.85 with a mean average of 4.30 and median average of 4.41. Ability means range from 4.71 to 2.90 with a mean average of 3.96 and median average of 4.02.

Table 5 (continued)
Importance and Ability Means for CTE Teacher Competencies

CTE Teacher Competency	Importance			Ability		
	n	Mean	S.D.	*n*	Mean	S.D.
Category D: Instructional evaluation						
Assess student performance – skills (D.1)	101	4.79	0.54	101	4.46	0.82
Evaluate instructional effectiveness (D.2)	101	4.65	0.56	101	4.22	0.88
Assess student performance – knowledge (D.3)	101	4.75	0.52	101	4.49	0.69
Establish student performance criteria (D.4)	101	4.63	0.58	101	4.42	0.77
Assess student performance – attitudes (D.5)	101	4.63	0.58	101	4.22	0.93
Determine student grades using formative and summative assessments (D.6)	101	4.59	0.72	100	4.48	0.76
Search for industry-related assessments for use in class (D.7)	101	4.31	0.90	101	4.01	1.08
Category E: Instructional management						
Provide for student safety (E.1)	100	4.97	0.17	99	4.58	0.87
Project instructional resource needs (E.2)	100	4.59	0.55	99	4.18	0.97
Assist students in developing self-discipline (E.3)	100	4.71	0.50	99	4.07	0.97
Manage the CTE lab (E.4)	100	4.54	1.00	100	4.32	1.13
Maintain a filing system (E.5)	100	4.17	1.08	99	4.17	1.09
Organize the CTE lab (E.6)	100	4.41	1.04	100	4.16	1.27
Provide for the first aid needs of students (E.7)	100	4.61	0.84	98	4.37	0.97

Note. The range of possible importance and ability means is between 1.00 and 5.00. A mean of 1.00 represents low level of importance and/or ability. A mean of 5.00 represents a high level of importance and/or ability. Importance means range from 4.97 to 2.85 with a mean average of 4.30 and median average of 4.41. Ability means range from 4.71 to 2.90 with a mean average of 3.96 and median average of 4.02.

Table 5 (continued)
Importance and Ability Means for CTE Teacher Competencies

CTE Teacher Competency	Importance			Ability		
	n	Mean	S.D.	*n*	Mean	S.D.
Category E: Instructional management (continued)						
Arrange for improvement of CTE facilities (E.8)	100	4.58	0.77	100	3.68	1.37
Manage budgeting and reporting responsibilities (E.9)	100	4.33	0.97	100	4.06	1.18
Assist other professionals (teachers, counselors, administrators) with student behavioral issues (drug abuse and bullying) (E.10)	100	4.48	0.78	100	4.08	1.01
Monitor students' use of CTE lab chemicals (E.11)	100	4.25	1.39	100	4.00	1.41
Category F: Guidance						
Provide information on educational and career opportunities (F.1)	100	4.74	0.54	99	4.41	0.81
Assist students in applying for employment or further education (F.2)	99	4.71	0.54	100	4.30	1.07
Use conferences to help meet student needs (F.3)	100	4.27	0.94	99	4.05	1.10
Gather student data through personal contacts (F.4)	100	4.11	1.10	100	3.78	1.28
Gather student data using formal data-collection techniques (F.5)	100	4.09	1.09	100	3.82	1.27
Category G: School-community relations						
Develop and maintain a relationship with school guidance counselors (G.1)	100	4.75	0.52	97	4.40	0.91

Note. The range of possible importance and ability means is between 1.00 and 5.00. A mean of 1.00 represents low level of importance and/or ability. A mean of 5.00 represents a high level of importance and/or ability. Importance means range from 4.97 to 2.85 with a mean average of 4.30 and median average of 4.41. Ability means range from 4.71 to 2.90 with a mean average of 3.96 and median average of 4.02.

Table 5 (continued)
Importance and Ability Means for CTE Teacher Competencies

CTE Teacher Competency	Importance			Ability		
	n	Mean	S.D.	*n*	Mean	S.D.
Category G: School-community relations (continued)						
Work with members of the community (G.2)	100	4.62	0.60	98	4.02	1.13
Obtain feedback about the CTE program (G.3)	100	4.48	0.76	99	3.97	1.11
Give presentations to promote the CTE program (G.4)	100	4.44	0.77	100	3.91	1.16
Conduct an open house (G.5)	100	4.22	0.93	100	4.05	1.15
Develop brochures to promote the CTE program (G.6)	100	4.13	1.08	100	4.12	1.07
Prepare news releases and articles concerning the CTE program (G.7)	100	4.21	0.87	100	3.62	1.25
Develop a school-community relations plan for the CTE program (G.8)	100	4.16	0.92	100	3.42	1.30
Develop student-ambassador programs to assist with marketing CTE programs (G.9)	100	4.04	1.03	100	3.43	1.26
Develop and maintain a program web site (G.10)	100	4.09	1.07	100	3.52	1.38
Arrange for television and radio presentations concerning the CTE program (G.11)	100	3.60	1.34	97	2.92	1.50
Develop and maintain a program social media presence (G.12)	100	4.08	1.11	100	3.37	1.48

Note. The range of possible importance and ability means is between 1.00 and 5.00. A mean of 1.00 represents low level of importance and/or ability. A mean of 5.00 represents a high level of importance and/or ability. Importance means range from 4.97 to 2.85 with a mean average of 4.30 and median average of 4.41. Ability means range from 4.71 to 2.90 with a mean average of 3.96 and median average of 4.02.

Table 5 (continued)
Importance and Ability Means for CTE Teacher Competencies

CTE Teacher Competency	Importance			Ability		
	n	Mean	S.D.	*n*	Mean	S.D.
Category H: Career and technical student organizations						
Supervise activities of the CTSO (H.1)	100	4.15	1.11	99	3.95	1.25
Guide participation in CTSO (H.2)	100	4.13	1.10	98	3.86	1.21
Prepare CTSO members for leadership roles (H.3)	100	4.17	1.09	98	3.80	1.19
Develop a personal philosophy concerning CTSOs (H.4)	100	4.06	1.08	99	3.84	1.21
Assist CTSO members in developing and financing a yearly program of activities (H.5)	100	3.87	1.20	99	3.51	1.28
Develop creative/effective alternatives to official CTSOs (local or regional competitions and/or service learning projects) (H.6)	100	4.00	1.20	98	3.53	1.33
Establish a CTSO (H.7)	99	4.07	1.21	99	3.64	1.29
Category I: Professional role and development						
Keep up-to-date professionally (I.1)	100	4.85	0.36	99	4.46	0.76
Serve the school and community (I.2)	101	4.70	0.64	101	4.42	0.85
Obtain a suitable teaching position (I.3)	101	4.73	0.60	101	4.65	0.67
Serve the teaching profession (I.4)	101	4.64	0.64	100	4.62	0.60
Develop an active personal philosophy statement (I.5)	101	4.19	1.07	101	4.34	0.83

Note. The range of possible importance and ability means is between 1.00 and 5.00. A mean of 1.00 represents low level of importance and/or ability. A mean of 5.00 represents a high level of importance and/or ability. Importance means range from 4.97 to 2.85 with a mean average of 4.30 and median average of 4.41. Ability means range from 4.71 to 2.90 with a mean average of 3.96 and median average of 4.02.

Table 5 (continued)
Importance and Ability Means for CTE Teacher Competencies

CTE Teacher Competency	Importance			Ability		
	n	Mean	S.D.	*n*	Mean	S.D.
Category I: Professional role and development (continued)						
Mentor new CTE teachers (I.6)	101	4.68	0.68	101	4.17	1.19
Supervise student-teachers (I.7)	101	4.50	0.89	101	3.92	1.34
Build a network of supportive resources such as a mentor teacher, as well as state and national organizations (MBEA, MHOEA, etc.) (I.8)	101	4.24	1.03	100	3.75	1.27
Provide lab experiences for prospective teachers (I.9)	101	4.16	1.09	100	3.54	1.42
Plan the student teaching experience (I.10)	101	4.11	1.21	100	3.33	1.46
Work summer externships to keep up-to-date with industry trends and changes (I.11)	101	4.01	1.14	100	3.25	1.45
Category J: Coordination of cooperative education						
Prepare for students' related instruction (J.1)	100	4.54	0.74	100	4.15	1.10
Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	100	4.42	0.89	101	3.53	1.32
Establish guidelines for a cooperative CTE program (J.3)	99	4.37	0.84	100	3.52	1.37

Note. The range of possible importance and ability means is between 1.00 and 5.00. A mean of 1.00 represents low level of importance and/or ability. A mean of 5.00 represents a high level of importance and/or ability. Importance means range from 4.97 to 2.85 with a mean average of 4.30 and median average of 4.41. Ability means range from 4.71 to 2.90 with a mean average of 3.96 and median average of 4.02.

Table 5 (continued)
Importance and Ability Means for CTE Teacher Competencies

CTE Teacher Competency	Importance			Ability		
	n	Mean	S.D.	*n*	Mean	S.D.
Category J: Coordination of cooperative education (continued)						
Secure high-quality training stations for the co-op program (J.4)	99	4.31	0.88	100	3.36	1.37
Place co-op students on the job (J.5)	100	4.29	0.98	100	3.38	1.42
Develop the training ability of work site instructors (J.6)	100	4.12	1.01	100	3.22	1.43
Supervise an employer/employee appreciation event (J.7)	100	3.91	1.24	100	3.20	1.41
Manage the attendance, transfers, and terminations of co-op students (J.8)	99	4.25	1.09	99	3.35	1.39
Category K: Serving students with special needs						
Improve teacher communication skills (K.1)	101	4.67	0.60	99	4.24	0.78
Promote peer acceptance of students with special needs (K.2)	101	4.76	0.59	99	4.25	0.86
Use instructional techniques to meet the needs of students with special needs (K.3)	101	4.75	0.48	99	4.09	0.97
Assess the progress of students with special needs (K.4)	101	4.70	0.56	99	4.03	0.96

Note. The range of possible importance and ability means is between 1.00 and 5.00. A mean of 1.00 represents low level of importance and/or ability. A mean of 5.00 represents a high level of importance and/or ability. Importance means range from 4.97 to 2.85 with a mean average of 4.30 and median average of 4.41. Ability means range from 4.71 to 2.90 with a mean average of 3.96 and median average of 4.02.

Table 5 (continued)
Importance and Ability Means for CTE Teacher Competencies

CTE Teacher Competency	Importance			Ability		
	n	Mean	S.D.	*n*	Mean	S.D.
Category K: Serving students with special needs (continued)						
Prepare to serve students with special needs (K.5)	101	4.68	0.55	99	4.07	0.98
Provide appropriate instructional materials for students with special needs (K.6)	101	4.72	0.51	100	4.00	1.05
Modify the learning environment for students with special needs (K.7)	101	4.60	0.75	99	3.95	1.10
Prepare special education students for employability (K.8)	101	4.51	0.74	100	3.65	1.28
Work collaboratively with special education personnel including assisting in the development of IEPs and accommodations (K.9)	101	4.54	0.70	100	4.07	1.14
Assist special education students in developing career planning skills (K.10)	101	4.61	0.63	100	3.72	1.17
Counsel special education students with personal-social problems (K.11)	101	4.41	0.79	101	3.40	1.35
Promote a CTE program for students with special needs (K.12)	101	4.41	0.86	101	3.53	1.34

Note. The range of possible importance and ability means is between 1.00 and 5.00. A mean of 1.00 represents low level of importance and/or ability. A mean of 5.00 represents a high level of importance and/or ability. Importance means range from 4.97 to 2.85 with a mean average of 4.30 and median average of 4.41. Ability means range from 4.71 to 2.90 with a mean average of 3.96 and median average of 4.02.

Table 5 (continued)
Importance and Ability Means for CTE Teacher Competencies

CTE Teacher Competency	Importance			Ability		
	n	Mean	S.D.	*n*	Mean	S.D.
Category L: Assisting students in improving their basic skills						
Assist students in improving their career and employability skills (L.1)	101	4.84	0.39	101	4.51	0.73
Assist students in improving their oral communication skills (L.2)	101	4.80	0.42	101	4.38	0.85
Assist students in improving their survival skills (L.3)	101	4.33	0.94	100	4.03	1.07
Assist students in developing technical reading skills (L.4)	101	4.60	0.65	100	3.96	1.10
Assist students in improving their math skills (L.5)	100	4.55	0.80	100	3.98	1.10
Assist students in improving their writing skills (L.6)	99	4.61	0.68	99	4.03	1.10
Assist students in achieving basic reading skills (L.7)	100	4.64	0.70	100	3.91	1.16
Category M: Teaching adults						
Prepare to work with adult learners (M.1)	99	3.56	1.40	99	3.42	1.47
Manage the instructional process (M.2)	99	3.74	1.34	99	3.53	1.45
Plan instruction for adults (M.3)	99	3.51	1.37	99	3.45	1.53
Evaluate the performance of adults (M.4)	99	3.51	1.38	99	3.38	1.55

Note. The range of possible importance and ability means is between 1.00 and 5.00. A mean of 1.00 represents low level of importance and/or ability. A mean of 5.00 represents a high level of importance and/or ability. Importance means range from 4.97 to 2.85 with a mean average of 4.30 and median average of 4.41. Ability means range from 4.71 to 2.90 with a mean average of 3.96 and median average of 4.02.

Table 5 (continued)
Importance and Ability Means for CTE Teacher Competencies

CTE Teacher Competency	Importance			Ability		
	n	Mean	S.D.	*n*	Mean	S.D.
Category M: Teaching adults (continued)						
Determine individual training needs (M.5)	99	3.60	1.38	99	3.32	1.46
Market the adult education program (M.6)	98	3.55	1.35	98	3.10	1.50

Note. The range of possible importance and ability means is between 1.00 and 5.00. A mean of 1.00 represents low level of importance and/or ability. A mean of 5.00 represents a high level of importance and/or ability. Importance means range from 4.97 to 2.85 with a mean average of 4.30 and median average of 4.41. Ability means range from 4.71 to 2.90 with a mean average of 3.96 and median average of 4.02.

Category Comparison

Examining the combined competency scores for each category provides insight into the responses for importance and ability for broader topics. Table 6 provides the mean average and standard deviation for importance and ability for all competencies within each category.

Table 6
Importance and Ability Means for CTE Teacher Competency Categories

CTE Teacher Competency Category	Importance			Ability		
	n	Mean	S.D.	*n*	Mean	S.D.
Category A: Program planning, development and evaluation (9*)	911	4.11	1.06	894	3.67	1.25
Category B: Instructional planning (7*)	703	4.57	0.72	714	4.50	0.74
Category C: Instructional execution (3*)	3444	4.11	1.09	3422	4.09	1.09
Category D: Instructional evaluation (7*)	707	4.62	0.65	706	4.33	0.87
Category E: Instructional management (11*)	1099	4.51	0.91	1094	4.15	1.14
Category F: Guidance (5*)	499	4.38	0.92	498	4.07	1.14
Category G: School-community relations (12*)	1200	4.24	0.98	1191	3.73	1.29
Category H: Career and technical student organizations (7*)	593	4.06	1.15	690	3.73	1.26
Category I: Professional role and development (11*)	1110	4.44	0.93	1104	4.04	1.22
Category J: Coordination of cooperative education (8*)	797	4.28	0.98	800	3.47	1.38
Category K: Serving students with special needs (12*)	1212	4.62	0.66	1196	3.92	1.13
Category L: Assisting students in improving their basic skills (7*)	703	4.62	0.69	701	4.12	1.04
Category M: Teaching adults (6*)	593	3.58	1.37	593	3.37	1.49

Note. The value of *n* for each competency category is determined by the total number of responses for all questions within that category. Each competency has one question on importance and one question on ability. The range of possible importance and ability means is between 1.00 and 5.00. A mean of 1.00 represents low level of importance and/or ability. A mean of 5.00 represents a high level of importance and/or ability.
* Number of competencies for the category.

Mean Weighted Discrepancy Score

The Mean Weighted Discrepancy Score (MWDS) is calculated by subtracting the ability score from the importance score for each competency, as scored by each respondent, to produce a list of discrepancy scores. Each discrepancy score is multiplied by the mean of all importance scores to produce a mean discrepancy score for each response. The mean discrepancy scores are then added together and divided by the number of responses to produce the MWDS. Table 7 provides a list of the MWDS for each competency ranked from highest to lowest. Competencies with the highest scores represent those with the highest prioritization as needed for CTE teacher professional development.

Table 7
Prioritization Ranking of Professional Development Competencies for Virginia CTE Teachers

	CTE Teacher Competency	*n*	MWDS
1.	Counsel special education students with personal-social problems (K.11)	101	4.45
2.	Assist special education students in developing career planning skills (K.10)	100	4.15
3.	Arrange for improvement of CTE facilities (E.8)	100	4.12
4.	Secure high-quality training stations for the co-op program (J.4)	99	4.01
5.	Place co-op students on the job (J.5)	100	3.90
6.	Prepare special education students for employability (K.8)	100	3.88
7.	Promote a CTE program for students with special needs (K.12)	101	3.84
8.	Manage the attendance, transfers, and terminations of co-op students (J.8)	99	3.82

Note. Mean Weighted Discrepancy Scores (MWDS) are calculated using a four step process. First, the mean average of importance scores for all respondents is calculated. Second, each respondent's ability score is subtracted from the respondent's importance score resulting in a difference score. Third, each respondent's difference score is multiplied by the mean average for importance resulting in a mean discrepancy score. Fourth, the mean discrepancy score for each respondent are averaged together resulting in an MWDS. Any response pair (importance and ability scores) that did not include either an importance score or an ability score was not used in the MWDS calculation for that competency.

Table 7 (continued)
Prioritization Ranking of Professional Development Competencies for Virginia CTE Teachers

CTE Teacher Competency	*n*	MWDS
9. Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	100	3.80
10. Develop the training ability of work site instructors (J.6)	100	3.71
11. Establish guidelines for a cooperative CTE program (J.3)	99	3.62
12. Provide appropriate instructional materials for students with special needs (K.6)	100	3.40
13. Assist students in achieving basic reading skills (L.7)	100	3.39
14. Assess the progress of students with special needs (K.4)	99	3.18
15. Use instructional techniques to meet the needs of students with special needs (K.3)	99	3.17
16. Plan the student teaching experience (I.10)	100	3.16
17. Develop a school-community relations plan for the CTE program (G.8)	100	3.08
18. Work summer externships to keep up-to-date with industry trends and changes (I.11)	100	3.05
19. Assist students in developing self-discipline (E.3)	99	3.00
20. Modify the learning environment for students with special needs (K.7)	99	2.98
21. Assist students in developing technical reading skills (L.4)	100	2.95
22. Develop and maintain a program social media presence (G.12)	100	2.90
23. Prepare to serve students with special needs (K.5)	99	2.89
24. Work with members of the community (G.2)	98	2.93
25. Supervise an employer/employee appreciation event (J.7)	100	2.78
26. Assist students in improving their writing skills (L.6)	98	2.68
27. Supervise student-teachers (I.7)	101	2.63
28. Assist students in improving their math skills (L.5)	100	2.59

Note. Mean Weighted Discrepancy Scores (MWDS) are calculated using a four step process. First, the mean average of importance scores for all respondents is calculated. Second, each respondent's ability score is subtracted from the respondent's importance score resulting in a difference score. Third, each respondent's difference score is multiplied by the mean average for importance resulting in a mean discrepancy score. Fourth, the mean discrepancy score for each respondent are averaged together resulting in an MWDS. Any response pair (importance and ability scores) that did not include either an importance score or an ability score was not used in the MWDS calculation for that competency.

Table 7 (continued)
Prioritization Ranking of Professional Development Competencies for Virginia CTE Teachers

CTE Teacher Competency	*n*	MWDS
29. Collaborate with other CTE teachers and administrators to plan, develop, and evaluate a CTE program (A.5)	100	2.57
30. Provide lab experiences for prospective teachers (I.9)	100	2.54
31. Prepare news releases and articles concerning the CTE program (G.7)	100	2.48
32. Provide instruction for slower and more capable learners (C.7)	101	2.47
33. Develop student-ambassador programs to assist with marketing CTE programs (G.9)	100	2.46
34. Promote peer acceptance of students with special needs (K.2)	99	2.45
35. Arrange for television and radio presentations concerning the CTE program (G.11)	97	2.45
36. Mentor new CTE teachers (I.6)	101	2.41
37. Individualize instruction (C.15)	101	2.38
38. Give presentations to promote the CTE program (G.4)	100	2.35
39. Organize and maintain an occupational advisory committee (A.6)	100	2.33
40. Develop and maintain a program web site (G.10)	100	2.31
41. Obtain feedback about the CTE program (G.3)	99	2.23
42. Work collaboratively with special education personnel including assisting in the development of IEPs and accommodations (K.9)	100	2.23
43. Direct students in applying problem-solving techniques (C.1)	101	2.21
44. Search for existing regional employment forecasts (A.7)	98	2.08
45. Build a network of supportive resources such as a mentor teacher, as well as state and national organizations (MBEA, MHOEA, etc.) (I.8)	100	2.05
46. Conduct an occupational analysis (A.8)	100	2.04
47. Assist students in improving their oral communication skills (L.2)	101	2.03
48. Improve teacher communication skills (K.1)	99	2.03

Note. Mean Weighted Discrepancy Scores (MWDS) are calculated using a four step process. First, the mean average of importance scores for all respondents is calculated. Second, each respondent's ability score is subtracted from the respondent's importance score resulting in a difference score. Third, each respondent's difference score is multiplied by the mean average for importance resulting in a mean discrepancy score. Fourth, the mean discrepancy score for each respondent are averaged together resulting in an MWDS. Any response pair (importance and ability scores) that did not include either an importance score or an ability score was not used in the MWDS calculation for that competency.

Table 7 (continued)
Prioritization Ranking of Professional Development Competencies for Virginia CTE Teachers

CTE Teacher Competency	*n*	MWDS
49. Evaluate instructional effectiveness (D.2)	101	2.03
50. Develop long-range plans (A.3)	100	2.00
51. Develop creative/effective alternatives to official CTSOs (local or regional competitions and/or service learning projects) (H.6)	98	1.96
52. Provide for student safety (E.1)	99	1.96
53. Assist students in applying for employment or further education (F.2)	99	1.95
54. Assess student performance – attitudes (D.5)	101	1.93
55. Establish a CTSO (H.7)	98	1.87
56. Keep up-to-date professionally (I.1)	99	1.86
57. Project instructional resource needs (E.2)	99	1.85
58. Use subject matter experts to present information (C.17)	101	1.80
59. Assist other professionals (teachers, counselors, administrators) with student behavioral issues (drug abuse and bullying) (E.10)	100	1.79
60. Prepare for students' related instruction (J.1)	100	1.77
61. Prepare CTSO members for leadership roles (H.3)	98	1.74
62. Develop and maintain a relationship with school guidance counselors (G.1)	97	1.66
63. Conduct a course of study based on industry or state standards (A.2)	96	1.63
64. Assess student performance – skills (D.1)	101	1.61
65. Market the adult education program (M.6)	98	1.59
66. Assist students in improving their career and employability skills (L.1)	101	1.58
67. Provide information on educational and career opportunities (F.1)	99	1.58
68. Assist CTSO members in developing and financing a yearly program of activities (H.5)	99	1.52

Note. Mean Weighted Discrepancy Scores (MWDS) are calculated using a four step process. First, the mean average of importance scores for all respondents is calculated. Second, each respondent's ability score is subtracted from the respondent's importance score resulting in a difference score. Third, each respondent's difference score is multiplied by the mean average for importance resulting in a mean discrepancy score. Fourth, the mean discrepancy score for each respondent are averaged together resulting in an MWDS. Any response pair (importance and ability scores) that did not include either an importance score or an ability score was not used in the MWDS calculation for that competency.

Table 7 (continued)
Prioritization Ranking of Professional Development Competencies for Virginia CTE Teachers

CTE Teacher Competency	*n*	MWDS
69. Evaluate CTE programs (A.4)	98	1.51
70. Develop program goals and objectives (A.1)	100	1.49
71. Direct students in instructing other students (C.19)	100	1.46
72. Gather student data through personal contacts (F.4)	100	1.36
73. Serve the school and community (I.2)	101	1.35
74. Guide participation in CTSO (H.2)	98	1.31
75. Search for industry-related assessments for use in class (D.7)	101	1.28
76. Assess student performance – knowledge (D.3)	101	1.27
77. Assist students in improving their survival skills (L.3)	100	1.25
78. Determine needs and interests of students (B.4)	100	1.23
79. Prepare, conduct, and report community survey (A.9)	100	1.22
80. Provide for the first aid needs of students (E.7)	98	1.22
81. Manage budgeting and reporting responsibilities (E.9)	100	1.17
82. Employ simulation techniques (C.12)	100	1.14
83. Present information with models and real objects (C.20)	101	1.14
84. Monitor students' use of CTE lab chemicals (E.11)	99	1.12
85. Gather student data using formal data-collection techniques (F.5)	100	1.10
86. Organize the CTE lab (E.6)	100	1.10
87. Guide student study (C.16)	100	1.10
88. Develop a personal philosophy concerning CTSOs (H.4)	99	1.03
89. Establish student performance criteria (D.4)	101	1.01
90. Manage the CTE lab (E.4)	100	1.00
91. Determine individual training needs (M.5)	99	0.98
92. Supervise activities of the CTSO (H.1)	99	0.96
93. Research and select instructional materials (B.2)	101	0.94
94. Use conferences to help meet student needs (F.3)	99	0.91

Note. Mean Weighted Discrepancy Scores (MWDS) are calculated using a four step process. First, the mean average of importance scores for all respondents is calculated. Second, each respondent's ability score is subtracted from the respondent's importance score resulting in a difference score. Third, each respondent's difference score is multiplied by the mean average for importance resulting in a mean discrepancy score. Fourth, the mean discrepancy score for each respondent are averaged together resulting in an MWDS. Any response pair (importance and ability scores) that did not include either an importance score or an ability score was not used in the MWDS calculation for that competency.

Table 7 (continued)
Prioritization Ranking of Professional Development Competencies for Virginia CTE Teachers

CTE Teacher Competency	*n*	MWDS
95. Employ reinforcement techniques (C.3)	98	0.88
96. Direct student lab experience (C.6)	101	0.87
97. Manage the instructional process (M.2)	99	0.79
98. Employ the project method (C.10)	101	0.76
99. Employ a team-teaching approach (C.26)	100	0.72
100. Conduct an open house (G.5)	100	0.72
101. Conduct group discussions, panel discussions, and symposiums (C.23)	101	0.71
102. Employ the brainstorming technique (C.25)	101	0.69
103. Demonstrate a concept or principle (C.5)	101	0.56
104. Determine student grades using formative and summative assessments (D.6)	100	0.51
105. Prepare to work with adult learners (M.1)	99	0.47
106. Evaluate the performance of adults (M.4)	99	0.42
107. Develop a unit of instruction (B.1)	101	0.38
108. Obtain a suitable teaching position (I.3)	101	0.37
109. Employ oral questioning techniques (C.8)	101	0.36
110. Integrate academic instruction within CTE courses (B.7)	100	0.31
111. Direct field trips (C.11)	101	0.28
112. Develop student performance objectives (B.3)	101	0.27
113. Plan instruction for adults (M.3)	99	0.18
114. Prepare programmed instruction (C.27)	98	0.16
115. Serve the teaching profession (I.4)	100	0.14
116. Present information using a variety of electronic media (LCD projector, tablet, document camera, interactive whiteboard, clickers, etc.) (C.18)	101	0.13

Note. Mean Weighted Discrepancy Scores (MWDS) are calculated using a four step process. First, the mean average of importance scores for all respondents is calculated. Second, each respondent's ability score is subtracted from the respondent's importance score resulting in a difference score. Third, each respondent's difference score is multiplied by the mean average for importance resulting in a mean discrepancy score. Fourth, the mean discrepancy score for each respondent are averaged together resulting in an MWDS. Any response pair (importance and ability scores) that did not include either an importance score or an ability score was not used in the MWDS calculation for that competency.

Table 7 (continued)
Prioritization Ranking of Professional Development Competencies for Virginia CTE Teachers

CTE Teacher Competency	*n*	MWDS
117.Demonstrate a manipulative skill (C.14)	101	0.13
118.Prepare teacher-made instructional materials (B.5)	100	0.04
119.Maintain a filing system (E.5)	99	0.04
120.Develop brochures to promote the CTE program (G.6)	100	0.04
121.Present an illustrated talk (C.22)	99	0.04
122.Employ the buzz group technique (C.33)	101	0.00
123.Summarize a lesson (C.9)	101	-0.22
124.Employ the question box technique (C.32)	101	-0.35
125.Introduce a lesson (C.4)	101	-0.41
126.Develop an active personal philosophy statement (I.5)	101	-0.62
127.Present information using a variety of internet resources (C.13)	100	-0.77
128.Develop a lesson plan (B.6)	100	-0.84
129.Present information with televised and videotaped materials (C.24)	100	-1.26
130.Present information using instructional videos (C.2)	101	-1.27
131.Present information with audio recordings (C.31)	100	-1.32
132.Present information with overhead and opaque materials (C.30)	101	-1.33
133.Present information using presentation software (PowerPoint, Keynote, etc.) (C.21)	99	-1.38
134.Prepare bulletin boards and exhibits (C.28)	101	-1.48
135.Present information with a flip chart (C.34)	100	-1.48
136.Present information with the whiteboard (C.29)	101	-1.61

Note. Mean Weighted Discrepancy Scores (MWDS) are calculated using a four step process. First, the mean average of importance scores for all respondents is calculated. Second, each respondent's ability score is subtracted from the respondent's importance score resulting in a difference score. Third, each respondent's difference score is multiplied by the mean average for importance resulting in a mean discrepancy score. Fourth, the mean discrepancy score for each respondent are averaged together resulting in an MWDS. Any response pair (importance and ability scores) that did not include either an importance score or an ability score was not used in the MWDS calculation for that competency.

Data Analysis by Research Question

Research Question #1

Question one of this study asks, what knowledge-bases and/or skill-sets do CTE teachers in Virginia identify as those most important to the CTE program they currently work within? As seen previously, Table 5 details the importance mean average as identified by survey respondents. Table 8 highlights the top ten competencies identified by CTE teachers as those most important to their teaching practice.

Table 8
Top 10 Competencies Ranked by CTE Teacher Importance

CTE Teacher Competency	*n*	Mean	S.D.
1. Provide for student safety (E.1)	100	4.97	0.17
2. Keep up-to-date professionally (I.1)	100	4.85	0.36
3. Assist students in improving their career and employability skills (L.1)	101	4.84	0.39
4. Assist students in improving their oral communication skills (L.2)	101	4.80	0.42
5. Assess student performance – skills (D.1)	101	4.79	0.54
6. Direct students in applying problem-solving techniques (C.1)	102	4.78	0.44
7. Promote peer acceptance of students with special needs (K.2)	101	4.76	0.59
8. Demonstrate a concept or principle (C.5)	102	4.75	0.48
9. Assess student performance – knowledge (D.3)	101	4.75	0.52
10. Use instructional techniques to meet the needs of students with special needs (K.3)*	101	4.75	0.48
10. Develop and maintain a relationship with school guidance counselors (G.1)*	100	4.75	0.52

Note. Any response that did not include an importance score was not used in the mean or standard deviation calculations for the competency.
* Two competencies tied for tenth for importance and are therefore both included.

Research Question #1 Observations

The 11 competencies identified as the top ten most important represent seven of the 13 CTE teacher competency categories used in this study. No category has more than two

competencies in the top ten. The mean of the highest ranking competency is .12 higher than the mean of the second highest ranked competency. This is a much greater spread than the difference between any other competencies in the top ten where the next greatest difference is .04.

Six of the 11 competencies are the first listed for their broader category, two competencies are listed second in their category, two other competencies are listed third in their category, and the one remaining competency is fifth in a category with 34 competencies. The Delphi process used by Manley and Zinser (2012) to create the categorized competency list naturally pushes the competencies identified as overall most important by the group developing the list to the top of each category.

No competencies from "Category A: Program planning, development and evaluation" or "Category B: Instructional planning" are represented in the top ten list. The highest rated competency from Category A was "Develop program goals and objectives (A.1)" at 26th (M = 4.67, SD = 0.63) and the highest from Category B was "Develop a unit of instruction (B.1)" at 12th (M = 4.74, SD = 0.52). Providing quality instruction in the short- and long-term and planning to achieve prescribed course and program goals are frequently cited as foundational aspects of conducting and managing a CTE program (Stone, 2017).

Research Question #2

Question two of this study asks, what professional development topics do CTE teachers feel are most needed relative to the knowledge-bases and/or skill-sets identified as most important to their program? This question is answered through the MWDS scores of the competencies identified by the study. MWDS is calculated by taking the average of the importance weighted difference scores for each response. Difference scores are determined by

subtracting ability from importance. Each difference score is multiplied by the average importance rating for the competency resulting in weighted difference scores.

Ability

Competencies with high importance scores are most likely to result in the highest MWDS, however low ability scores can also indicate a high need for teacher professional development. Table 9 presents the ten competencies identified by CTE teachers as the skills most lacking in their teaching practice.

Table 9
Bottom 10 Competencies Ranked by CTE Teacher Ability

CTE Teacher Competency	*n*	Mean	S.D.
136. Employ the buzz group technique (C.33)	101	2.90	1.43
135. Arrange for television and radio presentations concerning the CTE program (G.11)	97	2.92	1.50
134. Prepare, conduct, and report community survey (A.9)	100	3.06	1.43
133. Market the adult education program (M.6)	98	3.10	1.50
132. Organize and maintain an occupational advisory committee (A.6)	100	3.12	1.37
131. Conduct an occupational analysis (A.8)	100	3.14	1.31
130. Supervise an employer/employee appreciation event (J.7)	100	3.20	1.41
129. Develop the training ability of work site instructors (J.6)	100	3.22	1.43
128. Work summer externships to keep up-to-date with industry trends and changes (I.11)	100	3.25	1.45
127. Employ the question box technique (C.32)	101	3.28	1.44

Note. Any response that did not include an ability score was not used in the mean or standard deviation calculations for the competency.

Ability Observations

Six of the 13 teacher competency categories are represented in the list of ten competencies with the lowest levels of teacher ability. Three items from Category A appear in the bottom ten list, as well as two competencies from Categories C and J. Categories G, I , and M provide one competency each. The gap of .14 between the 135th and 134th ranked

competencies represents the largest difference between competencies relative to the other gaps – which range from a high of .06 to a low of .02.

Categories

Table 10 provides the rankings for the 13 categories used by this study for importance and ability.

Table 10
Importance and Ability Rankings by Category

CTE Teacher Competency Category	Importance	Ability
Category A: Program planning, development and evaluation	11	11
Category B: Instructional planning	4	1
Category C: Instructional execution	10	5
Category D: Instructional evaluation	2	2
Category E: Instructional management	5	3
Category F: Guidance	7	6
Category G: School-community relations	9	10
Category H: Career and technical student organizations	12	9
Category I: Professional role and development	6	7
Category J: Coordination of cooperative education	8	12
Category K: Serving students with special needs	3	8
Category L: Assisting students in improving their basic skills	1	4
Category M: Teaching adults	13	13

Note. Importance rankings are from most important (1) to least important (13). Ability rankings are from highest level of ability (1) to lowest level of ability (13).

Category Observations

Three categories – C, G, and I – are represented by individual competencies on both the top ten importance list and bottom ten ability list. Each of these three categories have relatively large numbers of competencies – 34, 12 and 11 respectively.

Categories with high importance rankings and low ability rankings represent those that are most likely to contain teaching competencies identified as the highest professional

development priorities. Categories with high ability rankings and low importance rankings would be less likely to contain competencies with high demand for professional development. While that is generally the case, individual competencies identified as a high professional development priority can exist within a category without a large gap between importance and ability rankings – especially categories with relatively higher numbers of competencies.

Category rankings with comparatively high importance ranking and low ability ranking include Categories J, K, and L. Categories with minimal differences between importance and ability rankings include A, D, F, G, I, and M. Categories B, C, E, and H each has a higher ability ranking than an importance ranking.

Mean Weighted Discrepancy Score

A high MWDS indicates a high CTE teacher professional development need for that competency. As shown in Table 7, four competencies had an MWDS of 4.00 or higher, 15 had an MWDS between 3.99 and 3.00, 31 had an MWDS between 2.99 and 2.00, 40 had an MWDS between 1.99 and 1.00, 32 had an MWDS between 0.99 and 0.00, and 14 had an MWDS below 0.00. Of the top 15 competencies identified by MWDS, seven were from Category K and six were from Category J. Of the bottom 15 competencies identified by MWDS, 13 were from Category C.

The benefit gained by using MWDS instead of only calculating a difference score is that the MWDS identifies competencies with high difference scores and high importance means. If two competencies have similar average differences the competency with a higher mean average importance will have a higher MWDS. Competencies with the highest mean average differences do not necessarily match the competencies with the highest MWDS. Table 29 in Appendix G

presents the list of competencies sorted by MWDS ranking and includes the corresponding difference score rankings for comparison.

Research Question #2 Observations

The ten competencies identified as the top ten most important represent three of the 13 competency categories. One category, J, has five competencies represented in the top ten. Another, K, has four competencies represented in the top ten. The third, E, has one competency represented in the top ten. Table 11 presents the 13 competency categories sorted by the MWDS mean average of all competencies within that category.

Table 11
Category Ranking for MWDS of All Category Competencies

CTE Teacher Competency Category	Ranking Mean	MWDS Mean	MWDS SD
1. Category J: Coordination of cooperative education (8*)	15	3.53	0.85
2. Category K: Serving students with special needs (12*)	19	3.22	0.76
3. Category L: Assisting students in improving their basic skills (7*)	40	2.36	0.76
4. Category G: School-community relations (12*)	47	2.13	0.41
5. Category A: Program planning, development and evaluation (9*)	54	1.89	0.45
6. Category I: Professional role and development (11*)	59	1.72	1.26
7. Category E: Instructional management (11*)	66	1.67	1.10
8. Category H: Career and technical student organizations (7*)	70	1.48	0.40
9. Category F: Guidance (5*)	74	1.38	0.41
10. Category D: Instructional evaluation (7*)	73	1.38	0.53
11. Category M: Teaching adults (6*)	96	0.74	0.51
12. Category B: Instructional planning (7*)	107	0.33	0.66
13. Category C: Instructional execution (34*)	102	0.20	1.15

Note. Ranking Mean is the mean average of the MWDS rankings for all competencies within a category. MWDS Mean and MWDS S.D. are the mean average and standard deviation of the MWDS for all competencies within a category.
* Number of competencies for the category.

The 13 categories can be grouped into tiers where the first tier represents the competency category Virginia CTE teachers identified as the most important for their program. The first tier contains two categories, "Category J: Coordination of cooperative education" and "Category K: Serving student with special needs." The second tier contains three categories, "Category L: Assisting students in improving their basic skills", "Category G: School-community relations", and "Category A: Program planning, development and evaluation." The third tier includes five categories, "Category I: Professional role and development", "Category E: Instructional management", "Category H: Career and technical student organization", "Category F: Guidance", and "Category D: Instructional evaluation." The fourth tier contains the final three categories, "Category M: Teaching adults", "Category B: Instructional Planning", and "Category C: Instructional execution."

When considering the competency groupings and individual competencies together, the most important teaching competencies identified by Virginia CTE teachers are summarized in Table 12.

Table 12
Category Ranking for MWDS of All Category Competencies

CTE Teacher Competency Category and Associated Competencies	Cat. Rank	Comp. Rank	MWDS Mean	Comp. MWDS
Category J: Coordination of cooperative education	1		3.53	
Secure high-quality training situations for the co-op program (J.4)		4		4.01
Place co-op students on the job (J.5)		5		3.90
Manage the attendance, transfers, and terminations of co-op students (J.8)		8		3.82
Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)		9		3.80

Note. The top 19 competencies were selected using a cut-off MWDS of 3.00.

Table 12 (continued)
Category Ranking for MWDS of All Category Competencies

CTE Teacher Competency Category and Associated Competencies	Cat. Rank	Comp. Rank	MWDS Mean	Comp. MWDS
Category J: Coordination of cooperative education (continued)	1			
Develop the training ability of work site instructors (J.6)		10		3.71
Establish guidelines for a cooperative CTE program (J.3)		11		3.62
Category K: Serving students with special needs	2		3.22	
Counsel special education students with personal-social problems (K.11)		1		4.45
Assist special education students in developing career planning skills (K.10)		2		4.15
Prepare special education students for employability (K.8)		6		3.88
Promote a CTE program for students with special needs (K.12)		7		3.84
Provide appropriate instructional materials for student with special needs (K.6)		12		3.40
Assess the progress of students with special needs (K.4)		14		3.18
Use instructional techniques to meet the needs of students with special needs (K.3)		15		3.17
Category L: Assisting students in improving their basic skills	3		2.36	
Assist students in achieving basic reading skills (L.7)		13		3.39
Category G: School-community relations	4		2.13	
Develop a school-community relations plan for the CTE program (G.8)		17		3.08
Category I: Professional role and development	6		1.72	
Plan the student teaching experience (I.10)		16		3.16
Work summer externships to keep up-to-date with industry trends and changes (I.11)		18		3.05

Note. The top 19 competencies were selected using a cut-off MWDS of 3.00.

Table 12 (continued)
Category Ranking for MWDS of All Category Competencies

CTE Teacher Competency Category and Associated Competencies	Cat. Rank	Comp. Rank	MWDS Mean	Comp. MWDS
Category E: Instructional management	7		1.67	
Arrange for improvement of CTE facilities (E.8)		3		4.12
Assist students in developing self-discipline (E.3)		19		3.00

Note. The top 19 competencies were selected using a cut-off MWDS of 3.00.

Research Question #3

Question three of this study asks, what relationship do demographics, including gender, ethnicity, and intention to stay in the teaching profession, have with the teacher's perceived professional growth needs? This question is answered by comparing the disaggregated MWDS rankings of all competencies used in the study. Data was disaggregated by category for each of the three demographic categories for this research question: gender, ethnicity, and intention to stay in the teaching profession. The demographic category gender has two groups: "Male" and "Female." The demographic category ethnicity has four groups: "Black or African American", "Hispanic or Latino", "Other", and "White." The demographic category intention to stay in the teaching profession has three demographic categories has three groups: "No", "Unsure", and "Yes."

Mann-Whitney U testing is used to compare the MWDS of two groups within demographic categories. Mann-Whitney U testing can be used with categories that possess only two groups, such as gender in this study. Mann-Whitney U testing can also compare only two selected groups for a category with more than two groups. An example is a comparison of two of four groups, such as "Black or African American" and "White", within the ethnicity category which also includes "Hispanic" and "Other."

Two genders were selected by survey respondents: "Female" and "Male." Four ethnicity groups were selected by survey respondents: "Black or African American", "Hispanic or Latino", "White", and "Other", however only "Black or African American" and "White" were compared due to the low number of respondents ($n < 5$) for the other two groups. Three options for intention to remain in teaching were offered to respondents: "Yes", "No", and "Unsure." Each of the three intention to stay in the teaching profession responses were selected by at least one respondent, however only "Yes" and "Unsure" were compared due to a low number of respondents ($n < 5$) for "No." A complete list of demographic groupings for this research question and response frequencies can be found in Table 4.

Gender

A Mann-Whitney U test was conducted to determine if the MWDS data possess statistically similar results for those who identify as "Female" as for those who identify as "Male." The U test revealed that no statistically significant differences exist at a 0.05 significance-level by gender ($U = 8048$, $p = 0.0644$). Tables 13 and 14 provide a comparison of the top ten teaching competencies identified by each demographic category subgroup relative to the other subgroup.

Table 13
Top 10 Competencies Identified by Female CTE Teachers Ranked by MWDS Compared to Male CTE Teacher Rankings

CTE Teacher Competency	Female		Male	
	n	MWDS	Rank	MWDS
1. Counsel special education students with personal-social problems (K.11)	65	4.73	4	3.95
2. Arrange for improvement of CTE facilities (E.8)	65	4.58	15	3.27
3. Secure high-quality training stations for the co-op program (J.4)	63	4.48	17	3.22
4. Prepare special education students for employability (K.8)	64	4.42	23	2.94
5. Promote a CTE program for students with special needs (K.12)	65	4.35	22	2.95
6. Place co-op students on the job (J.5)	64	4.28	14	3.27
7. Assist special education students with personal-social problems (K.10)	65	4.09	3	4.27
8. Develop alternative work-based learning experience (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	64	4.02	9	3.45
9. Develop the training ability of work site instructors (J.6)	64	3.94	12	3.31
10. Establish guidelines for a cooperative CTE program (J.3)	63	3.72	8	3.71

Note. Mann-Whitney U testing failed to identify a statistically significant difference (U = 8048, p = 0.0644) at a 0.05 significance-level between "Female" (n = 65) and "Male" (n = 37) respondents.

Table 14
Top 10 Competencies Identified by Male CTE Teachers Ranked by MWDS Compared to Female CTE Teacher Rankings

CTE Teacher Competency	Male		Female	
	n	MWDS	Rank	MWDS
1. Develop and maintain relationships with school guidance counselors (G.2)	33	4.69	56	1.90

Note. Mann-Whitney U testing failed to identify a statistically significant difference (U = 8048, p = 0.0644) at a 0.05 significance-level between "Male" (n = 37) and "Female" (n = 65) respondents.

Table 14 (continued)
Top 10 Competencies Identified by Male CTE Teachers Ranked by MWDS Compared to Female CTE Teacher Rankings

CTE Teacher Competency	Male		Female	
	n	MWDS	Rank	MWDS
2. Manage the attendance, transfers, and terminations of co-op students (J.8)	36	4.27	11	3.46
3. Assist special education students with personal-social problems (K.10)	35	4.27	7	4.09
4. Counsel special education students with personal-social problems (K.11)	36	3.95	1	4.74
5. Provide appropriate instructional materials for students with special needs (K.6)	36	3.87	16	3.13
6. Assist students in improving their writing skills (L.6)	35	3.75	51	2.07
7. Assist students in achieving basic reading skills (L.7)	36	3.71	15	3.20
8. Establish guidelines for a cooperative CTE program (J.3)	36	3.45	10	3.72
9. Develop alternative work-based learning experience (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	36	3.42	8	4.02
10. Work summer externships to keep up-to-date with industry trends and changes (I.11)	35	3.31	24	2.90

Note. Mann-Whitney U testing failed to identify a statistically significant difference (U = 8048, p = 0.0644) at a 0.05 significance-level between "Male" (n = 37) and "Female" (n = 65) respondents.

Ethnicity

A Mann-Whitney U test was conducted to determine if the teaching competencies identified as the most needed for professional development are statistically similar for respondents who identify as "Black or African American" as for those who identify as "White." The test revealed that the rankings for teaching competencies possessed a statistically significant difference when disaggregated by ethnicity (U = 6041, p < 0.0001) at a 0.05 significance-level. Tables 15 and 16 compare of the top ten teaching competencies identified by ethnicity.

Table 15
Top 10 Competencies Identified by Black or African American CTE Teachers Ranked by MWDS Compared to White CTE Teacher Rankings

CTE Teacher Competency	B/AA		White	
	n	MWDS	Rank	MWDS
1. Counsel special education students with personal-social problems (K.11)	14	4.44	1	4.41
2. Prepare special education students for employability (K.8)	14	4.16	8	3.76
3. Develop and maintain a program social media presence (G.12)	14	3.65	31	2.62
4. Arrange for television and radio presentations concerning the CTE program (G.11)	13	3.63	48	2.12
5. Market the adult education program (M.6)	13	3.55	73	1.40
6. Assist special education students with personal-social problems (K.10)	14	3.52	3	4.07
7. Provide lab experiences for prospective teachers (I.9)	14	3.21	44	2.24
8. Assist students in improving their math skills (L.5)	14	3.12	32	2.55
9. Promote a CTE program for students with special needs (K.12)	14	3.03	7	3.79
10. Manage the attendance, transfers, and terminations of co-op students (J.8)	13	2.93	10	3.67

Note. Mann-Whitney U testing identified a statistically significant difference ($U = 6041$, $p < 0.0001$) at a 0.05 significance-level between "Black or African American" ($n = 14$) and "White" ($n = 85$) respondents.

Table 16
Top 10 Competencies Identified by White CTE Teachers Ranked by MWDS Compared to Black or African American CTE Teacher Rankings

CTE Teacher Competency	White		B/AA	
	n	MWDS	Rank	MWDS
1. Counsel special education students with personal-social problems (K.11)	84	4.41	1	4.44
2. Arrange for improvement of CTE facilities (E.8)	83	4.17	24	2.05

Note. Mann-Whitney U testing identified a statistically significant difference ($U = 6041$, $p < 0.0001$) at a 0.05 significance-level between "White" ($n = 85$) and "Black or African American" ($n = 14$) respondents.

Table 16 (continued)
Top 10 Competencies Identified by White CTE Teachers Ranked by MWDS Compared to Black or African American CTE Teacher Rankings

CTE Teacher Competency	White		B/AA	
	n	MWDS	Rank	MWDS
3. Assist special education students with personal-social problems (K.10)	83	4.07	6	3.52
4. Develop alternative work-based learning experience (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	84	4.05	54	0.75
5. Secure high-quality training stations for the co-op program (J.4)	83	3.92	19	2.20
6. Place co-op students on the job (J.5)	84	3.81	20	3.55
7. Promote a CTE program for students with special needs (K.12)	84	3.79	9	3.03
8. Prepare special education students for employability (K.8)	83	3.76	2	4.16
9. Establish guidelines for a cooperative CTE program (J.3)	83	3.69	18	2.20
10. Manage the attendance, transfers, and terminations of co-op students (J.8)	83	3.67	10	2.93

Note. Mann-Whitney U testing identified a statistically significant difference ($U = 6041$, $p < 0.0001$) at a 0.05 significance-level between "White" ($n = 85$) and "Black or African American" ($n = 14$) respondents.

Expectation to Stay in the Teaching Profession

A Mann-Whitney U test was conducted to determine if the teaching competencies most needed are statistically similar for those who answered "Yes" to the question asking if they intend to stay in the teaching profession for at least the next five years as for those who answered "Unsure." The test revealed that the rankings for teaching competencies possessed a statistically significant difference when disaggregated by expectation to stay in the teaching profession ($U = 7105$, $p = 0.001$) at a 0.05 significance-level. Tables 17 and 18 provide a comparison of the top ten teaching competencies identified relative to expectation to remain in the teaching profession.

Table 17

Top 10 Competencies Identified by CTE Teachers Unsure of their Intention to Remain in the Teaching Profession for the Next Five Years Ranked by MWDS Compared to Rankings of CTE Teachers Who Plan to Remain the Teaching Profession for the Next Five Years

CTE Teacher Competency	Unsure		Yes	
	n	MWDS	Rank	MWDS
1. Arrange for improvement of CTE facilities (E.8)	13	5.78	4	3.72
2. Prepare special education students for employability (K.8)	13	5.78	7	3.67
3. Develop alternative work-based learning experience (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	13	5.53	10	3.41
4. Assist special education students with personal-social problems (K.10)	13	4.97	2	3.77
5. Develop and maintain a program social media presence (G.12)	13	4.89	28	2.40
6. Counsel special education students with personal-social problems (K.11)	13	4.72	1	4.23
7. Individualize instruction (C.15)	13	4.62	53	1.77
8. Assist students in developing self-discipline (E.3)	13	4.53	23	2.65
9. Collaborate with other CTE teachers and administrators to plan, develop, and evaluate a CTE program (A.5)	12	4.38	40	2.04
10. Assist students in achieving basic reading skills (L.7)	12	4.35	14	3.13

Note. Mann-Whitney U testing identified a statistically significant difference ($U = 7105$, $p = 0.001$) at a 0.05 significance-level between CTE teachers who answered "Unsure" ($n = 13$) of their desire to remain in the teacher profession for the next five years and those who answered "Yes" ($n = 85$).

Table 18
Top 10 Competencies Identified by CTE Teachers Who Intend to Remain in the Teaching Profession for the Next Five Years Ranked by MWDS Compared to Rankings of CTE Teachers Unsure of Their Plan to Remain the Teaching Profession for the Next Five Years

CTE Teacher Competency	Yes		Unsure	
	n	MWDS	Rank	MWDS
1. Counsel special education students with personal-social problems (K.11)	84	4.29	6	4.72
2. Assist special education students with personal-social problems (K.10)	83	3.77	4	4.97
3. Place co-op students on the job (J.5)	83	3.75	39	3.02
4. Arrange for improvement of CTE facilities (E.8)	83	3.72	1	5.76
5. Secure high-quality training stations for the co-op program (J.4)	83	3.72	18	3.92
6. Promote a CTE program for students with special needs (K.12)	84	3.68	13	4.31
7. Prepare special education students for employability (K.8)	83	3.67	2	5.76
8. Provide appropriate instructional materials for students with special needs (K.6)	83	3.48	58	2.49
9. Manage the attendance, transfers, and terminations of co-op students (J.8)	83	3.45	22	3.61
10. Develop alternative work-based learning experience (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	83	3.41	4	5.53

Note. Mann-Whitney U testing identified a statistically significant difference ($U = 7105$, $p = 0.001$) at a 0.05 significance-level between CTE teachers who answered "Yes" ($n = 85$) for their intention to remain in the teacher profession for the next five years and those who answered "Unsure" ($n = 13$).

Research Question #3 Observations

The Mann-Whitney U test conducted to compare the competency rankings based on gender found that there are no statistically significant differences between male and female respondents. This is also borne out in the comparison of the top ten competencies identified by each group where all ten competencies identified by females were also in the male top 23 and eight out of ten competencies identified by males were also in the female top 24.

Two competencies identified by male respondents are ranked much differently when compared to female respondents. One is "Develop and maintain relationships with school guidance counselors (G.2)" which ranks first for male respondents and 56th for female respondents. The other is "Assist students in improving their writing skills (L.6)" which ranks sixth for male respondents and 51st for female respondents. Despite the high ranking for each competency by male respondents, neither of those two competencies ranked in the top 25 identified by all respondents.

The Mann-Whitney U test conducted for differences between ethnic groups – in this case "Black or African American" and "White" CTE teachers – did identify the existence of a statistically significant difference. Competencies identified by "Black or African American" CTE teachers that were not shared by their "White" counterparts include: "Develop and maintain a program social media presence (G.12)", "Arrange for television and radio presentations concerning the CTE program (G.11)", "Market the adult education program (M.6)", "Provide lab experiences for prospective teachers (I.9)", and "Assist students in improving their math skills (L.5)." Marketing and promotion was a common theme found amongst those competency differences.

"White" CTE teachers identified one competency that was ranked outside the top 24 for "Black or African American" CTE teachers – "Develop alternative work-based learning experience (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)." Each of the top ten competencies identified by "White" teachers were identified in the top 11 MWDS for all respondents.

The Mann-Whitney U test for differences based on CTE teacher intention to remain in the teaching profession for the next five years also identified the existence of a statistically

significant difference. CTE teachers who were "Unsure" of their intention to remain in the teaching profession for the next five years generated a top ten that included three competencies that were ranked outside the top 23 of respondents who selected "Yes" for their intention to stay in the teaching profession for at least the next five years. Those three differences were "Develop and maintain a program social media presence (G.12)", "Collaborate with other CTE teachers and administrators to plan, develop, and evaluate a CTE program (A.5)" and "Individualized instruction (C.15)."

CTE teachers who selected "Yes" for their intention to remain in the teacher profession ranked "Place co-op students on the job (J.5)" and "Provide appropriate instructional materials for students with special needs (K.6)" as top ten priorities, whereas CTE teachers who selected "Unsure" to the same question ranked those competencies as 39th and 58th respectively. The top ten competencies identified by those intending to stay were all identified in the overall top 12 MWDS by all respondents.

Research Question #4

Question four of this study asks, what relationship does the CTE program a teacher works within have with the teacher's current perceived professional growth needs? This question is answered by comparing the disaggregated MWDS rankings of the competencies. Data was disaggregated based on the CTE content area self-identified by the respondent. Seven CTE content areas were provided to respondents, as well as the ability to select "Other." Respondents who selected "Other" were able to add another group description.

Each of the seven CTE content areas listed by the Virginia Department of Education (VDOE), consisting of "Agriculture Education" (AgEd), "Business & Information Technology" (BIT), "Family & Consumer Sciences" (FCS), "Health & Medical Sciences" (HMS), "Marketing

Education" (MRKT), "Technology Education" (TECH), and "Trade & Industrial Education" (T&I) were selected by at least one respondent. Two additional content areas were added by selecting "Other" – "Career Connections" and "JROTC". "Career Connections" is a CTE content area identified by the VDOE (2020). While not universally grouped with CTE programs, JROTC courses in Military Science are supported by the Virginia CTE Resource Center's VERSO application (VDOE, 2020). Accordingly, both are considered Virginia CTE programs for the purposes of this study.

The Kruskal-Wallis one-way analysis of variance test by ranks was used to determine if a difference exists between three or more subgroups in a demographic category. Seven of the nine content areas had sufficiently large sample sizes ($n >= 5$) to compare. The two that were not included were "Career Connections" ($n = 1$) and "JROTC" ($n = 2$). The test revealed that the competency rankings for CTE teachers in different content areas were significantly different ($H = 64.99$, $p < 0.0001$) at a 0.05 significance level.

Post-hoc Mann-Whitney U testing was used to compare all pairs of groups. The results of the comparison tests are presented in Table 19. All comparisons with a p-value less than 0.05 are considered statistically significant.

Table 19

Post-Hoc Mann-Whitney U Test Results for Competency Ranking by CTE Content Area

Content Area	*n*	*U*-Value (*p*-Value)						
		AgEd	BIT	FCS	HMS	MRKT	TECH	T&I
Agriculture Education	7	-						
Business & Information Technology	21	5572 (<0.0001*)	-					
Family & Consumer Sciences	20	7353 (0.0036*)	6627.5 (<0.0001*)	-				
Health & Medical Sciences	5	4217 (<0.0001*)	6891 (0.0003*)	4721.5 (<0.0001*)	-			
Marketing Education	17	5859 (<0.0001*)	8688 (0.3884)	7194.5 (0.0016*)	6658 (<0.0001*)	-		
Technology Education	15	7098.5 (0.0009*)	7512.5 (0.0075*)	8781 (0.4720)	5671 (<0.0001*)	7806.5 (0.0263*)	-	
Trade & Industrial Education	14	5565 (<0.0001*)	9133.5 (0.8605)	6568.5 (<0.0001*)	7083 (0.0008*)	8640.5 (0.3494)	7490 (0.0067*)	-

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 64.99$, $p < 0.0001$). Post-Hoc Mann-Whitney U testing was conducted to identify specific subgroups with statistically significant differences.

* Statistically significant difference at a 0.05 significance-level where $p < 0.05$.

The results of the Mann-Whitney U tests show statistically significant differences exist for competency rankings produced by respondents from various CTE content areas with two exceptions. The first exception is the competency rankings produced by "Business & Information Technology", "Marketing Education", and "Trade & Industrial Education" where the three groups do not possess a statistically significant difference. The second exception is between "Family & Consumer Sciences" and "Technology Education" which also produces results that do not possess a statistically significant difference.

A closer examination of the highest ranked competencies for each CTE content area can be found in Table 20.

Table 20
Top Ten Competency Rankings by MWDS for Specific CTE Content Areas Compared to MWDS Rank from All Respondents

CTE Content Area Top Ten Competencies	*n*	MWDS	Overall Rank
Agriculture Education			
1. Promote a CTE program for students with special needs (K.12)	7	9.71	7
2. Organize and maintain an occupational advisory committee (A.6)	7	8.86	39
3. Prepare special education students for employability (K.8)	7	8.33	6
4. Assist special education students in developing career planning skills (K.10)	7	8.33	2
5. Work collaboratively with special education personnel including assisting in the development of IEPs and accommodations (K.9)	7	7.86	42
6. Plan the student teaching experience (I.10)	7	7.59	16
7. Arrange for improvement of CTE facilities (E.8)	6	7.25	3

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 64.99$, $p < 0.0001$) for each CTE Content Area: Agriculture Education ($n = 7$), Business & Information Technology ($n = 21$), Family & Consumer Sciences ($n = 20$), Health & Medical Sciences ($n = 5$), Marketing Education ($n = 17$), Technology Education ($n = 15$), and Trade & Industrial Education ($n = 14$).

Table 20 (continued)
Top Ten Competency Rankings by MWDS for Specific CTE Content Areas Compared to MWDS Rank from All Respondents

CTE Content Area Top Ten Competencies	*n*	MWDS	Overall Rank
Agriculture Education (continued)			
8. Place co-op students on the job (J.5)	7	7.18	5
9. Provide appropriate instructional materials for students with special needs (K.6)	7	6.94	12
10. Search for existing regional employment forecasts (A.7)	7	6.73	44
Business & Information Technology			
1. Place co-op students on the job (J.5)	19	5.16	5
2. Counsel special education students with personal-social problems (K.11)	20	5.06	1
3. Establish guidelines for a cooperative CTE program (J.3)	19	5.06	11
4. Assist students in achieving basic reading skills (L.7)	20	4.99	13
5. Assist students in developing technical reading skills (L.4)	19	4.65	21
6. Secure high-quality training stations for the co-op program (J.4)	19	4.49	4
7. Develop the training ability of work site instructors (J.6)	19	4.48	10
8. Assist students in improving their writing skills (L.6)	20	4.47	26
9. Promote a CTE program for students with special needs (K.12)	20	4.37	7
10. Manage the attendance, transfers, and terminations of co-op students (J.8)	19	4.21	8
Family & Consumer Sciences			
1. Secure high-quality training stations for the co-op program (J.4)	20	5.87	4
2. Counsel special education students with personal-social problems (K.11)	20	5.50	1
3. Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	20	5.40	9

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 64.99$, $p < 0.0001$) for each CTE Content Area: Agriculture Education ($n = 7$), Business & Information Technology ($n = 21$), Family & Consumer Sciences ($n = 20$), Health & Medical Sciences ($n = 5$), Marketing Education ($n = 17$), Technology Education ($n = 15$), and Trade & Industrial Education ($n = 14$).

Table 20 (continued)
Top Ten Competency Rankings by MWDS for Specific CTE Content Areas Compared to MWDS Rank from All Respondents

CTE Content Area Top Ten Competencies	*n*	MWDS	Overall Rank
4. Assist special education students in developing career planning skills (K.10)	20	5.35	2
5. Provide appropriate instructional materials for students with special needs (K.6)	19	5.19	12
6. Place co-op students on the job (J.5)	20	5.10	5
7. Arrange for improvement of CTE facilities (E.8)	20	5.00	3
8. Develop the training ability of work site instructors (J.6)	20	4.98	10
9. Prepare special education students for employability (K.8)	20	4.84	6
10. Modify the learning environment for students with special needs (K.7)	19	4.65	20
Health & Medical Sciences			
1. Work summer externships to keep up-to-date with industry trends and changes (I.11)	5	3.84	18
2. Supervise activities of the CTSO (H.1)	5	3.68	92
3. Guide participation in CTSO (H.2)	5	3.68	74
4. Prepare CTSO members for leadership roles (H.3)	5	3.68	61
5. Develop a personal philosophy concerning CTSOs (H.4)	5	3.68	88
6. Assist CTSO members in developing and financing a yearly program of activities (H.5)	5	3.68	68
7. Develop creative/effective alternatives to official CTSOs (local or regional competitions and/or service learning projects) (H.6)	5	3.68	51
8. Establish a CTSO (H.7)	5	3.68	55
9. Promote a CTE program for students with special needs (K.12)	5	3.68	7
10. Research and select instructional materials (B.2)	5	3.00	93

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 64.99$, $p < 0.0001$) for each CTE Content Area: Agriculture Education ($n = 7$), Business & Information Technology ($n = 21$), Family & Consumer Sciences ($n = 20$), Health & Medical Sciences ($n = 5$), Marketing Education ($n = 17$), Technology Education ($n = 15$), and Trade & Industrial Education ($n = 14$).

Table 20 (continued)
Top Ten Competency Rankings by MWDS for Specific CTE Content Areas Compared to MWDS Rank from All Respondents

CTE Content Area Top Ten Competencies	*n*	MWDS	Overall Rank
Marketing Education			
1. Assist students in developing self-discipline (E.3)	17	5.39	19
2. Plan the student teaching experience (I.10)	17	4.59	16
3. Arrange for improvement of CTE facilities (E.8)	17	3.84	3
4. Develop student-ambassador programs to assist with marketing CTE programs (G.9)	17	3.84	33
5. Mentor new CTE teachers (I.6)	17	3.82	36
6. Give presentations to promote the CTE program (G.4)	17	3.78	38
7. Collaborate with other CTE teachers and administrators to plan, develop, and evaluate a CTE program (A.5)	17	3.55	29
8. Manage the attendance, transfers, and terminations of co-op students (J.8)	17	3.49	8
9. Direct students in applying problem-solving techniques (C.1)	17	3.45	43
10. Supervise student-teachers (I.7)	17	3.40	27
Technology Education			
1. Work with members of the community (G.2)	15	5.76	24
2. Work summer externships to keep up-to-date with industry trends and changes (I.11)	15	5.33	18
3. Assist special education students in developing career planning skills (K.10)	15	5.05	2
4. Promote a CTE program for students with special needs (K.12)	15	4.99	7
5. Plan the student teaching experience (I.10)	15	4.88	16
6. Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	15	4.76	9

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 64.99$, $p < 0.0001$) for each CTE Content Area: Agriculture Education ($n = 7$), Business & Information Technology ($n = 21$), Family & Consumer Sciences ($n = 20$), Health & Medical Sciences ($n = 5$), Marketing Education ($n = 17$), Technology Education ($n = 15$), and Trade & Industrial Education ($n = 14$).

Table 20 (continued)
Top Ten Competency Rankings by MWDS for Specific CTE Content Areas Compared to MWDS Rank from All Respondents

CTE Content Area Top Ten Competencies	*n*	MWDS	Overall Rank
Technology Education (continued)			
7. Develop the training ability of work site instructors (J.6)	15	4.72	10
8. Manage the attendance, transfers, and terminations of co-op students (J.8)	15	4.72	8
9. Arrange for improvement of CTE facilities (E.8)	15	4.67	3
10. Assist students in applying for employment or further education (F.2)	15	4.60	53
Trade & Industrial Education			
1. Assist students in improving their writing skills (L.6)	13	6.14	26
2. Assist students in improving their math skills (L.5)	15	5.30	28
3. Assist students in achieving basic reading skills (L.7)	15	5.14	13
4. Assist students in developing technical reading skills (L.4)	15	5.05	21
5. Counsel special education students with personal-social problems (K.11)	15	4.82	1
6. Promote a CTE program for students with special needs (K.12)	15	4.36	7
7. Assist special education students in developing career planning skills (K.10)	15	4.15	2
8. Individualize instruction (C.15)	15	4.10	37
9. Provide appropriate instructional materials for students with special needs (K.6)	15	4.04	12
10. Assist students in improving their survival skills (L.3)	15	3.65	77

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 64.99$, $p < 0.0001$) for each CTE Content Area: Agriculture Education ($n = 7$), Business & Information Technology ($n = 21$), Family & Consumer Sciences ($n = 20$), Health & Medical Sciences ($n = 5$), Marketing Education ($n = 17$), Technology Education ($n = 15$), and Trade & Industrial Education ($n = 14$).

Research Question #4 Observations

Two combinations of CTE content areas were found to have statistically similar competency rankings. Combination One includes "Business & Information Technology",

"Marketing Education", and "Trade & Industrial Education." Combination Two includes "Family & Consumer Sciences" and "Technology Education." These five content areas all had similar response sizes, ranging between 14 and 21. The "Agriculture Education" and "Health & Medical Sciences" content areas had lower response sizes, seven and five respectively.

Each content area had two or more competencies in their top ten that are included in the list of competencies identified as highest priority professional development needs in Table 12. Demographic category subgroups also tended to identify themes within their top ten competency rankings. "Agriculture education" teachers ranked five competencies on working with special education students and preparing students for employment in their top ten. "Business and Information Technology" teachers ranked eight competencies on cooperative education programs and foundational academic skills in their top ten. "Family and consumer sciences" teachers ranked nine competencies related to special education students and cooperative education programs – categories identified for the overall study as well – in their top ten. "Health and medical sciences" teachers ranked seven competencies on CTSOs in their top ten – a topic not identified by other content areas. "Marketing Education" teachers ranked eight competencies related to teacher mentoring and preparing new/student teachers, student self-discipline and job placement, and program marketing in their top ten. "Technology education" teachers ranked eight competencies on preparing students to achieve gainful employment in their top ten. "Trade and industrial" teachers ranked nine competencies on providing instruction in foundational academic skills and working with special education students in their top ten.

Research Question #5

Question five of this study asks, what relationship does the number of years of experience a CTE teacher possesses have with the teacher's perceived professional growth needs? This

question is answered by comparing the disaggregated MWDS rankings of the competencies. Data was disaggregated based on the number of years of teaching experience self-identified by the respondent. Four groupings were used for years of experience: "0-3 years of experience", "4-9 years of experience", "10-14 years of experience", and "15 or more years of experience." The ranges of years of experience were selected in order to match the groupings used in a study on the average years of experience for U.S. teachers conducted by the U.S. Department of Education, National Center for Teacher Statistics (2016).

The Kruskal-Wallis one-way analysis of variance test by ranks was used to determine if a difference exists between three or more subgroups in a demographic category. Each of the four years of experience groupings had sufficiently large sample sizes ($n >= 5$) to compare. The test revealed that the competency rankings for CTE teachers based on years of experience were significantly different ($H = 27.57$, $p < 0.0001$) at a 0.05 significance level.

Post-hoc Mann-Whitney U testing was used to identify the years of experience groupings where differences in ranking exist. The results of the comparison tests are presented in Table 21. All comparisons with a p-value less than 0.05 are considered statistically significant.

Table 21
Post-Hoc Mann-Whitney U Test Results for Competency Ranking by Years of Experience

Years of Experience	*n*	*U*-Value (*p*-Value)			
		0 – 3	4 – 9	10 – 14	15+
0 – 3 Years	17	-			
4 – 9 Years	14	6905 (0.0003*)	-		
10 – 14 Years	16	8786 (0.4768)	6923.5 (0.0003*)	-	
15+ Years	55	8227 (0.1157)	5907 (<0.0001*)	8984 (0.6846)	-

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 27.57$, $p < 0.0001$). Post-Hoc Mann-Whitney U testing was conducted to identify specific subgroups with statistically significant differences.
* Statistically significant difference at a 0.05 significance-level where $p < 0.05$.

The results of the Mann-Whitney U tests identified statistically significant differences for one of the groupings when compared to each of the others: CTE teachers with "4-9 years of teaching experience." No statistically significant differences exist between other groups when companioning between all other groups of CTE teachers. Table 22 presents the top ten competencies identified by CTE teachers grouped by years of experience to compare those rankings to the overall rankings for those competencies.

Table 22
Top Ten Competencies Identified by CTE Teachers by MWDS based on Years of Experience

Competency	*n*	MWDS	Overall Rank
0-3 Years of Experience			
1. Arrange for improvement of CTE facilities (E.8)	17	6.09	3
2. Prepare special education students for employability (K.8)	17	5.94	6
3. Counsel special education students with personal-social problems (K.11)	17	4.61	1
4. Prepare to serve students with special needs (K.5)	17	4.43	23
5. Provide appropriate instructional materials for students with special needs (K.6)	17	4.37	12
6. Assist special education students in developing career planning skills (K.10)	17	4.32	2
7. Assist students in developing technical reading skills (L.4)	17	4.32	21
8. Promote a CTE program for students with special needs (K.12)	17	4.29	7
9. Use instructional techniques to meet the needs of students with special needs (K.3)	17	4.10	15
10. Evaluate instructional effectiveness (D.2)	17	3.92	49
4-9 Years of Experience			
1. Supervise student-teachers (I.7)	14	6.06	27
2. Secure high-quality training stations for the co-op program (J.4)	14	6.01	4
3. Place co-op students on the job (J.5)	14	5.91	5
4. Assess the progress of students with special needs (K.4)	14	5.90	14
5. Arrange for improvement of CTE facilities (E.8)	14	5.88	3
6. Modify the learning environment for students with special needs (K.7)	14	5.64	20
7. Assist students in achieving basic reading skills (L.7)	14	5.47	13

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 27.57$, $p < 0.0001$) for each years of experience grouping: 0 – 3 years ($n = 17$), 4 – 9 years ($n = 14$), 10 – 14 years ($n = 16$), and 15+ years ($n = 55$).

Table 22
Top Ten Competencies Identified by CTE Teachers by MWDS based on Years of Experience

Competency	*n*	MWDS	Overall Rank
4-9 Years of Experience (continued)			
8. Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	14	5.31	9
9. Use instructional techniques to meet the needs of students with special needs (K.3)	14	5.20	15
10. Establish guidelines for a cooperative CTE program (J.3)	14	5.14	11
10-15 Years of Experience			
1. Manage the attendance, transfers, and terminations of co-op students (J.8)	16	7.92	8
2. Develop the training ability of work site instructors (J.6)	16	6.84	10
3. Secure high-quality training stations for the co-op program (J.4)	16	6.74	4
4. Assist students in developing self-discipline (E.3)	15	6.25	19
5. Plan the student teaching experience (I.10)	16	6.11	16
6. Supervise an employer/employee appreciation event (J.7)	16	6.02	25
7. Provide lab experiences for prospective teachers (I.9)	16	5.93	30
8. Establish guidelines for a cooperative CTE program (J.3)	16	5.86	11
9. Place co-op student on the job (J.5)	16	5.70	5
10. Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	16	5.64	9
15 or More Years of Experience			
1. Counsel special education students with personal-social problems (K.11)	54	4.25	1
2. Assist special education students in developing career planning skills (K.10)	53	3.98	2

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 27.57$, $p < 0.0001$) for each years of experience grouping: 0 – 3 years ($n = 17$), 4 – 9 years ($n = 14$), 10 – 14 years ($n = 16$), and 15+ years ($n = 55$).

Table 22
Top Ten Competencies Identified by CTE Teachers by MWDS based on Years of Experience

Competency	*n*	MWDS	Overall Rank
15 or More Years of Experience (continued)			
3. Manage the attendance, transfers, and terminations of co-op students (J.8)	52	3.84	8
4. Place co-op students on the job (J.5)	53	3.79	5
5. Promote a CTE program for students with special needs (K.12)	54	3.65	7
6. Secure high-quality training stations for the co-op program (J.4)	52	3.43	4
7. Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	53	3.41	9
8. Develop the training ability of work site instructors (J.6)	53	3.30	10
9. Establish guidelines for a cooperative CTE program (J.3)	52	3.25	11
10. Prepare special education students for employability (K.8)	53	3.10	6

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 27.57$, $p < 0.0001$) for each years of experience grouping: 0 – 3 years ($n = 17$), 4 – 9 years ($n = 14$), 10 – 14 years ($n = 16$), and 15+ years ($n = 55$).

Research Question #5 Observations

While the overall rankings for teachers in the "4-9 years of teaching experience" grouping possessed a statistically significant difference when compared to the other groupings, Table 22 shows that the top ten identified competencies are similar to the highest prioritized competencies identified by all respondents. The greatest outlier in the top ten is the top ranked competency "Supervise student-teachers (I.7)" which is ranked 27th by all respondents. Competency rankings for CTE teachers in the "0-3 years of experience" group also included a top ten where competencies identified by the group were competencies ranked in the top 23 by

all respondents with one exception – "Evaluate instructional effectiveness (D.2)" which was ranked tenth by the "0-3 years of experience" group and 49th by all respondents.

CTE teachers in the "10-14 years of experience" group identified only one competency in their top then that was not ranked in the top 25 by all respondents – "Provide lab experiences for prospective teachers (I.9)" – which was ranked 30th by all respondents. The "15+ years of experience" group identified a top ten that were all ranked in the top 11 for all respondents.

Research Question #6

Question six of this study asks, what relationship does the school division a teacher works within have with the teacher's current perceived professional growth needs? This question is answered by comparing the disaggregated MWDS rankings of the competencies. Data was disaggregated based on the school division self-identified by the respondent as well as by that school division's region in the state of Virginia as defined by the VDOE (2020). A total of 29 school divisions out of the 133 in Virginia are represented in the study. At least one school division from each of the eight regions of Virginia is represented.

Of the 29 school divisions represented, eight had a large enough response rate ($n >= 5$) to be used for comparison. Those eight school divisions will be identified as "Division A", "Division B", "Division C", "Division D", "Division E", "Division F", "Division G", and "Division H." For the eight regions of the state, seven had a large enough response rate ($n >= 5$) to be used for comparison. Those seven regions will be identified by the VDOE region name assigned to each: "Region One", "Region Two", "Region Three", "Region Four", "Region Five", "Region Six", and "Region Seven."

The Kruskal-Wallis one-way analysis of variance test by ranks was used to determine if a difference exists between three or more subgroups in a demographic category. A Kruskal-Wallis

test was conducted to identify difference for the eight school divisions with sufficient response sizes. A separate Kruskal-Wallis test was conducted for the seven regions with sufficient response sizes ($n >= 5$). The test for school divisions revealed that the competency rankings for CTE teachers were significantly different ($H = 56.40$, $p < 0.0001$) at a 0.05 significance level. The test for VDOE regions revealed that the competency rankings for CTE teachers were significantly different ($H = 46.74$, $p < 0.0001$) at a 0.05 significance level.

Post-hoc Mann-Whitney U testing was used to identify the division and region groupings where differences in ranking exist. The results of the comparison tests for school divisions are presented in Table 23. The results of the comparison tests for regions are presented in Table 24. All comparisons with a p-value less than 0.05 are considered statistically significant.

Table 23

Post-Hoc Mann-Whitney U Test Results for Competency Ranking by School Division

School Division	*n*	*U*-Value (*p*-Value)							
		A	B	C	D	E	F	G	H
Division A	6	-							
Division B	11	8113.5 (0.0803)	-						
Division C	7	8076.5 (0.0709)	6669 (<0.0001*)	-					
Division D	8	8936 (0.6308)	8289.5 (0.1433)	7472.5 (0.0062*)	-				
Division E	8	8961 (0.6586)	8387 (0.1846)	7510 (0.0074*)	9008.5 (0.7125)	-			
Division F	10	7818.5 (0.0275*)	6557.5 (<0.0001*)	9061 (0.7737)	7551 (0.0089*)	7667.5 (0.0148*)	-		
Division G	11	8094 (0.0753)	6987 (0.0005*)	9091 (0.8093)	7910 (0.0392*)	7931 (0.0424*)	9131 (0.8575)	-	
Division H	6	6293 (<0.0001*)	5331 (<0.0001*)	7368 (0.0038*)	6123 (<0.0001*)	6230 (<0.0001*)	7429.5 (0.0050*)	7456.5 (0.0058*)	-

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 56.40$, $p < 0.0001$). Post-Hoc Mann-Whitney U testing was conducted to identify specific subgroups with statistically significant differences.

* Statistically significant difference at a 0.05 significance-level where $p < 0.05$.

Table 24

Post-Hoc Mann-Whitney U Test Results for Competency Ranking by VDOE Region

VDOE Region	*n*	*U*-Value (*p*-Value)						
		One	Two	Three	Four	Five	Six	Seven
Region One	8	-						
Region Two	13	6127 (<0.0001*)	-					
Region Three	10	9177.5 (0.9141)	6390 (<0.0001*)	-				
Region Four	13	9241 (0.9920)	6053.5 (<0.0001*)	9021.5 (0.7275)	-			
Region Five	11	8586 (0.3077)	5623 (<0.0001*)	8759 (0.4513)	8421 (0.2024)	-		
Region Six	30	8794 (0.4845)	5977.5 (<0.0001*)	9000 (0.7028)	8696 (0.3952)	9042.5 (0.7520)	-	
Region Seven	14	8435 (0.2103)	5623.5 (<0.0001*)	8716.5 (0.4130)	8370 (0.1761)	9127 (0.8527)	8902 (0.5943)	-

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 46.74$, $p < 0.0001$). Post-Hoc Mann-Whitney U testing was conducted to identify specific subgroups with statistically significant differences.

* Statistically significant difference at a 0.05 significance-level where $p < 0.05$.

Results from the Mann-Whitney U testing for school divisions indicate statistically significant differences for 17 of the 28 school division comparisons. One school division, "Division H", had results that were statistically different than all other school divisions. Another school division, "Division A", had results that were statistically different from only two other school divisions – the lowest number of differences. The other six school divisions each had results that were statistically different from four to five other school divisions. Table 25 compares the top ten identified competencies for each school division with the competency ranking determine from all responses.

Table 25
Top Ten Competencies Identified by CTE Teachers by MWDS based on School Division

Competency	*n*	MWDS	Overall Rank
Division A			
1. Mentor new CTE teachers (I.6)	6	8.06	36
2. Prepare special education students for employability (K.8)	6	6.25	6
3. Assist CTSO members in developing and financing a yearly program of activities (H.5)	6	4.86	68
4. Use instructional techniques to meet the needs of students with special needs (K.3)	6	4.67	15
5. Assist special education students in developing career planning skills (K.10)	6	4.50	2
6. Plan the student teaching experience (I.10)	6	4.33	16
7. Counsel special education students with personal-social problems (K.11)	6	4.33	1
8. Conduct a course of study based on industry or state standards (A.2)	6	4.17	63

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 56.40$, $p < 0.0001$) for each school division: Division A ($n = 6$), Division B ($n = 11$), Division C ($n = 7$), Division D ($n = 8$), Division E ($n = 8$), Division F ($n = 10$), Division G ($n = 11$), and Division H ($n = 6$).

Table 25 (continued)
Top Ten Competencies Identified by CTE Teachers by MWDS based on School Division

Competency	*n*	MWDS	Overall Rank
Division A (continued)			
9. Integrate academic instruction within CTE courses (B.7)	6	4.17	110
10. Develop long-range plans (A.3)	6	4.03	50
Division B			
1. Individualize instruction (C.15)	11	4.13	37
2. Work summer externships to keep up-to-date with industry trends and changes (I.11)	10	4.09	18
3. Counsel special education students with personal-social problems (K.11)	11	3.79	1
4. Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	11	3.50	9
5. Assist students in improving their writing skills (L.6)	11	3.37	26
6. Arrange for improvement of CTE facilities (E.8)	10	3.29	3
7. Employ the project method (C.10)	11	3.01	98
8. Assist students in achieving basic reading skills (L.7)	11	3.01	13
9. Use subject matter experts to present information (C.17)	11	2.98	58
10. Use instructional techniques to meet the needs of students with special needs (K.3)	9	2.68	15
Division C			
1. Prepare special education students for employability (K.8)	7	7.14	6
2. Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	7	6.24	9
3. Modify the learning environment for students with special needs (K.7)	7	6.06	20

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 56.40$, $p < 0.0001$) for each school division: Division A ($n = 6$), Division B ($n = 11$), Division C ($n = 7$), Division D ($n = 8$), Division E ($n = 8$), Division F ($n = 10$), Division G ($n = 11$), and Division H ($n = 6$).

Table 25 (continued)
Top Ten Competencies Identified by CTE Teachers by MWDS based on School Division

Competency	*n*	MWDS	Overall Rank
Division C (continued)			
4. Provide appropriate instructional materials for students with special needs (K.6)	7	5.71	12
5. Assist special education students in developing career planning skills (K.10)	7	5.55	2
6. Manage the attendance, transfers, and terminations of co-op students (J.8)	7	5.51	8
7. Counsel special education students with personal-social problems (K.11)	7	5.39	1
8. Prepare for students' related instruction (J.1)	7	4.71	60
9. Work collaboratively with special education personnel including assisting in the development of IEPs and accommodations (K.9)	7	4.71	42
10. Place co-op students on the job (J.5)	7	4.57	5
Division D			
1. Promote a CTE program for students with special needs (K.12)	7	6.12	7
2. Assist special education students in developing career planning skills (K.10)	7	5.22	2
3. Prepare special education students for employability (K.8)	7	5.06	6
4. Work collaboratively with special education personnel including assisting in the development of IEPs and accommodations (K.9)	7	4.57	42
5. Use instructional techniques to meet the needs of students with special needs (K.3)	7	4.43	15
6. Prepare to serve students with special needs (K.5)	7	4.43	23
7. Search for existing regional employment forecasts (A.7)	8	4.36	44
8. Assist students in achieving basic reading skills (L.7)	7	4.04	13

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 56.40$, $p < 0.0001$) for each school division: Division A ($n = 6$), Division B ($n = 11$), Division C ($n = 7$), Division D ($n = 8$), Division E ($n = 8$), Division F ($n = 10$), Division G ($n = 11$), and Division H ($n = 6$).

Table 25 (continued)
Top Ten Competencies Identified by CTE Teachers by MWDS based on School Division

Competency	*n*	MWDS	Overall Rank
Division D (continued)			
9. Individualize instruction (C.15)	7	3.96	37
10. Assist students in developing technical reading skills (L.4)	6	3.93	21
Division E			
1. Place co-op students on the job (J.5)	8	6.02	5
2. Manage the attendance, transfers, and terminations of co-op students (J.8)	8	6.02	8
3. Organize and maintain an occupational advisory committee (A.6)	8	5.31	39
4. Arrange for television and radio presentations concerning the CTE program (G.11)	7	5.14	35
5. Collaborate with other CTE teachers and administrators to plan, develop, and evaluate a CTE program (A.5)	8	5.06	29
6. Arrange for improvement of CTE facilities (E.8)	8	4.38	3
7. Establish guidelines for a cooperative CTE program (J.3)	8	4.38	11
8. Provide appropriate instructional materials for students with special needs (K.6)	8	4.38	12
9. Supervise student-teachers (I.7)	8	4.27	27
10. Plan the student teaching experience (I.10)	8	4.05	16
Division F			
1. Develop and maintain a program social media presence (G.12)	10	7.04	22
2. Assist students in developing self-discipline (E.3)	10	6.58	19
3. Plan the student teaching experience (I.10)	10	6.45	16
4. Assist special education students in developing career planning skills (K.10)	10	5.40	2
5. Develop and maintain a program web site (G.10)	10	5.20	40

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 56.40$, $p < 0.0001$) for each school division: Division A ($n = 6$), Division B ($n = 11$), Division C ($n = 7$), Division D ($n = 8$), Division E ($n = 8$), Division F ($n = 10$), Division G ($n = 11$), and Division H ($n = 6$).

Table 25 (continued)
Top Ten Competencies Identified by CTE Teachers by MWDS based on School Division

Competency	*n*	MWDS	Overall Rank
Division F (continued)			
6. Arrange for improvement of CTE facilities (E.8)	10	5.16	3
7. Manage the attendance, transfers, and terminations of co-op students (J.8)	10	5.16	8
8. Project instructional resource needs (E.2)	10	4.95	57
9. Direct students in applying problem-solving techniques (C.1)	10	4.90	43
10. Promote a CTE program for students with special needs (K.12)	10	4.51	7
Division G			
1. Promote a CTE program for students with special needs (K.12)	11	7.59	7
2. Assist students in developing technical reading skills (L.4)	11	6.69	21
3. Assist students in achieving basic reading skills (L.7)	11	6.13	13
4. Modify the learning environment for students with special needs (K.7)	11	6.13	20
5. Counsel special education students with personal-social problems (K.11)	11	5.83	1
6. Place co-op students on the job (J.5)	11	5.37	5
7. Provide instruction for slower and more capable learners (C.7)	11	5.36	32
8. Prepare to serve students with special needs (K.5)	11	5.36	23
9. Assist students in improving their math skills (L.5)	11	5.16	28
10. Prepare special education students for employability (K.8)	11	5.06	6
Division H			
1. Provide appropriate instructional materials for students with special needs (K.6)	6	9.00	12

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 56.40$, $p < 0.0001$) for each school division: Division A ($n = 6$), Division B ($n = 11$), Division C ($n = 7$), Division D ($n = 8$), Division E ($n = 8$), Division F ($n = 10$), Division G ($n = 11$), and Division H ($n = 6$).

Table 25 (continued)
Top Ten Competencies Identified by CTE Teachers by MWDS based on School Division

Competency	*n*	MWDS	Overall Rank
Division H (continued)			
2. Counsel special education students with personal-social problems (K.11)	6	8.67	1
3. Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	6	7.64	9
4. Establish guidelines for a cooperative CTE program (J.3)	6	7.64	11
5. Promote a CTE program for students with special needs (K.12)	6	7.33	7
6. Assess the progress of students with special needs (K.4)	6	6.75	14
7. Prepare to serve students with special needs (K.5)	6	6.75	23
8. Assist special education students in developing career planning skills (K.10)	6	6.50	2
9. Improve teacher communication skills (K.1)	6	6.44	48
10. Work summer externships to keep up-to-date with industry trends and changes (I.11)	6	6.39	18

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 56.40$, $p < 0.0001$) for each school division: Division A ($n = 6$), Division B ($n = 11$), Division C ($n = 7$), Division D ($n = 8$), Division E ($n = 8$), Division F ($n = 10$), Division G ($n = 11$), and Division H ($n = 6$).

Results from the Post-hoc Mann-Whitney U testing provided in Table 24 show that one region, "Region 2", was statistically different than all other regions. No other region had a statistically significant difference with any other school division. Table 26 compares the top ten identified competencies for CTE teachers in each of the seven regions with their overall ranking.

Table 26
Top Ten Competencies Identified by CTE Teachers by MWDS based on VDOE Region

Competency	*n*	MWDS	Overall Rank
Region One			
1. Prepare special education students for employability (K.8)	8	6.25	6
2. Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	8	5.48	9
3. Modify the learning environment for students with special needs (K.7)	8	5.34	20
4. Provide appropriate instructional materials for students with special needs (K.6)	8	5.00	12
5. Manage the attendance, transfers, and terminations of co-op students (J.8)	8	4.92	8
6. Assist special education students in developing career planning skills (K.10)	8	4.88	2
7. Counsel special education students with personal-social problems (K.11)	8	4.75	1
8. Prepare for students' related instruction (J.1)	8	4.16	60
9. Work collaboratively with special education personnel including assisting in the development of IEPs and accommodations (K.9)	8	4.16	42
10. Place co-op students on the job (J.5)	8	4.05	5
Region Two			
1. Assist special education students in developing career planning skills (K.10)	13	5.14	2
2. Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	12	4.35	9
3. Counsel special education students with personal-social problems (K.11)	13	4.05	1
4. Work with members of the community (G.2)	13	3.73	24

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 46.74$, $p < 0.0001$) for each school division: Region One ($n = 8$), Region Two ($n = 13$), Region Three ($n = 10$), Region Four ($n = 13$), Region Five ($n = 11$), Region Six ($n = 30$), and Region Seven ($n = 14$).

Table 26 (continued)
Top Ten Competencies Identified by CTE Teachers by MWDS based on VDOE Region

Competency	*n*	MWDS	Overall Rank
Region Two (continued)			
5. Prepare special education students for employability (K.8)	13	3.30	6
6. Manage the attendance, transfers, and terminations of co-op students (J.8)	12	3.17	8
7. Arrange for television and radio presentations concerning the CTE program (G.11)	13	3.08	35
8. Secure high-quality training stations for the co-op program (J.4)	12	3.00	4
9. Develop a school-community relations plan for the CTE program (G.8)	13	2.98	17
10. Plan the student teaching experience (I.10)	13	2.98	16
Region Three			
1. Counsel special education students with personal-social problems (K.11)	10	5.46	1
2. Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	10	5.16	9
3. Establish guidelines for a cooperative CTE program (J.3)	10	5.16	11
4. Provide appropriate instructional materials for students with special needs (K.6)	10	4.95	12
5. Develop student-ambassador programs to assist with marketing CTE programs (G.9)	10	4.73	33
6. Develop and maintain a program social media presence (G.12)	10	4.68	22
7. Develop a school-community relations plan for the CTE program (G.8)	10	4.62	17
8. Supervise an employer/employee appreciation event (J.7)	10	4.29	25
9. Conduct an occupational analysis (A.8)	10	4.00	46

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 46.74$, $p < 0.0001$) for each school division: Region One ($n = 8$), Region Two ($n = 13$), Region Three ($n = 10$), Region Four ($n = 13$), Region Five ($n = 11$), Region Six ($n = 30$), and Region Seven ($n = 14$).

Table 26 (continued)
Top Ten Competencies Identified by CTE Teachers by MWDS based on VDOE Region

Competency	*n*	MWDS	Overall Rank
Region Three (continued)			
10. Assist special education students in developing career planning skills (K.10)	10	3.96	2
Region Four			
1. Mentor new CTE teachers (I.6)	13	5.33	36
2. Prepare special education students for employability (K.8)	13	5.06	6
3. Arrange for improvement of CTE facilities (E.8)	13	4.12	3
4. Plan the student teaching experience (I.10)	13	3.98	16
5. Develop long-range plans (A.3)	13	3.67	50
6. Give presentations to promote the CTE program (G.4)	13	3.61	38
7. Conduct a course of study based on industry or state standards (A.2)	13	3.49	63
8. Assist CTSO members in developing and financing a yearly program of activities (H.5)	13	3.48	68
9. Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	13	3.32	9
10. Build a network of supportive resources such as a mentor teacher, as well as state and national organizations (MBEA, MHOEA, etc.) (I.8)	13	3.31	45
Region Five			
1. Organize and maintain an occupational advisory committee (A.6)	11	5.21	39
2. Conduct an occupational analysis (A.8)	11	5.09	46
3. Secure high-quality training stations for the co-op program (J.4)	10	4.95	4
4. Promote a CTE program for students with special needs (K.12)	10	4.92	7
5. Individualize instruction (C.15)	10	4.64	37

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 46.74$, $p < 0.0001$) for each school division: Region One ($n = 8$), Region Two ($n = 13$), Region Three ($n = 10$), Region Four ($n = 13$), Region Five ($n = 11$), Region Six ($n = 30$), and Region Seven ($n = 14$).

Table 26 (continued)
Top Ten Competencies Identified by CTE Teachers by MWDS based on VDOE Region

Competency	*n*	MWDS	Overall Rank
Region Five (continued)			
6. Use instructional techniques to meet the needs of students with special needs (K.3)	10	4.40	15
7. Assist special education students in developing career planning skills (K.10)	10	4.40	2
8. Develop the training ability of work site instructors (J.6)	10	4.30	10
9. Provide instruction for slower and more capable learners (C.7)	10	4.09	37
10. Arrange for television and radio presentations concerning the CTE program (G.11)	9	4.00	35
Region Six			
1. Manage the attendance, transfers, and terminations of co-op students (J.8)	29	5.26	8
2. Arrange for improvement of CTE facilities (E.8)	30	5.25	3
3. Promote a CTE program for students with special needs (K.12)	30	5.21	7
4. Counsel special education students with personal-social problems (K.11)	30	4.99	1
5. Assist students in achieving basic reading skills (L.7)	30	4.70	13
6. Place co-op students on the job (J.5)	30	4.66	5
7. Assist special education students in developing career planning skills (K.10)	30	4.14	2
8. Assist students in developing self-discipline (E.3)	30	4.13	19
9. Prepare special education students for employability (K.8)	30	4.11	6
10. Secure high-quality training stations for the co-op program (J.4)	30	3.93	4
Region Seven			
1. Arrange for improvement of CTE facilities (E.8)	13	5.14	3

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 46.74$, $p < 0.0001$) for each school division: Region One ($n = 8$), Region Two ($n = 13$), Region Three ($n = 10$), Region Four ($n = 13$), Region Five ($n = 11$), Region Six ($n = 30$), and Region Seven ($n = 14$).

Table 26 (continued)
Top Ten Competencies Identified by CTE Teachers by MWDS based on VDOE Region

Competency	*n*	MWDS	Overall Rank
Region Seven (continued)			
2. Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	14	5.06	9
3. Establish guidelines for a cooperative CTE program (J.3)	14	4.52	11
4. Place co-op students on the job (J.5)	14	4.52	5
5. Secure high-quality training stations for the co-op program (J.4)	14	4.44	4
6. Work summer externships to keep up-to-date with industry trends and changes (I.11)	13	4.43	18
7. Assist special education students in developing career planning skills (K.10)	13	4.35	2
8. Individualize instruction (C.15)	14	4.24	37
9. Supervise student-teachers (I.7)	14	4.24	27
10. Develop brochures to promote the CTE program (G.6)	13	4.05	120

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 46.74$, $p < 0.0001$) for each school division: Region One ($n = 8$), Region Two ($n = 13$), Region Three ($n = 10$), Region Four ($n = 13$), Region Five ($n = 11$), Region Six ($n = 30$), and Region Seven ($n = 14$).

Research Question #6 Observations

"Division H" was found to be statistically different than all other school divisions with large enough sample sizes, however it still produced a top ten that includes nine competencies identified in the top 23 identified by all respondents. The other school divisions each had one or more top ten competencies that were ranked outside of the top 25 identified by all respondents. "Division A" had five, "Division B" and "Division E" had four each, "Division D" and "Division F" had three each, and "Division G" had two. The response sizes for the school

divisions identified ranged from six to 11. The eight school divisions cumulatively accounted for 66 of the 102 survey responses.

Similar observations exist when comparing responses by region. One region, "Region Two", was statistically different than all the others, however that region's top ten included nine competencies ranked in the top 24 of those most needed for professional development by all respondents. "Region Four" had six top ten competencies outside of the top 25 for all respondents. "Region Five" had five, "Region One", "Region Three", and "Region Seven" had two each, and "Region Six" had zero. "Region Six" had the highest number of respondents with 30. "Region One" had the lowest number with eight. Each of the other five regions compared had between ten and 14 responses.

Research Question #7

Question seven of this study asks, what relationship does the type of pre-service training a CTE teacher received have with the teacher's current perceived professional growth needs? This question is answered by comparing the disaggregated MWDS rankings of the competencies. Data was disaggregated based on the licensure type self-identified by the respondent. Five options were provided for respondents as well as the ability to select "Other" in order to enter a path to licensure not provided. The five licensure options provided were "Alternative licensure program, such as the Career Switcher program" (Alternative), "Preservice training program at a college or university in fulfillment of degree requirements" (Preservice), "Reciprocity from another state" (Reciprocity), "Technical professional license" (Technical), and "Use of three-year provisional license" (Provisional). Two respondents used the "Other" option. Those two entries were reclassified within the original five based on the description provided by the respondents.

The Kruskal-Wallis one-way analysis of variance test by ranks was used to determine if a difference exists between three or more subgroups in a demographic category. All five of the licensure pathways had sufficiently large sample sizes (n >= 5) to compare. The test revealed that the competency rankings for CTE teachers based on licensure pathways were significantly different ($H = 93.43$, $p < 0.0001$) at a 0.05 significance level.

Post-hoc Mann-Whitney U testing was used to identify the content areas where differences in ranking exist. The results of the comparison tests are presented in Table 27. All comparisons with a p-value less than 0.05 are considered statistically significant.

Table 27
Post-Hoc Mann-Whitney U Test Results for Competency Ranking by Initial Licensure Pathway

Initial Licensure Type	*n*	*U*-Value (*p*-Value)				
		Alt	Pre	Rec	Tec	Pro
Alternative	14	-				
Preservice	45	9171.5 (0.9067)	-			
Reciprocity	8	8783 (0.4737)	8700 (0.3968)	-		
Technical	17	6313 (<0.0001*)	5787 (<0.0001*)	7101.5 (0.0009*)	-	
Provisional	18	5979 (<0.0001*)	5497.5 (<0.0001*)	5748 (<0.0001*)	3257 (<0.0001*)	-

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 93.43$, $p < 0.0001$). Post-Hoc Mann-Whitney U testing was conducted to identify specific subgroups with statistically significant differences.
* Statistically significant difference at a 0.05 significance-level where $p < 0.05$.

Results of the post-hoc Mann-Whitney U testing from Table 27 show that competency rankings for CTE teachers who gained licensure through an "Alternative licensure program, such as the Career Switcher program" (Alternative), "Preservice training program at a college or

university in fulfillment of degree requirements" (Preservice), and "Reciprocity from another state" (Reciprocity) did not have statistically significant differences from each other. CTE teachers who gained licensure through a "Technical professional license" (Technical) or "Use of three-year provisional license" (Provisional) had statistically significant differences with all other licensure types, including each other. Table 28 compares the top ten identified competencies for CTE teachers based on initial Virginia teacher licensure type with their ranking produced by all respondents.

Table 28
Top Ten Competencies Identified by CTE Teachers by MWDS based on Initial Licensure Type

Competency	*n*	MWDS	Overall Rank
Alternative Licensure			
1. Counsel special education students with personal-social problems (K.11)	13	6.50	1
2. Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	13	5.78	9
3. Arrange for improvement of CTE facilities (E.8)	13	5.68	3
4. Prepare special education students for employability (K.8)	12	4.92	6
5. Secure high-quality training stations for the co-op program (J.4)	13	4.64	4
6. Plan the student teaching experience (I.10)	13	4.62	16
7. Manage the attendance, transfers, and terminations of co-op students (J.8)	13	4.62	8

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 93.43$, $p < 0.0001$) for each initial licensure type: Alternative ($n = 14$), Preservice ($n = 45$), Reciprocity ($n = 8$), Technical ($n = 17$), and Provisional ($n = 18$).

Table 28 (continued)
Top Ten Competencies Identified by CTE Teachers by MWDS based on Initial Licensure Type

Competency	*n*	MWDS	Overall Rank
Alternative Licensure (continued)			
8. Assist special education students in developing career planning skills (K.10)	13	4.62	2
9. Provide lab experiences for prospective teachers (I.9)	13	4.56	30
10. Provide appropriate instructional materials for students with special needs (K.6)	13	4.40	12
Preservice Licensure			
1. Assist students in developing self-discipline (E.3)	43	3.79	19
2. Assist special education students in developing career planning skills (K.10)	45	3.73	2
3. Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	45	3.64	9
4. Assist students in achieving basic reading skills (L.7)	45	3.60	13
5. Counsel special education students with personal-social problems (K.11)	45	3.52	1
6. Arrange for improvement of CTE facilities (E.8)	44	3.47	3
7. Modify the learning environment for students with special needs (K.7)	44	3.43	20
8. Plan the student teaching experience (I.10)	45	3.35	16
9. Promote a CTE program for students with special needs (K.12)	45	3.28	7
10. Place co-op students on the job (J.5)	45	3.21	5
Reciprocity			
1. Develop the training ability of work site instructors (J.6)	8	6.02	10
2. Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	8	5.63	9
3. Secure high-quality training stations for the co-op program (J.4)	7	5.33	4

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 93.43$, $p < 0.0001$) for each initial licensure type: Alternative ($n = 14$), Preservice ($n = 45$), Reciprocity ($n = 8$), Technical ($n = 17$), and Provisional ($n = 18$).

Table 28 (continued)
Top Ten Competencies Identified by CTE Teachers by MWDS based on Initial Licensure Type

Competency	*n*	MWDS	Overall Rank
Reciprocity (continued)			
4. Establish a CTSO (H.7)	8	5.20	55
5. Prepare CTSO members for leadership roles (H.3)	8	5.06	61
6. Assist CTSO members in developing and financing a yearly program of activities (H.5)	8	4.92	68
7. Place co-op students on the job (J.5)	8	4.92	5
8. Prepare special education students for employability (K.8)	8	4.92	6
9. Develop a school-community relations plan for the CTE program (G.8)	8	4.63	17
10. Mentor new CTE teachers (I.6)	8	4.50	36
Technical Licensure			
1. Assist students in improving their math skills (L.5)	16	4.21	28
2. Counsel special education students with personal-social problems (K.11)	17	3.79	1
3. Assist students in improving their writing skills (L.6)	16	3.14	26
4. Assist students in developing technical reading skills (L.4)	17	2.73	21
5. Place co-op students on the job (J.5)	17	2.63	5
6. Assist special education students in developing career planning skills (K.10)	16	2.55	2
7. Assess the progress of students with special needs (K.4)	16	2.29	14
8. Develop student-ambassador programs to assist with marketing CTE programs (G.9)	17	2.21	33
9. Develop the training ability of work site instructors (J.6)	17	2.18	10
10. Prepare special education students for employability (K.8)	17	2.16	6

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 93.43$, $p < 0.0001$) for each initial licensure type: Alternative ($n = 14$), Preservice ($n = 45$), Reciprocity ($n = 8$), Technical ($n = 17$), and Provisional ($n = 18$).

Table 28 (continued)
Top Ten Competencies Identified by CTE Teachers by MWDS based on Initial Licensure Type

Competency	*n*	MWDS	Overall Rank
Provisional Licensure			
1. Place co-op students on the job (J.5)	17	7.63	5
2. Secure high-quality training stations for the co-op program (J.4)	17	7.46	4
3. Manage the attendance, transfers, and terminations of co-op students (J.8)	17	7.19	8
4. Arrange for improvement of CTE facilities (E.8)	18	7.08	3
5. Develop the training ability of work site instructors (J.6)	17	6.91	10
6. Promote a CTE program for students with special needs (K.12)	18	6.83	7
7. Develop and maintain a program social media presence (G.12)	18	6.50	22
8. Assist special education students in developing career planning skills (K.10)	18	6.40	2
9. Establish guidelines for a cooperative CTE program (J.3)	17	6.31	11
10. Prepare special education students for employability (K.8)	18	6.25	6

Note. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine that one or more demographic category subgroups possessed a statistically significant difference at a 0.05 significance-level ($H = 93.43$, $p < 0.0001$) for each initial licensure type: Alternative ($n = 14$), Preservice ($n = 45$), Reciprocity ($n = 8$), Technical ($n = 17$), and Provisional ($n = 18$).

Research Question #7 Observations

Three initial licensure types, "Alternative", "Preservice", and "Reciprocity", were found to lack statistically significant differences. The top ten competencies identified by "Alternative" respondents were all within the top 16 of overall competencies with one exception – "Provide lab experiences for prospective teachers (I.9)" ranked ninth on the alternative list and 30th by all respondents. Each of the "Preservice" licensure top ten competencies ranked in the top 25 by all respondents. The top ten for "Reciprocity" contained four competencies that were outside of the

top seventeen by all respondents. Those included three related to CTSOs and one related to mentoring new teachers.

The final two groups, "Technical" and "Provisional" were found to be statistically different from all other groups, including each other. The top ten for the "Technical" group contained three competencies outside of the top 21 by all respondents. Those were "Assist students in improving their math skills (L.5)" coming in first for the group and 28th overall, "Assist students in improving their writing skills (L.6)" coming in third for the group and 26th overall, and "Develop student-ambassador programs to assist with marketing CTE programs (G.9)" coming in eighth for the group and 33rd overall. The top ten for the "Provisional" group contained one competency outside of the top 11 identified by all respondents. The "Provisional" group ranked "Develop and maintain a program social media presence (G.12)" as seventh in their top ten compared to 22nd by all respondents.

Summary

CTE teacher survey responses were first used to determine the teaching competencies most important for working as a CTE teacher in Virginia. Those competencies deemed most important covered topics in student safety, teacher professional knowledge, instructional demonstration, student employability, student oral communication, student problem-solving skills, assessment of student knowledge and skills, working with students with special needs, and building relationships with school counselors (Table 9). Competencies that Virginia CTE teachers feel are most needed for professional development were identified using the MWDS for each competency. The competencies most needed for teacher professional development included two broad categorical topics: cooperative education programs and working with students with special needs, as well as six specific topics: improving student reading skills, building student

self-discipline, planning for student teachers, working summer externships to maintain professional knowledge and skills, CTE program school-community relationship planning, and planning for CTE facility improvement (Table 12).

Response data was then disaggregated by the following demographic responses: gender, ethnicity, anticipation to remain in teaching for the next five years, CTE content area, school division, VDOE region, years of experience, and licensure pathway (Table 4). Statistical analysis of the disaggregated data revealed that each demographic category held statistically significant differences between demographic category subgroups with the exception of gender. The top ten competencies identified by each demographic category subgroup was then compared to the rankings by all respondents for each competency to determine which highly ranked demographic category subgroup competencies were similar to the overall sample population and which were dissimilar.

The comparison of competencies identified by demographic category subgroups to those most needed for professional development revealed that the specific topics identified by demographic category subgroups are generally included with the top competencies identified by the overall study. However, most demographic category subgroups also had at least one highly ranked competency that was outside of the those identified as most needed by the overall study.

CHAPTER FIVE

CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS

Chapter Five presents an overview of the study, conclusions drawn from the results of the study, a discussion of the study findings, and recommendations for practice and future research.

Overview of Study

The purpose of this study was to collect and analyze data related to CTE teachers' self-identified professional development needs in order to support the efforts of teachers, schools, and school divisions. Supporting the efforts of CTE teachers who helps them to provide excellent classroom experiences for students and operate CTE programs that are effective and comprehensive. Results from a survey consisting of 136 CTE teacher competencies were used to calculate a Mean Weighted Discrepancy Score (MWDS) to identify the competencies Virginia CTE teachers feel are the most needed professional development topics for their work. MWDS scores are based on the importance the CTE teacher assigns to each competency for achieving teaching and program goals, as well as the CTE teacher's self-reported current ability level to implement the competency.

Statement of the Problem

At present, the CTE teaching profession suffers from a shortage of qualified teachers entering the profession. Additionally, research by the American Institutes for Research (2015) found that experienced CTE teachers report needing additional training in order to operate their programs. Under ESSA and Perkins V, school divisions are responsible for preparing all students for college and career success. Running a CTE program requires a combination of knowledge-bases and skill-sets aligned with the college- and career-readiness goals of the school division and CTE best practices. Given the wide variety of ways that CTE teachers enter the

profession, as well as the varying demands associated with the different CTE disciplines and the individual complexities of the diverse school contexts across the state of Virginia and the country, it goes to reason that not all CTE teachers possess the same knowledge-bases and skill-sets nor do they necessarily possess the knowledge-bases and skill-sets needed for their CTE program. Therefore, the problem to be addressed in this study is to identify professional development topics that CTE teachers in Virginia believe they need training in, so that they are better prepared to provide comprehensive and high quality CTE programs.

Methodology

This quantitative study used the Borich Needs Assessment Model (BNAM) to investigate the CTE teacher competencies identified by Virginia CTE teachers as those most needed to improve their CTE programs and teaching practices. Non-experimental research and volunteer sampling were used to collect and analyze the data. An online survey was distributed to Virginia CTE teachers via email through school division CTE directors. Mean and standard deviation scores were calculated to represent importance and ability from the survey results for each item. Mean Weighted Discrepancy Scores (MWDS) were calculated to inform the ranking of the most needed professional development competencies identified in the survey.

Survey data was disaggregated by gender, ethnicity, desire to remain in the teaching profession, CTE program area, years of experience, school division, VDOE region, and pre-service training type to explore trends within those demographic category subgroups. Mann-Whitney U testing was used to determine if statistically significant competency ranking differences exist between two subgroups in a demographic category. Kruskal-Wallis one-way analysis of variance test by ranks was used to determine if statistically significant competency ranking differences exist between three or more subgroups in a demographic category.

Research Questions

The study was guided by the following research questions:

1. What knowledge-bases and/or skill-sets do CTE teachers in Virginia identify as those most important to the CTE program they currently work within?

2. What professional development topics do CTE teachers feel are most needed relative to the knowledge-bases and/or skill-sets identified as most important to their program?

3. What relationship do demographics, including gender, ethnicity, and intention to stay in the teaching profession, have with the teacher's perceived professional growth needs?

4. What relationship does the CTE program area a teacher works within have with the teacher's current perceived professional growth needs?

5. What relationship does the number of years of experience a CTE teacher possess have with the teacher's perceived professional growth needs?

6. What relationship does the school division a teacher works within have with the teacher's current perceived professional growth needs?

7. What relationship does the type of pre-service training a CTE teacher received have with the teacher's current perceived professional growth needs?

Key Findings

Key findings of the study are as follows:

1. Competencies identified as most important for Virginia CTE teachers are "Provide for student safety (E.1)", "Keep up-to-date professionally (I.1)", and "Assist students in improving their career and employability skills (L.1)" (Table 8).

2. Competency categories identified as most important for Virginia CTE teachers are "Assisting students in improving their basic skills (L)", "Instructional Evaluation (D)", and "Serving students with special needs (K)" (Table 10).

3. "Counsel special education students with personal-social problems (K.11)" was identified as the most needed professional development topic with an MWDS of 4.45 – a difference of .30 over the next highest ranked MWDS which is the largest difference between any two listed competencies with a positive MWDS (Table 7).

4. Competency categories with a high importance ranking relative to a low ability ranking include "Serving student with special needs (K)", "Coordination of cooperative education (J)", and "Assisting students in improving their basic skills (L)." These represent the competency categories where professional development is most needed (Table 10).

5. The use of MWDS produces a prioritization list that is different in the specifics, but similar in general, to the list created by only accounting for score differences. The specific rankings are different when the difference in importance and ability scores is weighted with the value of the mean of the importance scores. Nevertheless, general groupings of competencies can still be seen when comparing MWDS rankings with difference rankings (Table 29).

6. Competencies with the highest MWDS rankings (MWDS above 3.00) represent six of 13 categories used by this study. Six competencies are from Category J. Seven competencies are from Category K. Categories I and E provide two competencies each. Categories L and G provide one competency each (Table 12).

7. There was no statistically significant difference between the competency rankings for "Female" and "Male" CTE teachers.

8. There was a statistically significant difference between the competency rankings for "Black/African American" and "White" CTE teachers.

9. There was a statistically significant difference between the competency rankings for CTE teachers who are unsure of their anticipation to stay in the teaching profession for the next five years and for those who plan to remain.

10. There was a statistically significant difference between the competency rankings for CTE teachers based on the CTE content area the teacher works within (Table 19).

11. There was a statistically significant difference between the competency rankings for CTE teachers based on the teacher's years of experience (Table 21).

12. There was a statistically significant difference between the competency rankings for CTE teachers based on the school division the teacher works for (Table 23).

13. There was a statistically significant difference between the competency rankings for CTE teachers based on the VDOE region the teacher works within (Table 24).

14. There was a statistically significant difference between the competency rankings for CTE teachers based on the initial licensure type the CTE used to enter the profession (Table 27).

Conclusions

Based on the findings of the study, the following conclusions are made.

Conclusion #1: Importance

There are two conclusions associated with the importance of CTE teaching and program management competencies.

Conclusion 1A. The list of knowledge and skills identified as most important by CTE teachers helps identify those topics which are most foundational to working as a CTE teacher.

Competencies identified as the top ten most important for serving as a CTE teacher in Virginia (Table 8) represent seven of the 13 competency categories used for the study. The general topics identified include providing for student safety, maintaining professional knowledge and skills, assessing and improving student skills, incorporating students with special needs into CTE programs, and collaborating with school guidance counselors. This list of knowledge and skills provides a helpful perspective about the skills CTE teachers feel are most valuable for success as a CTE teacher – although the list is not intended to be a comprehensive list of the most necessary skills.

Conclusion 1B. The competencies identified as most important for serving as a CTE teacher generally did not align with the competencies that need to be prioritized for professional development.

The competency identified as the highest importance level was "Provide for student safety (E.1)." In his seminal work, Maslow (1970) presented his hierarchy of needs which establishes an individual's foundation need to feel safe in order to learn (Morrison, Furlong, & Morrison, 1994). The importance of providing for student safety is well documented within educational research (Brand, Felner, Shim, Seitsinger, & Dumas, 2003; National Research Council, 1993) and is often cited in pre-service teacher preparation and early career training courses (Cooper, 2005). Despite the high level of importance identified for this competency,

CTE teachers noted a high ability level for this competency (rank: 7) resulting in a mid-level MWDS (rank 52).

Of the top ten competencies identified as most important, only one – "Promote peer acceptance of students with special education needs (K.2)" – was also identified as a top 25 professional development priority through the MWDS ranking process. This suggests respondents tend to have high ability levels at tasks that are most important to their work. This is both sensible and encouraging.

Conclusion #2: Ability

There are two conclusions associated with the ability level of CTE teachers related to teaching and program management competencies.

Conclusion 2A. The competencies identified as those with the lowest ability for Virginia CTE teachers did not generally align with the competencies that need to be prioritized for professional development.

Competencies identified as those with the lowest current ability level (Table 9) represent six of the 13 competency categories used for this study. The general topics identified include use of specific instructional techniques, promoting a CTE program, making connections between the CTE program and community/business partners, work-based learning practices, and gaining summer employment to keep up-to-date professionally. A low ability rating does not necessarily mean it is a professional development topic that needs to be prioritized. Competencies with low ability and low importance should not result in high professional development prioritization. Low ability rankings could, and likely do in some cases, identify teaching competencies that are not frequently used by CTE teachers. These could be competencies that still maintain some importance for the profession but are neglected as a pre-service training and/or in-service

professional development topic. They may also be competencies that are no longer important to the profession. Of the bottom ten competencies identified as lowest ability, only one – "Develop the training ability of work site instructors (J.6)" – was also identified as a top 25 professional development priority through the MWDS rankings.

Conclusion 2B. The competencies identified as those with the lowest ability for CTE teachers tended to also have a low importance level, bringing into question the usefulness of these competencies for CTE teachers.

The lowest ranking competency identified was "Employ the buzz group technique (C.33)." Brewer (1997) explains that buzz groups are small groups of students who are given a set amount of time and a specific task centered on a question, problem, or issue. Brewer (1997) goes on to explain that buzz groups are intended to engage students in deep thinking on a topic and work against rote learning common with teacher-centric instruction. The possibility that some respondents are not familiar with this specific term could have potentially caused teachers to rate their ability to use this competency lower than they might have if they had a working definition of the term "buzz group." A lack of knowledge of the specific term used in the competency description could also have resulted in a lowered score for "Employ the question box technique (C.32)."

The second lowest ranked competency for teacher ability was "Arrange for television and radio presentations concerning the CTE program (G.11)." It is possible that this competency is one that many CTE teacher do not use frequently – if at all. If this is the case, the result would be a low importance ranking in conjuncture with the low ability ranking. The identified competency has an importance rank of 123. This is also the case for the remaining competencies in the bottom ten: "Prepare, conduct, and report community survey (A.9)" has an importance

rank of 127, "Organize and maintain an occupational advisory committee (A.6)" has an importance rank of 122, "Conduct an occupational analysis (A.8)" has an importance rank of 123, "Supervise an employer/employee appreciation event (J.7)" has an importance rank of 117, "Develop the training ability of work site instructors (J.6)" has an importance rank of 99, and "Work summer externships to keep up-to-date with industry trends and changes (I.11)" has an importance rank of 111.

Conclusion #3: Category Rankings

There is one conclusion associated with the category rankings of CTE teaching and program management competencies.

Conclusion 3. Two competency categories, "Serving students with special needs (K)" and "Coordination of cooperative education (J)" represent broad topic areas that should be prioritized for professional development.

The three categories with the largest gap between importance and ability, where importance is more highly ranked than ability (Table 10), include "Serving students with special needs (K)" with a gap of five (importance: 3; ability 8), "Coordination of cooperative education (J)" with a gap of four (importance: 8; ability 12), and "Assisting students in improving their basic skills (L)" with a gap of four (importance: 1; ability 4).

Categories K and J stand out as the categories that represent the most pressing professional development topics given the high MWDS mean for each category (Table 11). Despite the fact that Category L possesses importance and ability rankings which are both relatively high, the MWDS mean for the category competencies is much lower than K and J resulting in Category L being group in a second tier of competency category prioritization.

Conclusion #4: MWDS and Professional Development Priority Competencies

There is one conclusion associated with the MWDS rankings of CTE teaching and program management competencies used to prioritize the professional development topics most needed by Virginia CTE teachers.

Conclusion 4. The highest priority professional development needs of Virginia CTE teachers include two competency categories and six additional individual competencies not included in the two identified competency categories.

Two competency categories, "Coordination of cooperative education (J)" and "Serving students with special needs (K)", included seven and nine competencies ranked in the top 25 of all MWDS scores, respectively. The breadth of topics identified in categories J and K shows a need for extensive professional development delivery that addresses many individual competencies grouped across those two topics. The nine specific competencies ranked in the top 25 that were not part of category J or K came from four categories – L, G, I, and E. These specific topics represent professional development topics that can be addressed through focused trainings. The top 25 competencies identified by MWDS include:

1. Counsel special education students with personal-social problems (K.11)
2. Assist special education students in developing career planning skills (K.10)
3. Arrange for improvement of CTE facilities (E.8)
4. Secure high-quality training stations for the co-op program (J.4)
5. Place co-op students on the job (J.5)
6. Prepare special education students for employability (K.8)
7. Promote a CTE program for students with special needs (K.12)
8. Manage the attendance, transfers, and terminations of co-op students (J.8)
9. Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)

10. Develop the training ability of work site instructors (J.6)
11. Establish guidelines for a cooperative CTE program (J.3)
12. Provide appropriate instructional materials for students with special needs (K.6)
13. Assist students in achieving basic reading skills (L.7)
14. Assess the progress of students with special needs (K.4)
15. Use instructional techniques to meet the needs of students with special needs (K.3)
16. Plan the student teaching experience (I.10)
17. Develop a school-community relations plan for the CTE program (G.8)
18. Work summer externships to keep up-to-date with industry trends and changes (I.11)
19. Assist students in developing self-discipline (E.3)
20. Modify the learning environment for students with special needs (K.7)
21. Assist students in developing technical reading skills (L.4)
22. Develop and maintain a program social media presence (G.12)
23. Prepare to serve students with special needs (K.5)
24. Work with members of the community (G.2)
25. Supervise an employer/employee appreciation event (J.7)

Conclusion #5: Demographic Groups - Gender

There are two conclusions associated with the competency rankings of CTE teaching and program management based on teacher gender.

Conclusion 5A. There is no statistically significant difference between the competency rankings produced by gender, however the highest ranked competencies for each gender do have functional differences for planning professional development for specific gender subgroups.

No statistically significant differences were found between the rankings produced by CTE teachers based on their self-identified gender. When comparing the highest priority competencies for each subgroup there are clear similarities for highly ranked competencies for each group (Tables 13 & 14), however, a small number of the top identified competencies produced by male teachers did possess noteworthy differences when compared to their female counterparts (Table 14). Male teachers ranked "Develop and maintain relationships with school guidance counselors (G.2)" as their highest priority competency, whereas female teachers ranked that same competency 56th overall. Male teachers also ranked "Assist students in improving their writing skills (L.6)" as their 6th highest priority, whereas female teachers ranked that same competency 51st overall. These difference present an opportunity to close skill gaps between teacher groups by offering customized professional development opportunities to meet the specific needs of teacher subgroups.

Conclusion 5B. The CTE teacher workforce is predominately female resulting in the highest ranked competencies for the overall study being more closely aligned with the highest ranked competencies by female CTE teachers – an important consideration for planning professional development for groups of teachers containing multiple genders.

The top ten lists produced by each subgroup show similarities that identify professional development topics that would benefit both groups. When compared to the rankings by all respondents for the study, the differences in the highest ranked competencies for each subgroup shows that the rankings are more aligned to the rankings of female respondents compared to male respondents. The greater number of female respondents (n = 65) as compared to male teachers (n = 37) causes this rankings difference. This is appropriate given the manner in which

the respondent sample likely reflects the overall population. Nevertheless, the high degree of influence female respondents exert on the overall rankings is important to consider when planning professional develop activities for specific groups of teachers.

Conclusion #6: Demographic Groups - Ethnicity

There are two conclusions associated with the competency rankings of CTE teaching and program management based on teacher ethnicity.

Conclusion 6A. There is a statistically significant difference between the competency rankings produced by ethnicity which is also seen in the fact that the highest ranked competencies produced by "Black/African American" CTE teachers had five wide ranking differences when compared to the rankings of "White" CTE teachers resulting in a need to tailor professional development offerings for specific ethnicity subgroups.

A statistically significant difference was found between the rankings produced by CTE teachers based on their self-identified ethnicity. This difference can also be seen in the comparison rankings between the two groups. "Black/African American" CTE teachers ranked five competencies in their top ten that also appeared in the top ten for "White" CTE teachers. The other five in the "Black/African American" top ten were ranked 31st, 32nd, 44th, 48th, and 73rd by "White" CTE teachers (Table 15). Three of the five competencies ranked differently by "Black/African American" and "White" CTE teachers had to do with the marketing and promotion of the CTE program to audiences external to the school. These differences suggest that some professional development topics can be used for both groups but that there should also be targeted professional development for "Black/African American" CTE teachers. This is especially true when considering that "Black/African American" teachers often teach in

predominately minority and low socioeconomic schools (Sun, 2018) where the needs of students and the community can differ significantly compared to schools in predominately white and middle-class or above settings (American Psychological Association, 2017).

Conclusion 6B. The competency rankings produced by "White" CTE teachers were similar to those of "Black/African American" CTE teachers and highly reflective of the rankings by all study respondents due to the high percentage of "White" CTE teachers in the respondent sample – an important consideration for planning professional development for groups containing multiple ethnicity subgroups.

Competencies ranked highly by "White" CTE teachers were generally also highly ranked by their "Black/African American" colleagues. Only one competency identified by "White" CTE teachers – related to alternative WBL experiences – was ranked outside of the top 25, at 54, by "Black/African American" CTE teachers (Table 16). This also suggests the need for a common set of professional development topics that are augmented with specific topics aligned to the needs of "Black/African American" CTE teachers. Given the high number of respondents who identified as "White" (n = 85), it is important to note that the overall rankings will be more reflective of the responses by that subgroup.

Conclusion #7: Demographic Groups – Expectation to Stay in the Teaching Profession

There are two conclusions associated with the competency rankings of CTE teaching and program management based on teacher expectation to stay in the teaching profession.

Conclusion 7A. There is a statistically significant difference between the competency rankings produced by expectation to stay in the teaching profession for the next five years which is also seen in the highest ranked competencies

produced by each expectation subgroup resulting in a need to tailor professional development offerings based on intention to remain in the teacher profession.

A statistically significant difference was found between the rankings produced by CTE teachers based on their expectation to stay in the teaching profession for the next five years. This difference can also be seen in the comparison rankings between the two subgroups with sufficiently large enough sample sizes to compare – "Unsure" and "Yes." The "Unsure" subgroup identified three competencies that did not appear in the top 25 for the "Yes" subgroup. Those competencies were related to the use of social media for program promotion, collaborative efforts for CTE program improvement, and individualized instruction. Those were ranked 28th, 40th, and 53rd respectively, by the "Yes" subgroup (Table 17). The "Yes" subgroup identified two competencies not ranked in the top 25 by the "Unsure" subgroup. Those two topics were related to placing co-op students in jobs and providing instructional materials to students with special needs and were ranked 39th and 58th by the "Unsure" subgroup.

Conclusion 7B. The high percentage of respondents who intend to remain in the teaching profession results in overall rankings that are highly aligned with the rankings of that subgroup – an important consideration for planning professional development for groups containing teacher with different intentions to remain in the profession.

The relatively large size of the "Yes" respondent group (n = 85) when compare to the "Unsure" respondent group (n = 14) means that the rankings for all respondents will very closely reflect the rankings of the "Yes" respondents. As noted with previous demographic category subgroups gender and ethnicity, the pattern that appears is a need for the use of general topics

developed based on the responses of the full group since many competencies are highly rated across all subgroups but also for the use of targeted professional development topic for specific subgroups. Providing targeted support to CTE teachers who are potentially struggling with their vocation could help alleviate the high teacher turnover rate common in the teaching profession.

Conclusion #8: Demographic Groups – CTE Content Area

There is one conclusion associated with the competency rankings of CTE teaching and program management based on CTE teacher content area.

Conclusion 8. Each CTE content area's top ten competency list allows for the identification of general and specific topics that are the most important professional development needs for CTE teacher in the specific discipline.

A statistically significant difference was found between the rankings produced by CTE teachers based on the content area they teach within. Individual comparisons between each CTE content area with sufficiently large enough sample sizes to compare revealed that two CTE content areas – "Agriculture Education" and "Health & Medical Sciences" – were statistically different than all other content areas. Three content areas – "Business & Information Technology", "Marketing", and "Trade & Industrial Education" – lack a statistical difference with each other but possess a statistical difference with all other areas. The two remaining areas – "Family & Consumer Sciences" and "Technology Education" – lack a statistical difference with each other but possess a statistical difference with all other areas (Table 19).

"Agriculture Education" included three competencies in the top ten for that subgroup that are not included in the overall top 25. Those competencies included topics related to advisory committees (ranked 39th by all respondents), working with special education personnel (42nd),

and finding regional employment forecasts (44th). "Health & Medical Sciences" included eight competencies in the top ten for that subgroup that are not included in the top 25 produced by all respondents. Those competencies included seven related to CTSOs (ranging from 51st to 92nd overall) and one related to researching and selecting instructional materials (93rd). The competencies identified by "Health & Medical Sciences" teachers highlight an example of a subgroup with a very specific professional development need that is notably different than the needs of other subgroups.

"Business & Information Technology" included one competency – related to improving student writing skills (26th) – in the top ten for that subgroup that was not included in the top 25 identified by all respondents. "Marketing" included six competencies in the top ten for that subgroup that are not included in the top 25 for all respondents. Those competencies included topics related to CTE program promotion (33rd and 38th), supporting student teachers and new teachers (27th and 36th), collaborative efforts for CTE program improvement (29th), and improving student problem-solving skills (43rd). "Trade & Industrial Education" identified four competencies in the top ten for that subgroup that are not included in the top 25 by all respondents. Those competencies included topics related to improving student writing and math skills (26th and 28th), individualized instruction (37th), and improving student survival skills (77th). Even though each of these three subgroups lack a statistical difference with each other, their top ten rankings possess important differences that should be considered when planning professional development activities.

"Family & Consumer Sciences" produced a top ten where all competencies for the subgroup were ranked in the top 25 for all respondents. "Technology Education" included one competency – related to applying for employment and further education (53rd) – that was not

included in the top 25 of all respondents (Table 20). Despite the lack of a statistical difference, these two subgroups only possess four competencies in common in their respective top ten rankings. This highlights the need for a set of professional development competencies for the overall population as well as specifically identified topics targeted for subgroups based on the specific needs of those subgroups.

Conclusion #9: Demographic Groups – Years of Experience

There is one conclusion associated with the competency rankings of CTE teaching and program management based on teacher years of experience.

Conclusion 9. The competencies identified as most important for professional development by each years of experience subgroup are generally aligned with the top 25 competencies identified by all respondents.

A statistically significant difference was found between the rankings produced by CTE teachers based on the number of years of experience the teacher possesses. Individual comparisons between the four subgroups of years of experience found that one subgroup – "4-9 years of experience" – was different than the other three subgroups. The other three subgroups were not statistically different from each other (Table 21).

The competencies identified as the top ten most important for each years of experience subgroup were mostly in the top 25 identified by all respondents. In the "0-3 years of experience" subgroup, the tenth ranked competency – "Evaluate instructional effectiveness (D.2)" – was outside of the top 25 for all respondents at 49th. In the "4-9 years of experience" subgroup, the top ranked competency – "Supervise student-teachers (I.7)" – was outside of the top 25 identified by all respondents at 27th. In the "10-15 years of experience" subgroup, the seventh ranked competency – "Provide lab experiences for prospective teachers (I.9)" – was

outside of the top 25 for all respondents at 30th. No competencies in the "15+ years of experience" subgroup category were outside of the top 25 for all respondents (Table 22).

The relatively high ranking for "Evaluate instructional effectiveness (D.2)" by CTE teachers in the "0-3 years of experience" group indicates a need to help young CTE teachers with program self-assessment. The relationship between the highly ranked competencies for the "15+ years of experience" group and the rankings by all respondents is likely related to the comparatively large size of the "15+ years of experience" group (n = 55).

The consistency between group top ten competency rankings that are also highly ranked by all study respondents suggests there is a strong tendency by all CTE teachers to highly rank competencies from a relatively small group of competencies used by the study regardless of their experience level (Table 22). The statistically significant difference for rankings by the "4-9 years of experience" group is likely due to differences in MWDS competency rankings for competencies outside of the top ten of the rankings.

The exceptionally high rankings for "Supervise student-teachers (I.7)" by the "4-9 years of experience" subgroup, as well as the ranking of "Provide lab experiences for perspective teachers (I.9)" by the "10-14 years of experience" subgroup stand out as indicators that these subgroups feel preparing student teachers is important, something they feel they should be able to do and/or would want to do but also something they feel unprepared to do.

The competencies identified by all study respondents as the highest prioritized professional development needs cover the majority of the competencies in the top ten for each years of experience subgroup. Two specific topics – evaluating instructional effectiveness and working with student teachers – are also topics that would benefit early- and mid-career teachers, respectively.

Conclusion #10: Demographic Groups – School Division

There is one conclusion associated with the competency rankings of CTE teaching and program management based on teacher school division.

Conclusion 10. The competencies identified as most important for professional development based on a teacher's school division show that a CTE teacher's school division provides an important context for identifying a CTE teachers most needed professional development topics.

A statistically significant difference was found between the rankings produced by CTE teachers based on the school division the teacher works for. Individual comparisons were made between the eight school divisions with sufficiently large enough sample sizes to compare (Table 23). One school division – "Division H" – was found to have a statistically significant difference with all other school divisions. Three divisions – "Division B", "Division D" and "Division E" – were found to lack a statistical difference with each other. The relationships between the other school divisions are more complicated.

One pair of divisions – "Division C" and "Division G" – were found to lack a statistical difference when compared to each other and possessed the same comparison results when compared to all other school divisions. They lacked a statistical difference with "Division A" and "Division F" and possessed a statistical difference with "Division B", "Division D", "Division E", and "Division H." "Division A" was found to be statistically different than the fewest number of other divisions. It possessed statistical differences with only two other school divisions – "Division F" and Division "H." The remaining school division – "Division F" – was statistically different than every school division other than the "Division C" and "Division G" pairing (Table 23). The final breakdown is one group of three statistically similar school

divisions, one group of two statistically similar school divisions, and three individual school divisions with unique comparisons to each of the other divisions.

A review of the top ten competencies identified by school division revealed a wide variety of competencies when compared to the study's top 25 for all respondents and when comparing each school division to the others (Table 25). No single competency was represented in the top ten of each of the eight school divisions. This wide variety of identified competencies shows a need for professional development to be planned to meet the specific needs of school divisions. The data does suggest that multiple school divisions can possess a similar list of prioritized professional development competencies but it does not provide any insight into what factors associated with a school division might cause those similarities to exist.

Conclusion #11: Demographic Groups – VDOE Region

There is one conclusion associated with the competency rankings of CTE teaching and program management based on VDOE region.

> **Conclusion 11.** The competencies identified as most important for professional development based on the VDOE region the teacher works within shows that VDOE region can help provide context for identifying the most needed professional development topics but is not necessarily aligned with the competencies identified by each school division within that region.

A statistically significant difference was found between the rankings produced by CTE teachers based on the VDOE region the school division the CTE teacher works for exists within. Individual comparisons were made between the seven regions with sufficiently large enough sample sizes to compare. One VDOE region – "Region Two" – was found to have a statistically

significant difference with all other VDOE regions. Each of the other regions compared was found to lack a statistical difference with every region other than "Region Two" (Table 24).

A review of the top ten competencies identified by VDOE region revealed a wide variety of competencies when compared to the study's top 25 for all respondents and when comparing each VDOE region's top ten list to each other (Table 26). No single competency was represented in the top ten of each of the VDOE regions. This wide variety of identified competencies reinforces the conclusion drawn from the analysis of individual school divisions which is a need for professional development to be planned to meet the specific needs of school divisions with the understanding that school divisions can possess similar highly prioritized professional development needs. Additionally, the VDOE region a school division exists within does not seem to be a primary factor that causes multiple school divisions within the same VDOE region to possess similar professional development needs.

Conclusion #12: Demographic Groups – Initial Licensure

There is one conclusion associated with the competency rankings of CTE teaching and program management based on teacher initial licensure type.

Conclusion 12. The competencies identified as most important for professional development based on a teacher's initial licensure type show that the type of license a teacher enters the profession with provides an important context for identifying a CTE teachers most needed professional development topics.

A statistically significant difference was found between the rankings produced by CTE teachers based on the teacher's initial licensure type. Individual comparisons were made between each of the five licensure types available to Virginia CTE teachers. Two licensure types

– "Technical" and "Provisional" – were found to be statistically different from all other licensure types, including each other. The other three licensure types – "Alternative", "Preservice", and "Reciprocity" – were found to lack a statistical difference (Table 27).

A review of the top ten competencies identified by licensure type revealed that the highest ranked competencies for "Alternative" and "Preservice" share five competencies in their respective top ten lists. The top ten rankings for those two subgroups only have one competency that is not ranked in the study's top 25 for all respondents – "Provide lab experiences for prospective teachers (I.9)", ranked 9th by "Alternative" and 30th by all respondents. CTE teachers in the "Reciprocity" subgroup category identified four competencies outside of the top 25 for all respondents that were also not identified by any other licensure type subgroup. Those competencies relate to establishing CTSOs and mentoring new CTE teachers.

CTE teachers with "Technical" licensure identified three competencies outside of the top 25 for all respondents. Those competencies are related to improving student math and writing skills, as well as using student ambassadors to promote their program. CTE teachers who entered the profession with "Provisional" licensure identified nine of the top 11 competencies for all respondents in their subgroup's top ten. The one remaining competency in the subgroup category's top ten was ranked 22nd overall in the study.

The competencies identified as the highest priorities for professional development for each licensure type were generally aligned with those identified by all study respondents. The use of "Reciprocity" licensure suggests a need to provide professional development with CTSOs specifically for that subgroup. The use of "Technical" licensure suggests a need to provide professional development in supporting students' basic skills. Other than those specific outliers,

the competencies identified by all respondents for the study would meet the highest prioritized professional development needs of each licensure type.

Discussion

Survey Respondents

The goal of the study was to identify the professional development topics that Virginia CTE teachers identify as the most needed to improve their programs. The degree to which that goal was achieved is directly related to the response rate for this survey by Virginia CTE teachers. Collecting responses from 102 current Virginia CTE teachers provides results that are meaningful enough to create a professional development planning agenda that can benefit the work of CTE teachers across the state of Virginia.

The results of the study would have been greatly strengthened by a greater number of responses. A number of mitigating factors lead to the lower than expected response rates for a survey that was intended to be distributed to the 6,000+ CTE teachers in Virginia. The first is the impact of COVID-19. The school divisions that opted out of the study represent 38% of the secondary student population in Virginia Public Schools. Each school division identified factors related to COVID-19 as a reason to opt out, primarily focused on an expected increased workload on teachers as they transition to online and hybrid learning and a desire to not put additional expectations on teachers during a pandemic. It is also likely many CTE directors did not distribute the survey, thus preventing CTE teachers in their school division from responding.

Achieving high response rates with email surveys is proving to be increasingly difficult (Saleh & Bista, 2017). Strategies that can improve response rates for educational research can provide some guidance for future studies that use a similar mechanism for data collection

(Mohker & Pearson, 2017). The response rate for this study benefited greatly from direct, personalized communication between the researcher, CTE directors and CTE teachers.

While the overall response rate for the state was relatively low, there were a number of school divisions that produced response rates that represent a majority of CTE teachers in their division. Conclusion #10 noted that responses disaggregated by school divisions show that customizing prioritized professional development needs lists for individual school divisions is a warranted activity. Identifying the highest priority professional development topics for individual school divisions was not a goal of this study, however results from this study can be used to provide customized topic lists to individual school divisions with sufficiently high response rates. This can be valuable information for divisions and schools as they plan professional development activities for their CTE teachers.

Virginia CTE teachers who responded to the survey for this study were predominately white (83%), female (64%), and possess ten or more years of experience (70%). This aligns with research on the make-up for all teachers in the United States – white (79%), female (64%) and ten or more years of experience (63%) (National Center for Education Statistics, 2020). The majority of respondents also anticipate remaining in the teaching profession for the next five years (83%). The most common way survey respondents entered the profession was though a college or university pre-service program (44%). Table 30 in Appendix H compares the percentage of respondents from each CTE content area to the percentage of Virginia CTE teachers from each content area. Overall, the demographics of the respondents are similar to the known and/or expected population of Virginia's CTE teachers.

Competency Identification

Mean importance scores for individual competencies ranged from a low of 2.85 for

"Present information with overhead and opaque materials (C.30)" and "Present information with a flip chart (C.34)" to a high of 4.97 for "Provide for student safety (E.1)." The variance between ranked scores was less than 0.10 with the only exceptions occurring at the top and bottom of the rankings. The continuous nature of the ranked mean scores makes it difficult to create tiers of competencies based on importance alone. Identifying the most important competencies can be useful for teacher pre-service programs. Comparing existing program content and goals to the competencies identified as most important can help pre-service teacher instructors and program developers identify potential gaps in their programs. This information can also be used for teacher "on-boarding" programs created by schools and school divisions.

The variance between the highest ranked competency and the second highest ranked competency was 0.12. This highlights the importance put on providing students with a safe learning environment – the highest ranked competency based on importance alone. At the bottom, the variance between the 132nd and 133rd ranked competencies was 0.23. The variance between the 133rd and 134th competencies was 0.27. The bottom four competencies each dealt with specific teaching techniques: overhead projection, question box technique, buzz group technique, and use of flip charts. The level of specificity described in these competencies likely obscured the more general purpose of each by not taking into account modern tools used to accomplish similar goals: video projectors, in-class anonymous polling / online surveys, think-pair-share group discussion, and presentation software. Updating these competencies would benefit the competency list used for this study.

Mean ability scores ranged from a low of 2.91 for "Employ the buzz group technique (C.33)" to a high of 4.71 for "Introduce a lesson (C.4)." Similar to importance ranked scores, the variance ability ranked scores exceeded 0.10 only once at lowest ability levels. The variance

between the second and third weakest ability competencies was 0.14. The two lowest competencies were related to use of the buzz group technique and promoting a CTE program through radio and television advertising. Neither of these skills were identified as possessing high importance for CTE teachers – likely because the term buzz group is unfamiliar to teachers and because promoting a program with radio and/or television is uncommon practice. In isolation, the ability rankings are not very informative but are helpful when compared with importance and are necessary to create the MWDS used by this study to identify the highest priority professional development topics.

MWDS ranked scores ranged from a low of -1.61 for "Present information with the whiteboard (C.29)" to a high of 4.45 for "Counsel special education students with personal-social problems (K.11)." Variance in MWDS ranked scores were larger resulting in more obvious tiers of competencies. Table 12 was developed based on the tiers that emerged from the MWDS ranked scores.

The prioritized professional development topics identified through MWDS ranked scores include two competency categories and six individual competencies. The two categories identified were coordination of cooperative education and serving students with special needs. The appearance of coordination of cooperative education is likely due, at least in part, to changes that have occurred in CTE over the past 20 to 30 years. The educational accountability push that began with *A Nation at Risk* in the 80s, progressed in the 90s with *Goals 2000*, and reached its peak during the *No Child Left Behind* era of the 2000s, turned the focus of education away from preparation for the workplace and towards preparation for college. The focus has now shifted towards college and career readiness. As school work towards this new objective, CTE programs are working to reestablish cooperative education programs. These programs are an

important part of high-quality CTE programs. Managing a cooperative education program takes knowledge and skills that are missing at an institutional level within many schools and school divisions.

Serving students with special needs is another emerging topic in modern CTE programs. As CTE programs work to integrate non-traditional student populations into their programs, working with students with special needs is becoming more common for CTE teachers. Providing learning opportunities that meet the specific learning needs of students is a skillset that all teachers need, not just CTE teachers. Helping CTE teacher improve their ability to serve students with special needs will allow CTE programs to become more accessible and equitable.

The six individual competencies identified in the study cover the following topics: assisting students with reading skills, developing CTE school-community relationship plans, planning to work with student teachers, working summer externships, improving CTE facilities, and assisting students in learning self-discipline. The diversity of topics identified in these individual competencies exemplifies the unique nature of the work done by CTE teachers. CTE classes can often be the only opportunity that students have to use technical or job-specific reading skills – a skillset that students need in order to be prepared to be lifelong learners in their future profession. CTE teachers need to have relationships with community and business partners in order to provide students WBL opportunities. CTE teachers need to prepare students for WBL opportunities by developing the self-discipline and resilience needed to be a member of the workforce. CTE facilities need to offer students the opportunity to use equipment that is common in a professional setting. In order to do that, CTE teachers need to seek current workplace experiences in their field through summer externships. Finally, CTE teachers need to plan ways to help new and aspiring CTE teachers develop these skills.

Planning Professional Development

The competency categories and individual competencies identified by this study can be used to provide an "entree menu" of professional development offerings for Virginia's CTE teachers. These highest ranked competencies showed up consistently for subgroups identified in the study. Competencies highly ranked by specific subgroup categories can be added as "side items" to the overall professional development menu. The top ten lists presented in Chapter Four can be used to develop professional development topic lists aligned with specific subgroup needs. Examples of specific topics selected for subgroup categories include: professional development on collaborating with guidance counselors – identified by male teachers; promoting a CTE program – identified by African American/Black teachers; training on working with advisory committees – identified by Agriculture Education teachers; managing a CTSO – identified by Health and Medical Sciences teachers and teachers using reciprocity for licensure; evaluating instructional effectiveness – identified by early career teachers; and improving student math and writing skills – identified by teachers with technical licensure.

Results from the study also show that school division subgroups tend to produce high priority competency lists that are unique to their teachers. It is often the responsibility of schools and school divisions to plan professional development activities for their teachers. At the school-level, these activities are often whole school activities. At the division-level, these activities are often conducted with like-groups, such as by grade-level or teaching discipline. CTE teachers would benefit from targeted professional development that meets their self-identified needs at the school- and/or division-level. Collectively working towards a shared goal, such as improving cooperative education opportunities and experiences, or improving outcomes for students with special needs, can lead to greater program improvements than having CTE

teachers participate in professional development more closely aligned with the goals of core academic courses. Individualized professional development plans can also be beneficial, however allowing CTE teachers to collaboratively work towards meeting goals for their programs can provide an even greater benefit to the school, students, community, and employers.

Recommendations for Practice

The following recommendations for practice are based on the results of the study.

1. Encourage schools and school divisions to assess the professional development needs of their CTE teachers before planning professional development activities.
2. Support the efforts of professional development providers and developers by encouraging alignment of offerings with the topics identified as most important by Virginia CTE teachers.

The first step individual schools and school divisions can take towards improving their CTE programs is identifying the highest prioritized competencies their CTE teachers need for professional development. The results of this study can be used as a guide towards developing a CTE professional development agenda for a Virginia school division. Professional development should be strategically planned to address the needs of CTE teachers that align with the goals of the CTE program and the school and/or school division. CTE teachers should collaboratively engage in the professional development activities they've identified.

Professional development providers can create customized offerings based on the "menu" of topics identified in this study. This approach will allow divisions, schools and individual teachers to select professional development that meets their needs. Professional development offerings can be delivered in a variety of formats to meet the needs of CTE teachers, schools, and school divisions.

Recommendations for Further Research

The following recommendations for further research are based on the results of the study.

1. Conduct a comparison study using Virginia CTE teacher professional development needs and the professional development needs of CTE teachers in other states.

2. Analyze how environmental factors, such as economic, social, and political factors, impact the self-perceived professional development needs of CTE teachers.

3. Further study the relationship between CTE teacher professional development needs and demographic factors for CTE teachers, especially years of experience, CTE content area, school division, and initial licensure type.

4. Assess the effectiveness of various professional development delivery models in order to provide the meaningful professional development training that positively impacts CTE teachers, students, programs, schools, and communities.

The professional development needs of Virginia CTE teachers should be compared to the professional development needs of CTE teachers in other states. Other state-wide studies on CTE teacher professional development needs exist, although important differences in competency lists and timing of the studies exist. Conducting longitudinal studies would also provide insight into the changing professional development needs of CTE teachers. Aligning external factors to the changing professional development needs of CTE teacher could allow for more forward-thinking professional development offerings, as opposed to offerings that react to the current environment.

A current example of the need to align CTE professional development topics with the current environment is the COVID-19 pandemic. The impact of COVID-19 on schools will likely be felt by CTE programs for years to come. The necessary increase in online course offerings has created a new standard that CTE programs and teachers will need to adjust to and plan for moving forward. The impact on school funding will likely cause significant changes to CTE programs as well. As CTE programs change, the needs of CTE teachers change as well. Anticipating those changes and the resulting professional development needs could positively impact student, school, community, and employment outcomes.

Additionally, more research on the unique needs of individual teachers, school CTE departments, and school division CTE programs should be conducted. This study suggests that differences in school divisions likely cause meaningful differences for professional development needs. Studies that specifically address the relationship between professional development needs and subgroups such as school division, CTE content area, years of experience, and licensure type are needed to better align professional develop with specific CTE teacher subgroup needs.

Lastly, high-yield professional development activities for the identified topics need to be researched and planned in order to meet the needs of CTE teachers. Adult learners are different than school-age students. The learning activities used with adult learners need to be hands-on and address specific topics that are important to the learners. Creating a system that allows for the delivery of professional development content requires a deep understanding professional development activities that are effective with CTE teachers.

Concluding Remarks

Experienced educators know that teachers are the key component of great schools. Research tells us that there is no in-school factor more important than teachers. The foundational work that resulted in this study started before anyone had ever heard of COVID-19. Understanding the professional development needs of Virginia's CTE teachers was important then. The current educational climate brought on by a global pandemic has made that understanding even more important today.

The new model of schooling devised for the pandemic-era has created a greater divide between teachers and students – and resulted in worsened student outcomes. Students need great teachers who are experts at their work. Great teaching doesn't happen by accident. It happens by identifying specific areas for growth and addressing those areas through targeted professional

development. Addressing the needs of CTE teachers is critical to creating an educational environment that prepares students for postsecondary education and the workforce. Great CTE programs answer the age-old question, "Why do I need to know this?" If we as a society take student learning seriously then we need to recognize that teacher learning is the accelerant that generates improved student learning.

References

Abdallah, J. (2009). Lowering teacher attrition rates through collegiality. *Academic Leadership: The Online Journal, 7*(1), Article 24.

Achieve. (2015). *Seizing the future: How Ohio's career-technical education programs fuse academic rigor and real-world experiences to prepare students for college and careers*. Washington, DC: Achieve.

Adnot, M., Dee, T., Katz, V., & Wyckoff, J. (2016). *Teacher turnover, teacher quality, and student achievement in DCPS*. Cambridge, MA: National Bureau of Economic Research.

Advance CTE. (2018). *Career Technical Education*. Retrieved from https://careertech.org/cte on October 22, 2018.

Advance CTE & Association for Career and Technical Education. (2018). *Perkins V: Strengthening Career and Technical Education for the 21st Century Act*. Retrieved from https://www.acteonline.org/wp-content/uploads/2018/08/PerkinsV_One-Pager_082418.pdf.

Advance CTE, Center on Great Teachers, & American Institutes for Research. (2016). *The state of career technical education: Increasing access to industry experts in high schools*. Retrieved from https://careertech.org/resource/state-of-cte-increasing-access-to-industry-experts.

Ahsan, S., Akber, A., Islam, A., Rahman, M., & Rahman, M. R. (2017). Shrimp farmers' competence and training needs on climate change adaptation: A case study from southwest coastal Bangladesh. *Proceeding of the International Conference on Climate Change, 1*, 1-9.

Alabi, O. S. & Ajayi, A. O. (2018). Assessment of desired competencies of agricultural extension agents in sustainable agriculture development activities in southwest Nigeria. *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, 18*(3), 11-20.

Alfed, C., Stone III, J. R., Aragon, S. R., Hansen, D. M., Zirkle, C., Connors, J., Spindler, M., Romine, R. S., & Woo, H. (2007). *Looking inside the black box: The value added by career and technical student organizations to students' high school experience*. St. Paul, MN: National Research Center for Career and Technical Education.

Aliaga, O. A., Kotamraju, P., & Stone III, J. R. (2014). Understanding participation in secondary career and technical education in the 21st century: Implications for Policy and Practice. *The High School Journal, 97*(3), 128-158.

Alibaygi, A. & Zarafshani, K. (2008). Training needs of Iranian extension agents about sustainability: The use of Borich's need assessment model. *African Journal of Agricultural Research, 3*(10), 681-687.

Amadeo, K. (2020). *1920s economy: What made the twenties roar*. Retrieved from https://www.thebalance.com/roaring-twenties-4060511 on March 16, 2020.

American Institutes for Research. (2015). *Promoting teacher effectiveness: Teacher induction and mentoring brief*. Washington, DC: American Institutes for Research.

American Institutes for Research. (2015). *What career and technical education teachers really want for professional development*. Washington, DC: American Institutes for Research.

American Psychological Association. (2017). *Education and Socioeconomic Status*. Retrieved from https://www.apa.org/pi/ses/resources/publications/education on November 24, 2020.

Anderson, T. (2016). Theories for learning with emerging technologies In G. Veletsianos (Ed.), *Emergence and innovation in digital learning: Foundations and applications* (pp 35-50). Edmonton, AB: AU Press, Athabasca University.

Angulo, A. J. (2009). *William Barton Rogers and the idea of MIT*. Baltimore, MD: The Johns Hopkins University Press.

Aragon, S. (2016). *Teacher shortages: What we know*. Denver, CO: Education Commission of the States.

Arnett-Hartwick, S. E. & Cannon, J. (2019). Problems faced by secondary technology education novice and veteran teachers. *Journal of Research in Technical Careers, 3*(1).

Ashiedu, J. A. & Scott-Ladd, B. D. (2012). Understanding teacher attraction and retention drivers: Addressing teacher shortages. *Australian Journal of Teacher Education, 37*(11), Article 2.

Association for Career and Technical Education. (2014). *Career and technical student organizations*. Retrieved from http://www.ctsos.org/wp-content/uploads/2014/02/CTSOTrifoldNoMembership.pdf.

Association for Career and Technical Education. (2018). *Celebrate the future of CTE with 100 years of the Smith-Hughes act*. Retrieved from https://www.acteonline.org/celebrate-the-future-of-cte-with-100-years-of-the-smith-hughes-act/ on October 17, 2018.

Association for Career and Technical Education. (2019). *Teach CTE: A national teacher recruitment and retention summit*. Retrieved from https://www.acteonline.org/cteteach/ on October 10, 2019.

Asunda, P. A. (2011). Career and technical education teacher preparation trends: A pilot study. *Online Journal of Workforce Education and Development, 5*(3).

Augustyn, A., Bauer, P., Duignan, B., Eldridge, A., Gregersen, E., McKenna, A., Petruzzello, M., Rafferty, J. P., Ray, M., Rogers, K., Tikkanen, A., Wallenfeldt, J. Zeidan, A., & Zelazko, A. (2010). Guild. In *Encyclopedia Britannica*. Retrieved from https://www.britannica.com/topic/guild-trade-association on October 21, 2018.

Augustyn, A., Bauer, P., Duignan, B., Eldridge, A., Gregersen, E., McKenna, A., Petruzzello, M., Rafferty, J. P., Ray, M., Rogers, K., Tikkanen, A., Wallenfeldt, J. Zeidan, A., & Zelazko, A. (2019). Industrial Revolution. In *Encyclopedia Britannica*. Retrieved from https://www.britannica. com/event/Industrial-Revolution on March 14, 2020.

Augustyn, A., Bauer, P., Duignan, B., Eldridge, A., Gregersen, E., McKenna, A., Petruzzello, M., Rafferty, J. P., Ray, M., Rogers, K., Tikkanen, A., Wallenfeldt, J. Zeidan, A., & Zelazko, A. (2019). Scopes Trial. In *Encyclopedia Britannica.* Retrieved from https://www.britannica. com/event/Industrial-Revolution on March 28, 2020.

Avant, K. S. (2015). *Teacher certification in technology education: Differences in testing scores of alternative and traditional certified teachers* (Doctoral dissertation). Available from Walden Dissertations and Doctoral Studies database.

Ball, D. L. & Frozani, F. M. (2009). The work of teaching and the challenge for teacher education. *Journal of Teacher Education, 60*(5), 497-511.

Balter, D. & Duncombe, W. D. (2007). Recruiting highly qualified teachers: Do district recruitment practices matter? *Public Finance Record, 36*(33), 33-62.

Bandura, A. (1971). *Social learning theory*. New York, NY: General Learning Corporation.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191–215.

Bandura, A. (1986). *Social Foundations of Thought and Action*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.), *Encyclopedia of human behavior* (Vol. 4, pp. 71-81). New York: Academic Press.

Barlow, M. L. (1976). 200 years of vocational education: 1776-1976: Coming of age, 1926-1976. *American Vocational Journal, 51*(5), 63-88.

Barrera-Pedemonte, F. (2016). *High-quality teacher professional development and classroom teaching practices: Evidence from Talis 2013*. OECD Education Working Papers No. 141. Paris, France: OECD Publishing.

Barrick, R. K., Ladewig, H. W. & Hedges, L. E. (1983). Development of a systematic approach to identifying technical inservice needs of teachers. *Journal of the American Association of Teacher Educators in Agriculture, 24*(1), 13-19.

Bartholomew, S. R., Bullock, E. P., & Nadelson, L. S. (2018). A route less traveled: Principals' perceptions of alternative licensed CTE teachers. *Journal of Education and Training, 5*(2), 12-20.

Baum, S., Kurose, C., & McPherson, M. (2013). An overview of American higher education. *The Future of Children, 23*(1), 17-39.

Berry, B., Montgomery, D., & Snyder, J. (2008). *Urban teacher residency models and institutions of higher education: Implications for teacher preparation*. Carrboro, NC: Center for Teaching Quality.

Beteille, T., Kalogrides, D., & Loeb, S. (2010). *Effective schools: Managing the recruitment, development, and retention of high-quality teachers*, presented at the Annual Meeting of the American Educational Research Association, Denver, CO, 2010.

Biehler, R. (2016). *Professional development for teaching probability and inference statistics with digital tools at upper secondary level*. Paper presented at the 13th International Congress on Mathematical Education in Hamburg, Germany. Retrieved from https://www.researchgate.net/profile/Rolf_Biehler/publication/307965020_Professional_Development_for_teaching_probabilty_and_inference_statistics_with_digital_tools_at_upper_secondary_level/links/57d3e7ca08ae5f03b490d2b6.pdf.

Blevins, R. M. (2016). *Analysis of new teacher mentoring programs with regard to new CTE teachers* (Doctoral dissertation). Jefferson City, TN: Carson-Newman University.

Blömeke, S., Olsen, R. V., & Suhl, U. (2016). Relation of student achievement to the quality of their teachers and instructional quality. In T. Nilson & J. Gustafsson (Eds.), *Teacher quality, instructional quality and student outcomes: Relationships across countries, cohorts and time* (pp. 21-50). Retrieved from https://www.oapen.org/download?type=document&docid=1002053#page=29.

Blonder, R., Benny, N. & Jones, M. G. (2014). Teaching self-efficacy of science teachers. In Evans, R. et al. (Eds.), *The Role of Science Teachers' Beliefs in International Classrooms* (pp. 3-16). Rotterdam, Netherlands: Sense Publishers.

BloomBoard & American Institutes for Research. (2019). *Redefining educator career pathways with micro-credentials: A blueprint for attracting and retaining high-quality educators*. Bethesda, MD: Education Week.

Blum, R. W. (1989). The forgotten half. *Developmental and Behavioral Pediatrics, 10*(6), 326-327.

Blunk, M. (2010). *1956 Health Amendments Act*. Retrieved from https://w.taskstream.com/ts/blunk1/Unit2-917to1956.html/ uvctcq00u0crcwcpc5c6cucqco on April 10, 2020.

Bohan, C. H. (2010). Committee of ten of the national education association. In Kridel, C. (Ed.) *Encyclopedia of curriculum studies* (pp. 126-126). Thousand Oaks, CA: SAGE Publications, Inc.

Bond, M. A. & Blevins, S. J. (2019). Using faculty professional development to foster organizational change: A social learning framework. *Organizational Training and Performance*. https://doi.org/10.1007/s11528-019-00459-2.

Borich, G. D. (1977). *Three school based models for conducting follow-up studies of teacher education and training*. Research and Development Center for Teacher Education, The University of Texas at Austin: Austin, TX.

Borich, G. D. (1980). Implications for developing teacher competencies form process-product research. *Journal of Teacher Education, 30*(1), 77-86.

Borich, G. D. (1980). A needs assessment model for conducting follow-up studies. *Journal of Teacher Education, 31*(3), 39-42.

Borko, H. (2004). Professional Development and Teacher Learning: Mapping the Terrain. *Educational Researcher, 33*(8).

Borman, G. D. & Dowling, N. M. (2008). Teacher attrition and retention: A meta-analytic and narrative review of the research. *Review of Education Research, 78*(3), 367-409.

Bottoms, G., Egelson, P., Sass, H., & Uhn, J. (2013). *Improving the quality of technical alternative teacher preparation: An induction model of professional development and support*. Louisville, KY: National Research Center for Career and Technical Education.

Bottoms, G. & McNally, K. (2005). *Actions states can take to place a highly qualified career/technical teacher in every classroom*. Atlanta, GA: Southern Regional Education Board.

Bowen, B., Williams, T., Napoleon, L., & Marx, A. (2019). Teacher preparedness: A comparison of alternatively and traditionally certified technology and engineering education teachers. *Journal of Technology Education, 30*(2), 75-89.

Bowling, A. M. & Ball, A. L. (2018). Alternative certification: A solution or an alternative problem? *Journal of Agriculture Education, 59*(2), 109-122.

Boyd, D., Lankford, H., Loeb, S., & Wyckoff, J. (2005). The impact of assessment and accountability on teacher recruitment and retention: Are there unintended consequences? *Public Finance Review, 36*(1), 88-111.

Boylan, M. (2018). Enabling adaptive system leadership: Teachers leading professional development. *Educational Management Administration & Leadership, 46*(1), 86-106.

Brand, B., Valent, A., & Browning, A. (2013). *How career and technical education can help students be college and career ready: A primer*. Washington, DC: American Institutes for Research.

Brand, S. Felner, R. Shim, M., Seitsinger, A., & Dumas, T. (2003). Middle school improvement and reform: Development and validation of a school-level assessment of climate, cultural pluralism, and school safety. *Journal of Educational Psychology, 95*(3), 570-588.

Brown, K. M. & Schainker, S. A. (2008). Doing all the right things: Teacher retention issues. *Journal of Cases in Educational Leadership, 11*(1), 10-17.

Bruening, T. H., Scanlon, D. C., Hodes, C., Dhital, P., Shao, X., & Li, S. (2001). *The status of career and technical education teacher preparation programs*. Minneapolis, MN: The National Research Center for Career and Technical Education.

Buery, Jr., R. (2019). *All Students Need Career and Technical Education*. Retrieved from http://blogs.edweek.org/edweek/rick_hess_straight_up/2019/07/all_students_need_career_and_technical_education.html.

Butrymowicz, S. (2016). Push for career-technical education meets parent resistance. *Tech Directions, Spring 2016*, 32-34.

Camp, W. G. & Heath-Camp, B. (1991). *On becoming a teacher: "They just gave me a key and said, 'good luck'."* Berkeley, CA: National Center for Research in Vocational Education.

Cannon, J. G., Kitchel, A., & Duncan, D. W. (2012). Perceived teaching and learning professional development needs of Idaho secondary career and technical education teachers. *The Researcher, 24*(1), 43-54.

Cannon, J. G., Kitchel, A., & Duncan, D. W. (2010). Identifying perceived professional development needs of Idaho secondary CTE teachers: Program management needs of skilled and technical science teachers. *Journal of STEM Teacher Education, 47*(1), 42-69.

Cannon, J. G., Kitchel, A., Duncan, D. W., & Arnett, S.E. (2011). Professional development needs of Idaho technology teachers: Teaching and learning. *Journal of Career and Technical Education, 26*(1), 32-47.

Cannon, J. G., Kitchel, A., & Tenuto, P. (2013). District superintendent perceptions of Idaho secondary CTE teachers' professional development needs. *Journal of Career and Technical Education, 28*(1), 39-55.

Carl, J. (2009) Industrialization and public education: Social cohesion and social stratification. In: Cowen R. & Kazamias A.M. (Eds.), *International Handbook of Comparative Education (pp. 503-518)*. Dordrecht, Netherlands: Springer.

Carl D. Perkins Vocational Education Act, 98 U.S.C. § 524 (1984).

Carnevale, A. P., Strohl, J. Cheah, B., & Ridley, N. (2017). *Good jobs that pay without a BA*. Washington, DC: Georgetown University Center on Education and the Workforce.

Carlson, T. E., Kelly, A. J., & Williams, C. P. (1964). The vocational education act of 1963. School Life, 46(5), 3-12. Retrieved from https://books.google.com/books?id=GkfWAAAAMAAJ&pg=RA6-PA11&lpg=RA6-PA11&dq=Title+I--Fishery+Training+Act,+Title+II--Health+Amendments+Acts+of+1956&source=bl&ots=_nSUbMQgdy&sig=ACfU3U1RM6NDT8045Bo0cv_tHlGorOkvIw&hl=en&sa=X&ved=2ahUKEwiDgJSW2d7oAhWOlnIEHT4ADQYQ6AEwAnoECAsQMg#v=onepage&q=fishery&f=false.

Carver, R. P. (1975). The Coleman report: Using inappropriately designed achievement tests. *American Education Research Journal, 12*(1), 77-86.

Carver-Thomas, D. & Darling-Hammond, L. (2017). *Teacher turnover: Why it matters and what we can do about it*. Palo Alto, CA: Learning Policy Institute.

Castro, A. J. & Bauml, M. (2009). Why now? Factors associated with choosing teaching as a second career and their implications for teacher education programs. *Teacher Education Quarterly, Summer 2009,* 113-126.

Cavanagh, S. (2019). *Automation fueling hunger for education, Pearson study finds*. Retrieved from https://marketbrief.edweek.org/marketplace-k-12/workers-prepping-automation-education-not-just-u-s-pearson-survey-finds/.

Center on Standards & Assessment Implantation. (2019). *Career and technical education (CTE) standards*. San Francisco, CA: WestEd.

Chenven, J. S. (2018). *Perceptions of career and technical education (CTE) teachers on indicators of teaching quality* (Doctoral dissertation). Available from University of New Mexico Digital Repository.

Chetty, R., Friedman, J. N., & Rockoff, J. E. (2014). Measuring the Impacts of Teachers II: Teacher Value-Added and Student Outcomes in Adulthood. *American Economic Review, 104*(9), 2633–79.

Clemons, C. A., Heidenreich, A. E., & Lindner, J. R. (2018). Assessing the technical expertise and content needs of Alabama agriscience teachers. *Journal of Agriculture Education, 59*(3), 87-99.

Cohen, M. & Besharov, D. J. (2002). *The role of career and technical education: Implications for the federal government*, presented at Preparing America's Future: The High School Symposium, Washington, DC, 2002. Washington, DC: Office of Vocational and Adult Education.

Coleman, J. S. (1966). *Equality of Educational Opportunity*. Washington, DC: National Center for Education Statistics.

Conklin, N. L., Hook, L. L., Kelbaugh, B. J., & Nieto, R. D. (2002). Examining a professional development system: A comprehensive needs assessment approach. *Journal of Extension, 40*(5).

Cooper, P. (2005). Life before tests. *The School Administrator, 9*(62). Retrieved from https://www.aasa.org/SchoolAdministratorArticle.aspx?id=7780 on October 24, 2020.

Cordingley, P., Higgins, S., Greany, T., Buckler, N., Coles-Jordan, D., Crisp, B., Saunders, L, & Coe, R. (2015). *Developing great teaching: Lessons from the international reviews into effective professional development*. London, England: Teacher Development Trust.

Council for Exceptional Children. (n.d.). *Issue brief: Carl D. Perkins act*. Retrieved from https://www.cec.sped.org/~/media/Files/Policy/Current%20Sped%20Issues%20Home/Perkins.pdf on October 19, 2018.

Creswell, J. W. & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: SAGE Publications, Inc.

Cubberley, E. P. (1947). *Public education in the United States: A study and interpretation of American educational history*. Cambridge, MA: The Riverside Press.

Daggett, W. R. (2003). *The future of career and technical education*. Rexford, NY: International Center for Leadership in Education.

Danns, D. & Span, C. M. (2008). History of schooling. In T. L. Good (Ed.), *21st century education: A reference handbook* (pp. 265-273). Thousand Oaks, CA: Sage Publications, Inc.

Darling-Hammond, L. (2014). *To close the achievement gap, we need to close the teaching gap*. Retrieved from https://www.huffpost.com/entry/to-close-the-achievement_b_5542614.

Darling-Hammond, L. (2000). Teacher quality and student achievement: A review of state policy evidence. *Education Analysis Policy Archives, 8*(1).

Darling-Hammond, L., Holtzman, D., Gatlin, S., & Vasquez Heilig, J. (2005). Does teacher preparation matter? Evidence about teacher certification, Teach for America, and teacher effectiveness. *Education Policy Analysis Archives, 13*(42), 1-51.

Darling-Hammond, L., Wei, R. C., Andree, A., Richardson, N., Orphanos, S. (2009). *Professional learning in the learning profession: A status report on teacher development in the United States and abroad.* Oxford, OH: National Staff Development Council.

Davis, T. S. (2015). *An examination of high school career and technical education (CTE) teachers', CTE program directors' and campus administrators' perceptions of CTE teacher recruitment, development, and retention efforts in a large urban school district* (Doctoral dissertation). Houston, TX: University of Houston.

Dellarocas, C. (2018). *Higher education in a world where students never graduate*. Retrieved from https://www.insidehighered.com/digital-learning/views/2018/08/01/role-university-world-where-students-never-graduate-opinion on October 23, 20220.

DeLuca, S., Plank, S., & Estacio, A. (2006). *Does career and technical education impact college enrollment?* Columbus, OH: National Dissemination Center for Career and Technical Education.

Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. *Educational Researcher, 38*(3), 181-199.

Devier, B. H. (2019). Teacher shortage and alternative licensure solutions for technical educators. *The Journal of Technology Studies, 45*(2), 48-29.

Dewey, J. (1904). *The Relation of theory to practice in education*. Retrieved from https://people.ucsc.edu/~ktellez/dewey_relation.pdf.

Dewey, J. (1916). *Democracy and education: An introduction to the philosophy of education*. New York, NY: The McMillian Company.

Dewey, J. (1938). *Experience and education*. New York, NY: Simon and Schuster.

Dewey, J. (2010). The teacher and the public. In Simpson, D.J., & Stack, S.F. (eds.), *Teachers, leaders and schools: Essays by John Dewey* (214–44). Carbonale, IL: Southern Illinois University Press, 2010.

Dewey, J. (2010). To those who aspire to the profession of teaching. In Simpson, D.J., & Stack, S.F. (eds.), *Teachers, leaders and schools: Essays by John Dewey* (33–36). Carbonale, IL: Southern Illinois University Press, 2010.

Dickinson, E. V. (2016). Coleman report set the standard for the study of public education. *Johns Hopkins Magazine, Winter 2016*. Retrieved from https://hub.jhu.edu/magazine/2016/winter/coleman-report-public-education/.

Dimock, M. (2019). *Defining generations: Where Millennials end and Generation Z begins*. Retrieved from https://www.pewresearch.org/fact-tank/2019/01/17/where-millennials-end-and-generation-z-begins/.

Dobbie, W. (2011). Teacher characteristics and student achievement: Evidence from Teach for America. *Unpublished manuscript, Harvard University.*

Dodd-Nufrio, A. T. (2011). Reggio Emilia, Maria Montessori, and John Dewey: Dispelling teachers' misconceptions and understanding theoretical foundations. *Early Childhood Education Journal, 39,* 235–237.

Doolittle, P.E. and Camp, W.G. (1999). Constructivism: The career and technical education perspective. *Journal of Career and Technical Education, 16*(1). DOI: http://doi.org/10.21061/jcte.v16i1.706.

Dougherty, S. M. (2016). *Career and technical education in high school: Does it improve student outcomes?* Washington, DC: Thomas B. Fordham Institute.

Drage, K. (2010). Professional development: Implications for Illinois career and technical education teachers. *Journal of Career and Technical Education, 25*(2), 24-37.

Duncan, D. W., Cannon, J., & Kitchell, A. (2013). Teaching efficacy: A comparison of traditionally and alternatively certified teachers in Idaho. *Career and Technical Education Research, 38*(1), 57-67.

Duncan, D. W., Ricketts, J. C., Peake, J. B., & Uesseler, J. (2006). Teacher preparation and inservice needs of Georgia Agriculture teachers. Journal of Agriculture Education, 47(2), 24-35.

Ebert-May, D., Derting, T. L., Hodder, J., Momsen, J. L., Long, T. M., & Jardelleza, S. E. (2011). What we say is not what we do: Effective evaluation of faculty professional development programs. *BioScience, 61*(7), 550-558.

Education Association of the United States. (1894). *Report of the committee of ten on secondary school studies: With the reports of the conferences arranged by the committee*. New York, NY: The American Book Company.

Edwards, M. C. & Briers, G. E. (1999). Assessing the inservice needs of entry-phase agriculture teachers in Texas: A discrepancy model versus direct assessment. *Journal of Agricultural Education, 40*(3), 40-49.

Eisenman, G. Edwards, S. & Cushman, C. A. (2015). Bringing reality to classroom management in teacher education. *The Professional Educator, 39*(1).

Elliott, E. M., Isaacs, M. L., & Chugani, C. D. (2010). Promoting self-efficacy in early career teachers: A principal's guide for differentiated mentoring and supervision. *Florida Journal of Education Administration & Policy, 4*(1), 131-146.

Elliott, S. N., Kratochwill, T. R., Littlefield Cook, J. & Travers, J. (2000). *Educational psychology: Effective teaching, effective learning* (3rd ed.). Boston, MA: McGraw-Hill College.

English High School Association. (2019). *History of the English high school*. Retrieved from https://www.englishhighalumni.org/copy-of-200th-anniversary on March 28, 2020.

Erickson, D. (2016). *State's first online technical education high school to be based in McFarland district*. Retrieved from https://madison.com/wsj/news/local/education/local_schools/state-s-first-online-technical-education-high-school-to-be/article_3befc968-a046-55d7-9c0f-3274855858bf.html on April 24, 2019.

Erwine, R. H. & Fordyce, W. G. (1943). The workshop and in-service teacher training. *Educational Research Bulletin, 22*(3), 59-62.

Eyestone, J. E. (1992). The influence of Swedish sloyd and its interpreters on American art education. *Studies in Art Education: A Journal of Issues and Research, 34*(1), 28-38.

Fisher, C., Fishman, B., Levy, A. J., Eisenkraft, A., Dede, C., Lawrenz, F., Jia, Y., Kook, J. F., Frumin, K., & McCoy, A. (2016). When do students in low-SES schools perform better-than expected on a high-stakes test? Analyzing school, teacher, teaching, and professional development characteristics. *Urban Education*, 1-35.

Fistolera, J. (2018). *How to create and retain the next generation of leaders*. Retrieved from https://www.diplomaticourier.com/issue/create-retain-next-generation-leaders.

Fletcher Jr., E. C. (2014). Instructional strategy use in the P-12 business and marketing education classroom. In ARBE-DPE, NABTE, & NBEA (Eds.), *2014 Business Education Research Conference* (pp. 35-50). Los Angeles, CA: Association for Research in Business Education.

Fletcher Jr., E. C. & Djajalaksana, Y. (2014). Instructional strategy preferences in the career and technical education classroom. *The Journal of Research in Business Education, 56*(1), 32-56.

Fletcher Jr., E. C. & Gordon, H. R. D. (2017). The status of career and technical education undergraduate programs in the Unites States. *Peabody Journal of Education, 92*(2), 236-253.

Fletcher Jr., E. C., Gordon, H. R. D., Asunda, P., & Zirkle, C. (2015). A 2015 status study of career and technical education programs in the United States. *Career and Technical Education Research, 40*(3), 191-211.

Fletcher Jr, E. C. & Zirkle, C. (2011). Career and technical education's role in alternative teacher licensure. In V. Wang (Ed.), *Definitive Readings in the History, Philosophy, Theories and Practice of Career and Technical Education* (pp. 84-102). Hershey, PA: Information Science Reference.

Friedrichsen, P. J., Linke, N. & Barnett, E. (2016). Biology teachers' professional development needs for teaching evolution. *Science Educator, 25*(1), 51-61.

Fry, R. (2018). *Millennials projected to overtake Baby Boomers as America's largest generation*. Retrieved from https://www.pewresearch.org/fact-tank/2018/03/01/millennials-overtake-baby-boomers/.

Gammill, D. M. (2015). Time to give CTE what it deserves – R-E-S-P-E-C-T. *The Phi Delta Kappan, 96*(6), 17-20.

Gamson, D. A., McDermott, K. A., & Reed, D. S. (2015). The Elementary and Secondary Education Act at fifty: Aspirations, effects, and limitations. *RSF: The Russell Sage Foundation Journal of the Social Sciences, 1*(3), 1-29.

Garcia, N., Shaughnessy, M., Prawat, X. J., Pfaff, E., Mortimer, J., Cirino, N., Blunk, M., & Robinson, D. (2018). Changing teaching practice: Examining professional development impact on mathematics discussion leading practice. In Hodges, T.E., Roy, G. J., & Tyminski, A. M. (Eds.). (2018). *Proceedings of the 40th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 366-369). Greenville, SC: University of South Carolina & Clemson University.

Garrison, J. (2008). *Reconstructing democracy, recontextualizing Dewey: Pragmatism and interactive constructivism in the twenty-first century*. Albany, NY: State University of New York Press.

Garton, B. L. & Chung, N. (1996). The inservice needs of beginning teachers of agriculture as perceived by beginning teachers, teacher educators, and state supervisors. *Journal of Agriculture Education, 37*(3), 52-58.

Garton, B. L. & Chung, N. (1997). An assessment of the inservice needs of beginning teachers of agriculture using two assessment models. *Journal of Agriculture Education, 38*(3), 51-58.

Gerber, N. (2019). *Teacher evaluation that's meaningful*. Washington, DC: National Council on Teacher Quality.

Gewertz, C. (2019). *Why the high-achievers have moved to 'shop' class*. Retrieved from https://www.edweek.org/ew/articles/2019/05/01/why-the-high-achievers-have-moved-to-shop.html.

Glassman, M. (2004). Running in circles: Chasing Dewey. *Educational Theory, 54*(3), 315-341.

Golden, M. E. (2013). *Assessing needs of middle school agriculture teachers in Georgia* (Doctoral dissertation). Auburn, AL: Auburn University.

Gordon, H. R. D. (2009). Identification of selected factors that impact the preparation of CTE teachers. *Online Journal of Workforce Education and Development, 3*(4). Retrieved from https://pdfs.semanticscholar.org/b92f/6488ee611ac63e910255f0a0d1dfb7184cfe.pdf.

Gordon, H. R. D. (2009). *The history and growth of career and technical education in America*. Long Grove, IL: Waveland Press, Inc.

Gordon, H. R., Shaw, S., & Xing, X. (2019). Analysis of subject matter topics presented at AERA's CTE annual meeting. *The CTE Journal, 7*(2).

Gray, K. C. & Walter, R. A. (2001). *Reforming career and technical education teacher licensure and preparation: A public policy synthesis*. Washington, DC: National Dissemination Center for Career and Technical Education.

Groen, M. (2008). The whig party and the rise of common schools, 1837-1854: Party and policy reexamined. *American Educational History Journal, 35*(2), 251-260.

Grollmann, P. (2008). The quality of vocational teachers: Teacher education, institutional roles and professional reality. *European Educational Research Journal, 7*(4), 535-547.

Gross, J. (2018). *Can immigrant professionals help reduce teacher shortages in the U.S.?* New York, NY: World Education Services.

Grubbs, M. E., Love, T. S., Long, D. E., & Kittrell, D. (2016). Science educators teaching engineering design: An examination across science professional development sites. *Journal of Education and Training Studies, 4*(11), 163-178.

Guha, R., Hyler, M. E., & Darling-Hammond, L. (2017). The teacher residency: A practical path to recruitment and retention. *American Educator, Spring 2017*, 31-44.

Guskey, T. R. (1986). Staff development and the process of teacher change. *Educational Researcher, 15*(5), 5-12.

Guskey, T. R. (2002). Professional development and teacher change. *Teachers and Teaching: Theories and Practice, 8*(3/4), 381-391.

Guthrie, J. W. & Springer, M. G. (2004). A nation at risk revisited: Did "wrong" reasoning result in "right" results? At what cost? *Peabody Journal of Education, 79*(1), 7-35.

Guy, M. E. & Fenley, V. M. (2014). Inch by inch: Gender equity since the Civil Rights Act of 1964. *Review of Public Personnel Administration, 34*(1), 40-58.

Hackman, M. (2018). *Vocational training is back as firms pair with high schools to groom workers*. Retrieved from https://www.wsj.com/articles/vocational-training-is-back-as-firms-pair-with-high-schools-to-groom-workers-1534161601.

Haggerty, R. J. (1989). Youth and America's future: The forgotten half. *Developmental and Behavioral Pediatrics, 10*(6), 321-325.

Hammel, A. M. (2007). Professional development research in general education. *Journal of Music Teacher Education, 17*(1), 22-32.

Hampson, R. (2015). *70 years later: How World War II changed America*. Retrieved from https://www.usatoday.com/story/news/nation/2015/07/18/70-years-later-how-world-war-ii-changed-america/30334203/ on April 10, 2020.

Hanushek, E. A. (2011). Valuing teachers: How much is a good teacher worth? *Education Next, 11*(3), 40-45.

Hanushek, E. A., Piopiunik, M., & Widerhold, S. (2018). *The value of smarter teachers: International evidence on teacher cognitive skills and student performance*. Cambridge, MA: Program on Education Policy and Governance.

Hardesty, D. M. & Bearden, W. O. (2004). The use of expert judges in scale development: Implications for improving face validity of measures of unobservable constructs. *Journal of Business Research, 57*, 98-107.

Harvey, G. (2010). *Public education during the civil war and reconstruction era*. Retrieved from http://eoa.auburn.edu/article/h-2600.

Hashemi, S. M., Hosseini, S. M., & Damalas, C. A. (2009). Farmers' competence and training needs on pest management practices: Participation in extension workshops. *Crop Protection, 28*, 934-939.

Hattie, J. (2003). *Teachers make a difference. What is the research evidence?* Paper presented at the Building Teacher Quality: What does the research tell us ACER Research Conference, Melbourne, Australia. Retrieved from http://research.acer.edu.au/research_conference_2003/4/.

Hattie, J. (2009). *Visible Learning: A synthesis of over 800 meta-analyses relating to achievement*. New York, NY: Routledge.

Heafner, T. L. (2019). Teacher effect model for impacting student achievement. In (Information Resources Management Association, Eds.) *Pre-Service and In-Service Teacher Education*. Hershey, PA: IGI Global.

Healey Library. (2018). *Selected Resources Documenting Thompson Island*. Boston, MA: University of Massachusetts Boston. Retrieved from https://umb.libguides.com/thompson-island.

Heath-Camp, B., Camp, W. G., Adams-Casmus, E., Talbert, B. A., & Barder, J. D. (1992). *On becoming a teacher: An examination of the induction of beginning vocational teachers in*

American public schools. Berkeley, CA: National Center for Research in Vocational Education.

Hefling, K. (2018). *States embrace new career and technical education policies*. Retrieved from https://www. politico.com/newsletters/morning-education/2018/01/26/states-embrace-new-career-and-technicaleducation-policies-084330.

Helmer-Hirschberg, O. (1967). *Analysis of the future: The Delphi method*. Santa Monica, CA: The Rand Corporation.

Henry, G. T., Purtell, K. M., Bastian, K. C., Fortner, C. K., Thompson, C. L., Campbell, S. L., & Patterson, K. M. (2014). *The effects of teacher entry portals on student achievement. Journal of Teacher Education, 65*(1), 7-23.

Hernandez-Gantes, V. M. (2016). College and career readiness for all: The role of career and technical education in the US. In *The SAGE handbook of curriculum, pedagogy and assessment: Two volume set* (pp. 674-688). New York, NY: SAGE Publications Ltd.

Hess, F. M. (2019). *Should teachers and parents take the CTE boom seriously?* Retrieved from https://blogs.edweek.org/edweek/rick_hess_straight_up/2019/04/should_teachers_and_parents_take_the_cte_boom_seriously.html

Hess, F. M. (2018). *The facts behind the teacher strikes*. Retrieved from https://www.forbes.com/sites/frederickhess/2018/04/30/the-facts-behind-the-teacher-strikes/#4c3b5be07639.

Hess, F. M. & Gallo, S. (2019). *What would-be governors gad to say about education*. Retrieved from https://givingcompass.org/article/what-would-be-governors-had-to-say-about-education/

Hess, F. M. & Martin, R. J. (2019). *Is career and technical education just enjoying its 15 minutes of fame?* Retrieved from https://www.educationnext.org/is-career-technical-education-enjoying-15-minutes-of-fame/.

Heyward, G. (2019). *Schools lead the way but the system must change: Rethinking career and technical education*. Seattle, WA: Center on Reinventing Public Education.

Hildebrand, D. (2018). John Dewey. in Zalta, Edward N. (ed.), *The Stanford Encyclopedia of Philosophy* (Winter 2018 ed.). Metaphysics Research Lab, Stanford University

Hill, R. (1998). What sample size is "enough" in internet survey research? *Interpersonal Computing and Technology: An Electronic Journal for the 21st Century, 6* (3-4).

Hillard, A. T. (2015). Global blended learning practices for teaching and learning, leadership and professional development. *Journal of International Education Research, 11* (3), 179-188.

Hills, M. (2019). *Federal appropriations for career and technical education (CTE): Fiscal years 2004-2019*. Retrieved from https://cte.careertech.org/sites/default/files/Federal_Appropriations_Career_Technical_Education_April2019.pdf on April 10, 2020.

Hindley, M. (2017). World War I changed America and transformed its role in international relations: So why don't we pay more attention to it? *Humanities, 38*(3). Retrieved from https://www.neh.gov/humanities/2017/summer/feature/world-war-i-changed-america-and-transformed-its-role-in-international-relations.

Hoffman, N. (2018). *10 equity questions to ask about career and technical education*. Retrieved from https://www.jff.org/points-of-view/10-equity-questions-ask-about-career-and-technical-education/.

Huang, H. (2002). Toward constructivism for adult learners in online learning environments. *British Journal of Education Technology, 33*(1), 27-37.

Hunt, J. W. (2008). A nation at risk and No Child Left Behind: Déjà vu for administrators? *Phi Delta Kappan, 89*(8), 580-585.

Hunter, M. (2018). The vocational education option: A student's search for meaning in today's economy. *The Foreign Service Journal, June 2018*, 76-82.

Hyslop-Margison, E. J. (2004). Technology, human agency and Dewey's constructivism: Opening democratic spaces in virtual classrooms. *Australasian Journal of Educational Technology, 20*(2), 137-148.

Hyslop-Margison, E. J. (1999). *An assessment of the historical arguments in vocational education reform*. Retrieved from https://files.eric.ed.gov/fulltext/ED435825.pdf on April 10, 2020.

Imperatore, C. & Hyslop, A. (2017). *Defining high-quality CTE: Quality CTE program of study framework, version 4.0 (beta)*. Retrieved from https://www.acteonline.org/wp-content/uploads/2018/02/ACTE-HighQualityCTEFramework-Draft4.0-Beta.pdf.

Ingersoll, R. & May, H. (2011). *Recruitment, retention and the minority teacher shortage.* Retrieved from https://repository.upenn.edu/cgi/viewcontent.cgi?article=1232& context=gse_pubs.

Ingersoll, R. & May, H. (2016). *Minority teacher recruitment, employment, and retention: 1987 to 2013*. Washington, DC: Learning Policy Institute.

Ingersoll, R. & Smith, T. M. (2004). Do teacher induction and mentoring matter? Retrieved from https://repository.upenn.edu/gse_pubs/134.

Jacques, C. & Potemski, A. (2014). *21st century educators: Developing and supporting great career and technical education teachers*. Center on Great Teachers & Leaders at American Institutes for Research: Washington, DC.

Jang, S. T. & Horn, A. S. (2017). The relative effectiveness of traditional and alternative teacher preparation programs: A review of recent research. Midwestern Higher Education Compact: Minneapolis, MN.

Jeffrey, J. & Zirkle, C. (2020). Perceptions of levels of preparedness of alternatively licensed career and technical education teachers in the state of Ohio. *Online Journal of Workforce Education and Development, 10*(1), 1-20.

Joerger, R. M. (2002). A comparison of the inservice education needs of two cohorts of beginning Minnesota agriculture education teachers. *Journal of Agriculture Education, 43*(3), 11-24.

Joerger, R. M. & Bremer, C. D. (2001). *Teacher induction programs: A strategy for improving the professional experience of beginning career and technical education teachers*. Columbus, OH: National Dissemination Center for Career and Technical Education.

Jones, J. & Smith, L. (2020, January). *Virginia ACTE first-time attendee seminar*. Slideshow presented at the 21st Annual Professional Development Leadership Seminar for Virginia Educators, Richmond, VA.

Kamenetz, A. (2018). *What 'A Nation at Risk' got wrong, and right, about U.S. schools*. Retrieved from https://www.npr.org/sections/ed/2018/04/29/604986823/what-a-nation-at-risk-got-wrong-and-right-about-u-s-schools.

Kaufmann, J. (2007). *Induction programs for new and beginning teachers*. Denver, CO: Education Commission of the States. Retrieved from https://www.ecs.org/clearinghouse/76/65/7665.pdf.

Kennedy, M. (2016). How does professional development improve teaching? *Review of Educational Research, 86*(4), 945-980.

Kerna, K. D. (2012). Help wanted: Professional development and training for career and technical education faculty. *International Journal of Vocational and Technical Education, 4*(3), 38-45.

Kini, T., & Podolsky, A. (2016). *Does Teaching Experience Increase Teacher Effectiveness? A Review of the Research*. Palo Alto, CA: Learning Policy Institute.

Kitchel, A., Arnett, S., Cannon, J., & Duncan, D. (2010). Program management needs of family and consumer science teachers in Idaho. *Journal of Family & Consumer Sciences Education, 28*(2), 48-59.

Kitchel, A., Cannon, J., & Duncan, D. (2009). Program management educational needs of Idaho business and marketing teachers. *Career and Technical Education Research, 34*(3), 175-189.

Kitchel, A., Cannon, J., & Duncan, D. (2010). Professional development priorities of Idaho business teachers: An examination of a set of competencies associated with teaching and learning. *The Delta Pi Epsilon Journal, 52*(3), 138-152.

Kivinen, O. & Ristela, P. (2003). From constructivism to a pragmatist conception of learning. *Oxford Review of Education, 29*(3), 363-375.

Knowles, M. S. (1970). *The modern practice of adult education*. New York, NY: Association Press.

Knudson, P. (2019). *Closing the gap: Teacher shortages in career, technical fields contribute to labor deficit*. Retrieved from https://www.grandforksherald.com/news/education/4583844-closing-gap-teacher-shortages-career-technical-fields-contribute-labor on April 24, 2019.

Koellner, K & Greenblatt, D. (2018). *Inservice Teacher Education*. Oxford Bibliographies Online. Retrieved from https://www.oxfordbibliographies.com/view/document/obo-9780199756810/obo-9780199756810-0196.xml.

Kuhn, D. & Pease, M. (2006). Do children and adults learn differently? *Journal of Cognition and Development, 7*(3), 279–293.

Lambeth, J. M., Joerger, R. M., & Elliot, J. (2018). Merits of creating a revised CTE national research agenda for 2020. *Journal of Research in Technical Careers, 2*(1).

Lambeth, J. M., Joerger, R. M. & Elliot, J. (2009). Implications for focusing research in career and technical education and workforce development. *Career and Technical Education Research, 34*(3), 137-53.

Lamon, M. (2019). Learning theory: Constructivist approach. Retrieved from https://education.stateuniversity.com/pages/2174/Learning-Theory-CONSTRUCTIVIST-APPROACH.html on December 12, 2019.

Lasley II, T. J., Siedentop, D., & Yinger, R. (2006). A systematic approach to enhancing teacher quality: The Ohio model. *Journal of Teacher Education, 57*(13), 13-21.

Lavrakas, P. J. (2008). *Encyclopedia of Survey Research Methods*. Thousand Oaks, CA: Sage Publications, Inc.

Layfield, K. D. & Dobbins, T. R. (2002). Inservice needs and perceived competencies of South Carolina agriculture educators. *Journal of Agriculture Education, 43*(4), 46-55.

Lear, J. G. (1989). The forgotten half. *Developmental and Behavioral Pediatrics, 10*(6), 328-329.

Lee, C. (2015). Family reunification and the limits of immigration reform: Impact and legacy of the 1965 Immigration Act. *Sociological Forum, 30*(S1), 528-548.

Levin, C. & Pinto, M. (2001). *Only a teacher: Schoolhouse pioneers: Horace Mann*. Retrieved from https://www.pbs.org/onlyateacher/horace.html on March 28, 2020.

Levine, B. (2016). Works about Dewey, 1886-2016. Carbondale, IL: Center for Dewey Studies Southern Illinois University Carbondale. Retrieved from https://deweycenter.siu.edu/_common/documents/works-about-dewey-2016.pdf on March 31, 2020.

Li, C. (2017). A difference analysis on e-commerce curriculum offered in Taiwan, U.S.A. and Japan using the BNAM model. Proceedings from the 5th International Conference on Modern Education, Sanya, China. Retrieved from http://dpi-proceedings.com/index.php/dtssehs/article/view/19345/18836.

Library of Congress. (2017). *Primary documents in American history*. Retrieved from https://www.loc.gov/rr/program/bib/ourdocs/morrill.html.

Liston, D., Borko, H., & Whitcomb, J. (2008). The teacher educator's role in enhancing teacher quality. *Journal of Teacher Education, 59*(2), 111-116.

Little, J. W. & Bartlett, L. (2010). The teacher workforce and problems of educational equity. *Review of Research in Education, 34*(1), 285-328.

Liu, C. C. & Chen, I. J. (2010). Evolution of constructivism. *Contemporary Issues in Education Research, 3*(4), 63-66.

Lockwood, S. A., Miller, A. J., & Cromie, M. M. (2014). Preparing future biology faculty: An advanced professional development program for graduate students. *The American Biology Teacher, 76*(1), 17-21.

Loeb, S., Kalogrides, D., & Beteille, T. (2011). *Effective schools: Teacher hiring, assignment, development, and retention*. Cambridge, MA: National Bureau of Economic Research.

Loeb, S. & Myung, J. (2010). Economic approaches to teacher recruitment and retention.

Lopes, J. B. & Cunha, A. E. (2017). Self-directed professional development to improve effective teaching: Key points for a model. *Teaching and Teacher Education*. Retrieved from https://www.researchgate.net/profile/J_Lopes2/publication/320615200_Self-directed_professional_development_to_improve_effective_teaching_Key_points_for_a_model/links/59f07be2a6fdcc1dc7b5239b/Self-directed-professional-development-to-improve-effective-teaching-Key-points-for-a-model.pdf.

Lotto, L. S. (1985). The unfinished agenda: Report from the national commission on secondary vocational education. *The Phi Delta Kappan, 66*(8), 568-573.

Lynch, R. L. (2000). High school career and technical education for the first decade of the 21st century. *Journal of Vocational Education Research, 25*(2), 1-34.

Man, N. B., Saleh, J. M., Hassan, S. Zidane, F. H., Nawi, N. M., & Umar, S. (2016). Training needs of agriculture extension agents using Borich needs assessment model. *Asian Journal of Agriculture Extension, Economics & Sociology, 13*(1), 1-19.

Manley, R. A. (2011). The decentralization of Perkins: History, impact, and recommendations for future CTE legislation. *Career and Technical Education Research, 36*(2), 119-152.

Manley, R. A. & Zinser, R. (2012). A Delphi study to update CTE teacher competencies. *Education and Training, 54*(6), 488-503.

Martel, M. A. (2015). *Perceptions of teacher evaluation systems at CTE centers in Michigan* (Doctoral dissertation). Kalamazoo, Michigan: Western Michigan University.

Martinez Jr., R. L. (2007). An evolving set of values-based principles for career and technical education. *Journal of Career and Technical Education, 23*(1). DOI: http://doi.org/10.21061/jcte.v23i1.444.

Martino, L. & Lasonen, J. (2018). Comparison of VET and CTE teacher pathways: Finland and the U.S. In C. Nägele & B. E. Stalder (Eds.), *Trends in vocational education and training research. Proceedings of the European Conference on Educational Research (ECER), Vocational Education and Training Network (VETNET)* (pp. 246-252). https://doi.org/10.5281/zenodo.1319684.

Maslow, A. H. (1987). *Motivation and personality (3rd ed.).* New York: Harper and Row.

McLeod, S. (2019). Constructivism as a theory for teaching and learning. Retrieved from https://www.simplypsychology.org/constructivism.html.

Meeder, H. & Suddreth, T. (2012). *Common core state standards & career and technical education: Bridging the divide between college and career readiness*. Retrieved from https://files.eric.ed.gov/fulltext/ED532391.pdf.

Melnick, S. A. & Meister, D. G. (2008). A comparison of beginning and experienced teachers' concerns. *Education Research Quarterly, 31*(3), 40-56.

Merriam, S. B., Caffarella, R. S., & Baumgartner, L. M. (2007). *Learning in adulthood: A comprehensive guide*. San Francisco, CA: Jossey-Bass.

Mokher, C. & Pearson, J. L. (2017). The complexities of recruiting participants for a statewide education survey. *Survey Practice, 10*(4).

Moore, C., Green, C., & Clark, K. (2015). *What career and technical education teachers really want for professional learning*. Washington, DC: American Institutes for Research.

Morales-Burnett, J. (2017). *Three common criticisms of career and technical education*. Retrieved from https://unlockhighered.com/three-common-criticisms-of-career-and-technical-education/.

Morgan, M. M. & Kritsonis, W. A. (2008). A national focus: The recruitment, retention, and development of quality teachers in hard-to-staff schools. *National Journal For Publishing And Mentoring Doctoral Student Research, 5*(1), 2008.

Morrison, G. M., Furlong, M. J., & Morrison, R. L. (1994). School violence to school safety: Reframing the issue for school psychologists. *School Psychology Review, 23*(2), 236-256.

Morton, T. (2018). Higher education – Is the value worth the cost? *Journal of Professional Nursing, 34*, 327-328.

Motulsky, H. (1995). *Intuitive biostatistics: A nonmathematical guide to statistical thinking*. Oxford University Press, Inc. Retrieved from https://www.graphpad.com/support/faqid/1790/#:~:text=When%20comparing%20two%20groups%2C%20you,or%20matched%20with%20one%20another.

Movit, M., Sugar, R., Moore, C., Fedele-McLeod, M., Green, C., Jones, J., Miller, A., & Hector-Mason, A. (2014). *Meeting the professional development needs of career and technical education teachers*. Washington, DC: American Institutes for Research.

Mukuni, J. & Price, B. (2016). Identifying connections between career and technical education (CTE) and academic programs through standards of learning. *International Journal of Vocational and Technical Education, 8*(4), 25-34.

Mumaw, K. (2017). *Smith-Hughes Act celebrates centennial*. Retrieved from https://www.farmanddairy.com/news/smith-hughes-act-celebrates-centennial/451159.html on April 10, 2020.

Murairwa, S. (2015). Voluntary sampling design. *International Journal of Advanced Research in Management and Social Sciences, 4*(2), 185-200.

Murray, C. A. (2009). *Real education: Four simple truths for bringing America's schools back to reality*. New York, NY: Three Rivers Press.

National Academies of Sciences, Engineering, and Medicine. (2017). *Building America's skilled technical workforce*. Washington, DC: The National Academies Press.

National Archives. (n.d.). Servicemen's Readjustment Act (1944). Retrieved from https://www.ourdocuments.gov/doc.php?flash=true&doc=76 on March 16, 2020.

National Association of Special Education Teachers. (2019). *Perkins Vocational Education Act*. Retrieved from https://www.naset.org/index.php?id=perkinsvocational2.

National Board for Professional Teaching Standards. (2014). *Career and Technical Education Standards*, 2nd Edition. Retrieved from http://www.nbpts.org/wp-content/uploads/EAYA-CTE.pdf.

National Center for Education Statistics. (2020). *Characteristics of Public School Teachers*. Retrieved from https://nces.ed.gov/programs/coe/indicator_clr.asp on November 15, 2020.

National Center for Education Statistics. (2019). *Undergraduate enrollment*. Retrieved from https://nces.ed.gov/programs/coe/indicator_cha.asp on March 16, 2020.

National Center for Education Statistics. (2018). *Characteristics of Public School Teachers Who Completed Alternative Route to Certification Programs*. Retrieved from https://nces.ed.gov/programs/coe/indicator_tlc.asp on March 29, 2020.

National Center for Home Education. (2002). *The history of Goals 2000*. Retrieved from https://hslda.org/content/docs/nche/000010/200209010.asp.

National Commission on Excellence in Education. (1983). *A nation at risk: The imperative for educational reform*. Washington, DC: U.S. Department of Education.

National Commission on Secondary Vocational Education. (1984). *The unfinished agenda: The role of vocational education in the high school*. Columbus OH: National Center for Research in Vocational Education, the Ohio State University.

National Conference of State Legislatures. (2015). *A brief history lesson: The federal government's role in apprenticeships*. Retrieved from http://www.ncsl.org/documents/statefed/Apprenticeships_Blog_Federal_Final.pdf on October 18, 2017.

National Council on Teacher Quality. (2019). *State of the states 2019: Teacher and principal evaluation policy*. Retrieved from https://www.nctq.org/pages/State-of-the-States-2019:-Teacher-and-Principal-Evaluation-Policy.

Nebeker, M. L. (2002). The teacher and society: John Dewey and the experience of teachers. *Education and Culture, 18*(2), 14-20.

Newman, M. E. & Johnson, D. M. (1993). Inservice education needs of teachers of pilot agriscience courses in Mississippi. In R. G. Waters (Ed.), *Agriculture Education's Opportunities in the 21st Century* (pp. 185-193). The University of Tennessee: Knoxville, TN.

Notebaert, A., Barnard, M., Meyer, E., Dehon, E., Compretta, C., Stray, D., Taylor, J., Sullivan, D., & Rockhold, R. (2018). Science teaching excites medical interest: A teacher professional development program in Mississippi. Journal of STEM Outreach, 2018(1), 1-8.

O'Connor, P. J. (2012). The professional development needs of academic teachers adding career-technical education licenses. *Journal of Career and Technical Education, 27*(1), 34-47.

Olusegun, S. (2015). Constructivism learning theory: A paradigm for teaching and learning. *IOSR Journal of Research & Method in Education, 5*(6), 66-70.

Omar, M. K., Cole, K. M., & Self, M. J. (2017). Teaching job satisfaction of career-switchers in career and technical education school system. In MNNF Publisher (Eds.), *International Research Symposium Series* (IRSS) (pp. 11-21). Langkawi, Kedah, Malaysia: MNNF Publisher.

Opfer, V. D. & Pedder, D. (2011). Conceptualizing teacher professional learning. *Review of Educational Research, 81*(3), 376-407.

Opper, I. M., (2019). *Teachers matter: Understanding teachers' impact on student achievement*. Santa Monica, CA: Rand Corporation.

Orr, S. (2016). Getting career ready. *Indianapolis Business Journal*, August 15-21, 2016, 13-17.

Ozfidan, B. & de Miranda, M. A. (2017). K12 teacher credentialing containing engineering content in the USA. *EURASIA Journal of Mathematics, Science and Technology Education, 14*(1), 3-13.

Paige, R. & Gibbons, J. (2004). *A guide to education and No Child Left Behind*. Washington, DC: United States Department of Education.

Pannell, M. C. (2016). *What really works in teacher preparation programs: Teachers' self-efficacy and perceived successful methods after participation in Mississippi's career and technical education alternate route program* (Doctoral dissertation). Available from ProQuest Dissertations and Theses A&I database. (UMI No. 10141634)

Park, M. S. & Huh, M. K. (2019). A needs analysis of social responsibility, morality, self-reflection and control using Borich priority and locus for focus model. *European Journal of Research and Reflection in Educational Sciences, 7*(4), 57-64.

Paul, C. A. (2018). Elementary and secondary education act of 1965. Retrieved from https://socialwelfare.library.vcu.edu/programs/education/elementary-and-secondary-education-act-of-1965/ on March 28, 2020.

Peake, J. B., Duncan, D. W., & Ricketts, J. C. (2007). Identifying technical content training needs of Georgia agriculture teachers. *Journal of Career and Technical Education, 23*(1), 44-54.

Perkins, D., Hall, K., Sorensen, T. J., Dallin, J., & Francis, D. (2017). *Identifying professional development needs of secondary education professionals*. Retrieved from https://digitalcommons.usu.edu/cgi/viewcontent.cgi?filename=0&article=1001&context=aste_stures&type=additional.

Perry, J. C. & Wallace, E. W. (2012). What schools are doing around career development: Implications for policy and practice. *New Directions for Youth Development, 134*, 33-44.

Pettit, B. & Sykes, B. L. (2015). Civil rights legislation and legalized exclusion: Mass incarceration and the masking of inequality. *Sociological Forum, 30*(S1), 589-611.

Pirtle, S. S. & Tobia, E. (2014). Implementing effective professional learning communities. *SEDL Insights, 2*(3), 1-8.

Podgursky, M. & Springer, M. (2011). Teacher compensation systems in the United States K-12 public school system. *National Tax Journal, 64*(1), 165-192.

Popkewitz, T. S. (1998). Dewey, Vygotsky, and the social administration of the individual: Constructivist pedagogy as systems of ideas in historical spaces. *American Educational Research Journal, 35*(4), 535-570.

Portway, P. S. & Lane, C. (1997). Goals 2000: Educate America Act. In *Guide to Teleconferencing and Distance Learning, 3rd Edition*. Retrieved from https://www.tecweb.org/eddevel/telecon/de99.html.

Postholm, M. B. (2008). Cultural historical activity theory and Dewey's idea-based social constructivism: Consequences for educational research. *Critical Social Studies, 1*, 37-48.

Price, P.C., Jhangiani, R. S., & Chiang, I. A. (2015). *Research Methods in Psychology*. Retrieved from https://opentextbc.ca/researchmethods/front-matter/dedication/.

Professional Studies Requirements for Prek-12, Special Education, Secondary Grades 6-12, and Adult Education Endorsements, Virginia Statute §§ 22.1-298.1 and 22.1-299 (2018).

Putnam, H., Ross, E., & Walsh, K. (2018). *Making a difference: Six places where teacher evaluation systems are getting results*. Washington, DC: National Council on Teacher Quality.

Reese, S. (2010). Finding new teachers along different pathways. *Techniques, January 2010*, 16-21.

Reich, K. (2007). Interactive constructivism in education. *Education and Culture, 23*(1), 7-26.

Rensselaer Polytechnic Institute. (2010). *RPI History*. Troy, NY: Rensselaer Polytechnic Institute. Retrieved from https://www.rpi.edu/about/history.html.

Renzulli, K. A. (2019). *The JOBS act would offer some workers more than $3000 to learn new skills – here's how it works*. Retrieved from https://www.cnbc.com/2019/03/11/jobs-act-would-give-workers-more-than-3000-to-learn-new-skills.html on May 14, 2019.

Robbins, P. (1991). *How to plan and implement a peer coaching program*. Alexandria, VA: Association for Supervision and Curriculum Development.

Roberts, S. M. & Pruitt, E. Z. (2009). *Schools as Professional Learning Communities: Collaborative Activities and Strategies for Professional Development, 2nd Ed*. Thousand Oaks, CA: Corwin Press.

Rocca, S. J. & Washburn, S. G. (2013). Comparison of teacher efficacy among traditionally and alternatively certified agriculture teachers. *Journal of Agriculture Education, 47*(3), 58-69.

Rockoff, J. E., Jacob, B. A., Kane, T. J., & Staiger, D. O. (2008). *Can you recognize an effective teacher when you recruit one?* Cambridge, MA: National Bureau of Economic Research.

Rojewski, J. W. (2002). *Preparing the workforce of tomorrow: A conceptual framework for career and technical education*. Columbus, OH: National Dissemination Center for Career and Technical Education.

Ronfeldt, M., Reininger, M., & Kwok, A. (2013). Recruitment or preparation? Investigating the effects of teacher characteristics and student teaching. *Journal of Teacher Education, 64*(4), 319-337.

Rose, M. A., Shumway, S., Carter, V., & Brown, J. (2015). Identifying characteristics of technology and engineering teachers striving for excellence using a modified Delphi. *Journal of Technology Education, 26*(2), 2-21.

Rosenbaum, J., Ahearn, C., Becker, K., & Rosenbaum, J. (2015). *The new forgotten half and research directions to support them*. Washington, DC: William T. Grant Foundation.

Ross, E. & Walsh, K. (2019). *State of the states 2019: Teacher and principal evaluation policy*. Washington, DC: National Council on Teacher Quality.

Ruhland, S. K. & Bremer, C. D. (2002). *Alternative teacher certification procedures and professional development opportunities for career and technical education teachers*. St. Paul, MN: National Research Center for Career and Technical Education.

Ruhland, S. K. & Bremer, C. D. (2002). Professional development needs of novice career and technical education teachers. *Journal of Career and Technical Education, 19*(1), 18-31.

Ruhland, S. K. & Bremer, C. D. (2003). Perceptions of traditionally and alternatively certified career and technical education teachers. *Journal of Vocational Education Research, 28*(3), 285-302.

Rucker, K. (2018). *The six flaws of "traditional" professional development*. Retrieved from https://www.gettingsmart.com/2018/02/the-six-flaws-of-traditional-professional-development/ on October 23, 2020.

Rutherford-Hemming, T. (2012). Simulation methodology in nursing education and adult learning theory. *Adult Learning, 23*(3), 129-137.

Saleh, A. & Bista, K. (2017). Examining factors impacting online survey response rates in educational research: Perceptions of graduate students. *Journal of MultiDisciplinary Evaluation, 13*(29), 63-74.

Saleh, J. M. (2018). Effective job satisfaction on training needs of agriculture workers in extensive work zone at Iraqi provinces: A case study. *Asian Research Journal of Arts & Social Sciences, 6*(2), 1-12.

Saleh, J. M. & Man, N. B. (2017). Training requirements of agriculture extension officers using Borich needs assessment model. *Journal of Agriculture & Food Information, 18*(2), 110-122.

Saleh, J. M., Man, N., Sahih, M. H. Hassan, S., Nawi, N. M., & Mohammed, S. J. (2016). Training needs of agriculture extension officers in Iraq. *International Journal of Scientific and Research Publications, 6*(2), 146-152.

Saleh, J. M., Man, N., Muktar, B. G., Zidane, F. H. A., & Mohammed, S. J. (2017). *Asian Research Journal of Agriculture, 3*(3), 1-16.

Sass, E. (2020). American Educational History: A Hypertext Timeline. Retrieved from http://www.eds-resources.com/educationhistorytimeline.html on March 28, 2020.

Saucier, P. R. & Langley, G. C. (2017). An evaluation of the knowledge, performance, and consequence competence in a science, technology, engineering, and mathematics (STEM) based professional development for school-based agriculture science teachers: An assessment of an industry supported computer numerical control (CNC) plasma arc cutting workshop. *Journal of Agriculture Systems, Technology, and Management, 28*, 25-43.

Savery, J. R. & Duffy, T. M. (1996). Problem based learning: An instructional model and its constructivist framework. In B. G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design* (pp. 135-150). Englewood Cliffs, NJ: Educational Technology Publications.

Sawchuk, S. (2016). ESSA loosens reins on teacher evaluations, qualifications. Retrieved from http://www.coramcivic.org/resources/ESSA+Loosens+Reins+on+Teacher+Evaluations$2C+Qualifications_010616.pdf.

Scheer, A., Noweski, C., & Meinel, C. (2011). Transforming constructivist learning into action: Design thinking in education. *Design and Technology Education: An International Journal, 17*(3), 8-19.

Shaffer, L. & Thomas-Brown, K. (2015). Enhancing teacher competency through co-teaching and embedded professional development. *Journal of Education and Training Studies, 3*(3), 117-125.

Shipe, O. (2018). Keeping Alaskans in Alaska jobs. *Alaska Business*, April 2018, 92-95.

Smalley, S., Hainline, M. S., & Sands, K. (2019). School-based agricultural education teachers' perceived professional development needs associated with teaching, classroom management, and technical agriculture. *Journal of Agriculture Education, 60*(2), 85-98.

Snider, C. S. (2019). *Perceived competence of agriculture education student teachers to teach across the national agriculture, food, and natural resources career pathways: A needs assessment at Oklahoma state university* (Master's thesis). Available from ProQuest Dissertations and Theses A&I database. (UMI No. 13863948)

Snyder, T. D. (1993). *120 years of American education: A statistical portrait.* Washington, DC: National Center for Education Statistics.

Snyder, T. D., Hoffman, C. M. (2003). *Digest of Education Statistics 2002*. Washington, DC: National Center for Education Statistics.

Sorensen, T. J., Tarpley, R. S., & Warnick, B. K. (2010). Inservice needs of Utah agriculture teachers. *Journal of Agriculture Education, 51*(3), 1-11.

Stahl, J. (2015). *10 important Supreme Court cases about education*. Retrieved from https://constitutioncenter.org/blog/10-important-supreme-court-cases-about-education/ on March 28, 2020.

State of Washington Office of Superintendent of Public Instruction. (2011, January 27). *No Child Left Behind act of 2001*. Retrieved from http://www.k12.wa.us/esea/NCLB.aspx on October 17, 2018.

Stephens, G. A. (2015). Uncertified and teaching: Industry professionals in career and technical education classrooms. *International Journal for Research in Vocational Education and Training, 2*(2), 119-135.

Stevens, A. H. (2018). *What works in career and technical education? A review of evidence and suggested policy directions*. Washington, DC: Aspen Institute.

Stone, J. R. (2017). Introduction to pathways to a productive adulthood: The role of CTE in the American high school. *Peabody Journal of Education, 92*(2), 155-165. DOI: 10.1080/0161956X.2017.1302207.

Stronge, J. H., & Hindman, J. L. (2003). Hiring the best teachers. *Educational Leadership, 60*(8), 48-52.

Sun, M. (2018). Black Teachers' Retention and Transfer Patterns in North Carolina: How Do Patterns Vary by Teacher Effectiveness, Subject, and School Conditions? *AERA Open, 4*(3), 1-23.

Sunderman, G. L. & Orfield, G. (2006). *Domesticating a revolution: No Child Left Behind reforms and state administrative response*. Cambridge, MA: The Civil Rights Project at Harvard University.

Sutcher, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). *A coming crisis in teaching? Teacher supply, demand, and shortages in the U.S.* Retrieved from https://learningpolicyinstitute.org/product/coming-crisis-teaching-brief.

Tabernik, A. M. (2008). *A two-level hierarchical linear model analysis of the relationship between sustained, targeted professional development for teachers and student achievement in mathematics* (Doctoral dissertation). Cleveland, OH: Cleveland State University.

Talebi, M. L. (2015). John Dewey – Philosopher and education reformer. *European Journal of Education Studies, 1*(1).

Tenuto, P., Cannon, J., & Kitchel, A. (2013). Joining forces to advance teaching and learning of 21st century skills: Idaho school leaders' perspectives. *Education in a Democracy: A Journal of the National Network for Educational Renewal, 5*(October), 14-158.

The William T. Grant Foundation. (1989). *The forgotten half: Non-college youth in America*. Washington, DC: Commission on Youth and America's Future.

Thompson Island Outward Bound Education Center. (2020). *Our History*. Retrieved from https://thompsonisland.org/about/our-history.

Threeton, M. (2007). The Carl D. Perkins Career and Technical Education (CTE) Act of 2006 and the roles and responsibilities of CTE teachers and faculty members. *Journal of Industrial Teacher Education, 44*(1), 66-82.

Tobe, P. F. (2009). Value-added models of teacher effects. In Saha, L. J. & Dworkin, A. G. (Eds.) *International Handbook of Research on Teachers and Teaching: Part One* (Volume 21). New York, NY: Springer.

Towers, J. M. (1992). Twenty-five years after the Coleman report: What should we have learned? *The Clearing House, 65*(3), 138-140.

Ujifusa, A. (2019). *Governor's plan to hike starting teacher pay would lift Florida to near top of rankings*. Retrieved from http://blogs.edweek.org/edweek/campaign-k-12/2019/10/teacher-pay-starting-salary-increase-florida-rankings.html.

United States Congress. (2015). *Every Student Succeeds Act of 2015*, Pub. L. No. 114-95 § 114 Stat. 1177 (2015-2016).

United States Department of Education. (2018). *College- and career-ready standards*. Retrieved from https://www.ed.gov/k-12reforms/standards on August 29, 2018.

United States Department of Education. (2018). *Every Student Succeeds Act (ESSA)*. Retrieved from https://www.ed.gov/essa on October 19, 2018.

United States Department of Education. (2019). *Title II Higher Education Act – Data Files*. Retrieved from https://title2.ed.gov/Public/DataTools/2018/Virginia.xls.

United States Department of Education, National Center for Education Statistics. (2016). *Percentage of public school teachers based on years of teaching experience, average total years of teaching experience, percentage of teachers based on years teaching at current school, and average years teaching at current school, by selected school characteristics: 2015–16.* Retrieved from https://nces.ed.gov/surveys/ntps/tables/ntps1516_18051504_t1n.asp on November 4, 2020.

United States Department of Education Office of Career, Technical, and Adult Education. (2018). *Perkins V*. Retrieved from https://cte.ed.gov/legislation/perkins-v on October 19, 2018.

United States Department of Education Office of Civil Rights. (1999). *Impact of the Civil Rights Laws*. Retrieved from https://www2.ed.gov/about/offices/list/ocr/docs/impact.html on March 28, 2020.

Vanderstraeten, R. (2002). Dewey's transactional constructivism. *Journal of Philosophy Education, 36*(2), 233-246.

VanSledright, B. Maggioni, L. & Reddy, K. (2011). *Preparing teachers to teach historical thinking? The interplay between professional development programs and school-systems'*

cultures. Paper presented at the 2011 annual meeting of the American Educational Research Association, New Orleans, LA.

Virginia Department of Education. (2014). *Career and technical education work-based learning guide*. Richmond, VA: Virginia Department of Education.

Virginia Department of Education. (2018). *Industry credentials for teacher seeking an initial Virginia license with endorsement(s) in an area of career and technical education.* Richmond, VA: Virginia Department of Education – Office of Career and Technical Education.

Virginia Department of Education. (2018). *Application for an initial Virginia license*. Richmond, VA: Virginia Department of Education.

Virginia Department of Education. (2018). *Career & technical education*. Retrieved from http://www.doe.virginia.gov/instruction/career_technical/index.shtml on April 16, 2018.

Virginia Department of Education. (2018). *Career switcher program*. Retrieved from http://www.doe.virginia.gov/teaching/educator_preparation/career_switcher/index.shtml on October 20, 2018.

Virginia Department of Education. (2018). *Standard diploma: Minimum course & credit requirements*. Retrieved from http://www.doe.virginia.gov/instruction/graduation/standard.shtml on October 6, 2018.

Virginia Department of Education. (2019). *Career and technical student organizations in Virginia*. Retrieved from http://www.doe.virginia.gov/instruction/career_technical/ctso/index.shtml on November 6, 2019.

Virginia Department of Education. (2019). *Commonwealth of Virginia critical shortage teaching endorsement areas for 2018-2019 school year*. Retrieved from http://www.doe.virginia.gov/teaching/workforce_data/shortage_areas/2018-2019.pdf.

Virginia Department of Education. (2020). *Career and Technical Education*. Retrieved from https://www.doe.virginia.gov/instruction/career_technical/index.shtml on November 3, 2020.

Virginia Department of Education. (2020). *Fall Membership Build-A-Table*. Retrieved from https://p1pe.doe.virginia.gov/apex/f?p=180:1:5553674327122:SHOW_REPORT:::: on October 24, 2020.

Virginia Department of Education. (2020). *Virginia public schools listing – By region*. Retrieved from https://www.doe.virginia.gov/directories/schools/school_info_by_regions.shtml on November 4, 2020.

Virginia Department of Education Office of Career and Technical Education. (2012). *CTE local advisory committees*. Retrieved from http://www.cteresource.org/verso/files/cte-local-advisory-committees-brochure-130/CTE Local Advisory Committees Brochure 2012.pdf.

Walter, R. A. & Gray, K. C. (2002). Teacher preparation/licensure in career and technical education: A public policy analysis. *Journal of Vocational Education Research, 27*(1), 131-153.

Wasonga, C. O., Wanzare, Z. O. & Dawo, J. I. (2015). Mentoring beginning teachers: Bridging the gap between pre-service training and in-practice realities. *Journal of International Education and Leadership, 5*(2).

Waters, R. G. & Haskell, L. J. (1988). Identifying staff development needs of cooperative extension faculty using a modified Borich needs assessment model. *Journal of Agriculture Education, 30*(2), 26-32

Weber, E. T. (2010). *Rawls, Dewey, and constructivism: On the epistemology of justice*. New York, NY: Continuum International Publishing Group.

Weeks, K. J. (2019). *Twenty-first century skills: A needs assessment of school-based agricultural education teachers* (Master's thesis, Utah State University, Logan, UT). Retrieved from https://digitalcommons.usu.edu/etd/7521/.

West, J. (2019). *Data Collection*. Retrieved from https://www.researchconnections.org/childcare/datamethods/survey.jsp on April 10, 2020.

Wiessner, C. A., Hatcher, T., Chapman, D., & Storberg-Walker, J. (2008). Creating new learning at professional conferences: An innovative approach to conference learning, knowledge construction and programme evaluation. *Human Resource Development International, 11*(4), 367-383.

Wilkin, T., Nwoke, G. I. (2011). Career and technical education teacher shortage: A successful model for recruitment and retention. *Journal of STEM Education, 48*(1), 22-35.

Wilson, S. (2009). *Teacher Quality*. Retrieved from https://files.eric.ed.gov/fulltext/ED531145.pdf.

Wonacott, M. E. (2002). *Teacher induction programs for beginning CTE teachers. In brief: Fast facts for policy and practice*. Columbus, OH: National Dissemination Center for Career and Technical Education.

Wood, C. L., Goodnight, C. I., Bethune, K. S., Preston, A. I., & Cleaver, S. L. (2016). Role of professional development and multi-level coaching in promoting evidence-based practice in education. *Learning Disabilities: A Contemporary Journal, 14*(2), 159-170.

Xing, X., & Gordan, H. R. (2017). High quality career and technical education: Implications for Nevada. *Policy Issues in Nevada Education, 2*(1).

Xing, X., Shaw, S., & Gordon, H. R. D. (2017). Quality indicators guiding secondary career and technical education programs of study. *Journal of Research in Technical Careers, 1*(2), 47-60.

Yoon, S. A., Anderson, E., Koehler-Yom, J., Evans, C., Park, M., Sheldon, J., Schoenfeld, I., Wendel, D., Scheintaub, H., & Klopfer, E. (2016). Teaching about complex systems is no simple matter: building effective professional development for computer-supported complex systems instruction. *Instructional Science* (2016). Retrieved from https://dspace.mit.edu/bitstream/handle/1721.1/106838/11251_2016_Article_9388.pdf?sequence=1&isAllowed=y.

Yopp, A. M., McKim, B. R., Moore, L. L., Odom, S. F. & Hanagriff, R. (2017). A multidimensional needs assessment of social emotional learning skills areas. *Journal of Agriculture Education, 58*(1), 186-206.

Yost, D. S. (2006). Reflection and self-efficacy: Enhancing the retention of qualified teachers from a teacher education perspective. *Teacher Education Quarterly, Fall 2006*, 59-76.

Yu, T. & Richardson, J. C. (2015). An exploratory factor analysis and reliability analysis of the student online learning readiness (SOLR) instrument. *Online Learning, 19*(5), 120-141.

Yurtseven, N. & Altun, S. (2017). Understanding by design (UbD) in EFL teaching: Teachers' professional development and students' achievement. *Educational Sciences: Theory & Practice, 17*(2), 437-461.

Zehr, M. A. (1999). Debating the direction of vocational education. *Education Week, 18*(36), 27. Retrieved from https://www-edweek-org/ew/articles/1999/05/19/ 36voced.h18.html?print=1 on April 10, 2020.

Zhang, G. & Zeller, N. (2016). A longitudinal investigation of the relationship between teacher preparation and teacher retention. *Teacher Education Quarterly, 43*(2), 73-92.

Zinth, J. D. (2013). Career/technical education: Not your father's vocational education. *The Progress of Education Reform, 14*(1). Retrieved from https://files.eric.ed.gov/ fulltext/ED542108.pdf.

Zirkle, C. J., Fletcher Jr., E. C., Sander, K. L., & Briggs, J. (2011). Certification and Licensure Requirements for Career and Technical Educators. In V. Wang (Ed.), *Definitive Readings in the History, Philosophy, Theories and Practice of Career and Technical Education* (pp. 147-167). Hershey, PA: Information Science Reference.

Zirkle, C. J., Jeffery, J., & Shrewe, L. (2019). A longitudinal study of alternatively licensed career and technical teachers. *Career and Technical Education Research, 44*(1), 23-39.

Zulkifli, R. M., Hussain, M. A. M., & Nicholas, J. M. (2018). Teaching preparedness and the professional development needs of novice career and technical education (CTE) teachers in the United States. *International Journal of Pure and Applied Mathematics, 118*(24).

APPENDIX A

ACTE Quality Framework Elements and Criteria

Developing a set of criteria that can be used to assess the quality of a local CTE program is an important research priority for CTE educators and administrators (Lambeth, 2009). One approach proposed to developing a framework to summarize the features of a high-quality CTE program was developed by Imperatore & Hyslop (2017) with the Association for Career and Technical Education (ACTE). That framework is presented here.

1. Standards-aligned and Integrated Curriculum

    a. The program of study curriculum is developed with employer input to prepare students for both further education and in-demand and emerging careers.

    b. The curriculum is based on industry-validated technical standards and competencies.

    c. The curriculum is aligned with relevant content and standards for core subjects, such as reading, math and science, including federal, state and/or local standards, as appropriate.

    d. The curriculum incorporates employability skill standards that help students succeed in the workplace, such as problem solving, critical thinking, teamwork, communications and workplace etiquette.

    e. The curriculum allows for student application of integrated knowledge and skills in authentic scenarios.

    f. Program of study standards are publically available and accessible, as appropriate, to students, parents/guardians, partners and the community.

    g. The curriculum is reviewed regularly by all relevant stakeholders and revised as necessary to reflect the latest advances in the field, evidence-based program models and evaluations of student performance.

2. Sequencing and Articulation

    a. The CTE program of study includes a sequence of courses and/or competencies across secondary and postsecondary education that incorporates technical, academic and employability knowledge and skills.

    b. The program of study starts with broad foundational knowledge and skills and progresses in specificity to build students' depth of knowledge and skills.

c. Content and standards within the CTE program of study are non-duplicative and vertically aligned to prepare students to transition seamlessly to the next level of education.

d. The CTE program of study sequence leads to one or more recognized postsecondary credentials, including industry certifications, licenses, apprenticeship certificates, postsecondary certificates and degrees.

e. Students in the CTE program of study have opportunities to earn postsecondary credit while in high school. F

f. Secondary and postsecondary CTE educators, along with representatives of the employer community, collaborate regularly on course sequencing, vertical alignment and opportunities for postsecondary credit.

g. The program of study is coordinated with broader career pathways systems, as defined in the Workforce Innovation and Opportunity Act, such as through the development of stackable credentials, as appropriate and available.

3. Student Assessment

a. Formative and summative assessments are integrated throughout the program of study to validate student learning gains, including both classroom/school-based and standardized, third-party assessments, as appropriate.

b. Assessments are aligned to program standards and curriculum and appropriate to students' current level of knowledge and skill attainment.

c. Assessments are valid, reliable and developed or chosen in accordance with relevant quality standards.

d. The CTE program of study incorporates multiple forms of assessment, including performance-based assessment where students must demonstrate the application of their knowledge and skills.

e. Assessments within the CTE program of study provide objective information on student attainment of industry-validated technical knowledge and skills provided by program curriculum.

f. Assessments within the CTE program of study provide objective information on student attainment of academic knowledge and skills provided by program curriculum.

g. Assessments within the CTE program of study provide objective information on student attainment of employability knowledge and skills provided by program curriculum.

h. The CTE program of study prepares students for assessments that lead to recognized postsecondary credentials, as available and appropriate.

4. Prepared and Effective Program Staff

    a. CTE educators in the program of study meet minimum state, district and/or institution certification and licensing requirements.

    b. CTE educators maintain up-to-date knowledge and skills across all aspects of an industry and have appropriate industry-relevant credentials.

    c. CTE educators maintain relevant evidence-based pedagogical knowledge and skills.

    d. CTE educators engage in ongoing, rigorous professional development on a wide range of topics covering all elements of a high-quality CTE program of study, as described in ACTE's Defining High-quality CTE: Quality CTE Program of Study Framework, which might include pursuit of advanced educator certification.

    e. CTE educators demonstrate leadership and commitment to the profession.

    f. CTE educators have the time, resources and supports to implement all elements of a high-quality CTE program of study, as described in ACTE's Defining High-quality CTE: Quality CTE Program of Study Framework.

    g. CTE educators, academic educators, counselors, administrators and other relevant staff collaborate regularly and frequently to coordinate curriculum, instruction, assessment and extended learning activities and to analyze data for program improvement.

5. Engaging Instruction

    a. Program of study instruction is driven by relevant content area standards and learning objectives.

    b. Project-based learning and related instructional approaches, such as problem-based, inquiry-based and challenge-based learning, are fundamental to the CTE program of study.

    c. Contextualized instruction results in students applying technical, academic and employability knowledge and skills within authentic scenarios.

    d. Instruction emphasizes the connection between academic and technical knowledge and skills, including through cross-disciplinary collaboration.

    e. Instruction incorporates relevant equipment, technology and materials to support learning.

    f. Instruction is flexible, differentiated and personalized to meet the needs of a diverse student population.

    g. Management of the educational environment builds a culture of learning and respect.

6. Access and Equity

   a. The CTE program of study is promoted to all potential participants and, as appropriate, their parents/guardians, in a manner that is free from bias, inclusive and non-discriminatory.

   b. Students who have been traditionally underrepresented, including by gender, race and ethnicity, and special population status, are actively recruited.

   c. Career guidance is offered to all potential and current program of study participants in a manner that is free from bias, inclusive and non-discriminatory and that takes into account student interests, preferences and abilities.

   d. As appropriate, accommodations to facilities and equipment as well as curriculum, instruction, materials and assessments are provided to ensure all students have the opportunity to achieve success in the program of study.

   e. As appropriate, support services, such as tutoring and transportation assistance, are provided to ensure all students have the opportunity to achieve success in the program of study.

   f. Curriculum, instruction, materials and assessments are free from bias, inclusive and non-discriminatory.

   g. Appropriate actions are taken to eliminate barriers to extended learning experiences, such as work-based learning, CTSO participation and postsecondary credit attainment, for all students, including special populations.

7. Facilities and Equipment

   a. Facilities and equipment used in the program of study reflect current workplace, industry and/or occupational practices and requirements.

   b. Facilities and equipment support and align to curriculum standards and program objectives.

   c. Facilities and equipment meet appropriate federal, state and local standards for occupational safety and health, as applied in the related industry.

   d. Students demonstrate safe and appropriate use and maintenance of facilities and equipment within the CTE program of study.

   e. Processes are defined and resources provided to regularly inspect, update and replace facilities and equipment, as necessary.

   f. Program of study partners collaborate to maximize student access to relevant facilities and equipment.

g. Relevant materials, tools, supplies and personal protective equipment are available and used appropriately.

h. Facilities are free from bias, inclusive and non-discriminatory, and they meet all Title IX, Americans with Disabilities Act and other accessibility requirements.

8. Business and Community Partnerships

a. Representatives of the program of study actively conduct outreach activities to develop partnerships to ensure the program of study is informed by employer and community needs.

b. The program of study has a formalized, structured approach to coordinating partnerships, such as an advisory board or sector partnership.

c. Partners include a diverse range of employers; industry representatives; community, workforce and economic development agencies; and other education stakeholders.

d. The program of study has partners who:

- identify, validate and review curriculum for technical, academic and employability knowledge and skills that meet the needs of students and industry
- identify appropriate assessments and recognized postsecondary credentials
- evaluate equipment, facilities and materials to ensure they are consistent with industry standards
- provide input on current and future workforce demand and skill needs to inform updates to the program of study
- provide input on the further education and training necessary for career pathways
- identify, provide and evaluate work-based learning experiences for students
- participate in CTSO activities; for example, by serving as mentors and judges
- offer opportunities, such as externships, for educators to stay current with industry-relevant knowledge and skills
- provide support in tangible ways, such as by investing funds, providing in-kind support and/or helping raise external funds to meet program of study goals
- advocate for and promote the program of study
- help to evaluate the effectiveness of the program of study in preparing students for further education and careers

9. Career Development

   a. Comprehensive career development is coordinated and sequenced to promote and support the career decision-making and planning of all students, both prior to entering and during the program of study.

   b. Each CTE student in the program of study has a personalized, multi-year education and career plan that reflects exploration of the student's interests, preferences and abilities; and informs course selection, planning for further education and a career, and involvement in extended learning.

   c. Career development activities are aligned with relevant national, state and/or local standards.

   d. Students in the program of study and their parents/guardians, as appropriate, are provided accurate and timely information on:

      - extended learning experiences available through the program of study, such as work-based learning, CTSO participation and postsecondary credit attainment

      - further education and training options, including application procedures, enrollment, financing, and their projected educational, employment and earnings outcomes

      - regional occupational trends and outlook, high-demand and high-wage career opportunities, and the educational pathways that lead to current and projected career opportunities

   e. Students in the program of study have access to job search information and placement services as they near completion of the program of study.

   f. Guidance, counseling and advisement professionals have access to up-to-date information and training about extended learning experiences, education and training options, and regional occupational trends, in order to aid students in education and career planning and decision making.

10. Career Technical Student Organizations (CTSOs)

   a. A CTSO is an integral, intra-curricular part of the CTE program of study, available to every student at some point during the program of study.

   b. The CTSO is aligned with relevant national, state and/or local standards.

   c. CTSO activities develop and reinforce relevant technical, academic and employability knowledge and skills.

   d. The CTSO provides opportunities for students to interact with business professionals.

e. The CTSO provides opportunities for students to participate in relevant competitive events.

f. The CTSO provides opportunities for students to participate in relevant community and school service activities.

g. The CTSO provides opportunities for students to participate in leadership development activities.

h. The CTSO is closely supervised by an educator and/or other appropriate staff with clearly defined roles.

11. Work-based Learning

a. Work-based learning is organized in a sequenced continuum that progresses in intensity as a student moves through the program of study, including a range of activities such as workplace tours, job shadowing, school-based enterprises, internships and apprenticeships.

b. Work-based learning experiences are an integral part of the program of study curriculum and the full continuum is accessible to every student at some point during the program of study.

c. The work-based learning continuum is aligned with relevant national, state and/or local curriculum standards.

d. Work-based learning experiences develop and reinforce relevant technical, academic and employability knowledge and skills.

e. Work-based learning experiences are aligned with each student's multi-year education and career plan.

f. Work-based learning experiences provide students with meaningful interactions with business professionals at school, in workplaces, in the community and/or virtually.

g. Requirements and procedures for work-based learning experiences that address access, selection, liability, supervision, safety, transportation, learning objectives and evaluations are formalized with employers, students and, as appropriate, parents/guardians.

h. Training is provided to students and employers in advance of work-based learning experiences, addressing each stakeholder's rights and responsibilities as well as safety and appropriate behavior.

i. Work-based learning experiences comply with relevant federal, state and local laws and regulations.

j. Work-based learning experiences are closely supervised by an educator and/or other appropriate staff with clearly defined roles.

k. Employers play a leadership role in developing, facilitating and evaluating work-based learning experiences.

l. Students engage in reflection and document learning resulting from work-based learning experiences, such as through a portfolio or presentation.

12. Data and Program Improvement

a. Continuous evaluation of each element of ACTE's Defining High-quality CTE: Quality CTE Program of Study Framework, including all stakeholders, supports program improvement.

b. All stakeholders understand why data is collected, how it will be used, and its value in supporting student success.

c. There is a formal process in place for the systematic and continuous use of student performance data for program improvement, including identifying and addressing equity gaps.

d. Collaborative processes and supports are in place in the program of study to ensure the timely and accurate collection and submission of data for required reporting.

e. Federal and state performance indicators form the foundation of data collection, analysis and reporting; however, additional data on student access and performance are included, as appropriate, to aid in program improvement.

f. Privacy and security protections are in place for data collection, storage, analysis and reporting. Protections adhere to all federal, state and local privacy laws.

g. Educators have access to relevant valid and reliable aggregate data on all students participating in the program of study.

h. Educators have access to relevant valid and reliable data disaggregated by gender, race and ethnicity, and special population status, thus facilitating comparisons of access and performance among subpopulations and with the general student population.

i. Data is shared, as appropriate, in an easy-to-understand format with students, parents/guardians, partners and the community.

APPENDIX B

Updated CTE Teacher Competencies

CTE teachers are expected to engage in a wide variety of instructional activities within and outside of the walls of a typical classroom. In order to carry out these duties, CTE teachers are expected to possess a wide-variety of knowledge and skills. Many authors have attempted to capture the most essential knowledge and skills for working as a CTE teacher (Bottoms, et al, 2013; Cannon, et al, 2012; Gordon, et al, 2019; Kerna, 2012; Moore, et al, 2015; O'Connor, 2012; Pannell, 2016; Zulkifli, 2018), to assess the quality of CTE teachers (Chenven, 2018; Rose, et al, 2015; Xing & Gordon, 2017), or to guide the work of a CTE program (Xing, et al, 2017). This study relies on the work of Manley and Zinser (2012), who conducted a Delphi study to compile a list of the most fundamental knowledge and skills needed by CTE teachers. The findings of that study are presented here.

Category A – Program planning, development and evaluation

- Develop program goals and objectives
- Conduct a course of study based on industry or state standards
- Develop long-range plans
- Evaluate CTE programs
- Collaborate with other CTE teachers and administrators to plan, develop, and evaluate a CTE program
- Organize and maintain an occupational advisory committee
- Search for existing regional employment forecasts
- Conduct an occupational analysis
- Prepare, conduct, and report community survey

Category B – Instructional planning

- Develop a unit of instruction
- Research and select instructional materials
- Develop student performance objectives
- Determine needs and interests of students
- Prepare teacher-made instructional materials
- Develop a lesson plan
- Integrate academic instruction within CTE courses

Category C – Instructional execution

- Direct students in applying problem-solving techniques
- Present information using instructional videos
- Employ reinforcement techniques
- Introduce a lesson
- Demonstrate a concept or principle
- Direct student lab experience
- Provide instruction for slower and more capable learners
- Employ oral questioning techniques
- Summarize a lesson
- Employ the project method
- Direct field trips
- Employ simulation techniques
- Present information using a variety of internet resources
- Demonstrate a manipulative skill
- Individualize instruction
- Guide student study

- Use subject matter experts to present information
- Present information using a variety of electronic media (LCD projector, tablet, document camera, interactive whiteboard, clickers, etc.)
- Direct students in instructing other students
- Present information with models and real objects
- Present information using presentation software (PowerPoint, Keynote, etc.)
- Present an illustrated talk
- Conduct group discussions, panel discussions, and symposiums
- Present information with televised and videotaped materials
- Employ the brainstorming technique
- Employ a team-teaching approach
- Prepare programmed instruction
- Prepare bulletin boards and exhibits
- Present information with the whiteboard
- Present information with overhead and opaque materials
- Present information with audio recordings
- Employ the question box technique
- Employ the buzz group technique
- Present information with a flip chart

Category D – Instructional evaluation

- Assess student performance – skills
- Evaluate instructional effectiveness
- Assess student performance – knowledge
- Establish student performance criteria
- Assess student performance – attitudes

- Determine student grades using formative and summative assessments
- Search for industry-related assessments for use in class

Category E – Instructional management

- Provide for student safety
- Project instructional resource needs
- Assist students in developing self-discipline
- Manage the CTE lab
- Maintain a filing system
- Organize the CTE lab
- Provide for the first aid needs of students
- Arrange for improvement of CTE facilities
- Manage budgeting and reporting responsibilities
- Assist other professionals (teachers, counselors, administrators) with student behavioral issues (drug abuse and bullying)
- Monitor students' use of CTE lab chemicals

Category F – Guidance

- Provide information on educational and career opportunities
- Assist students in applying for employment or further education
- Use conferences to help meet student needs
- Gather student data through personal contacts
- Gather student data using formal data-collection techniques

Category G – School-community relations

- Develop and maintain a relationship with school guidance counselors
- Work with members of the community
- Obtain feedback about the CTE program

- Give presentations to promote the CTE program
- Conduct an open house
- Develop brochures to promote the CTE program
- Prepare news releases and articles concerning the CTE program
- Develop a school-community relations plan for the CTE program
- Develop student-ambassador programs to assist with marketing CTE programs
- Develop and maintain a program web site
- Arrange for television and radio presentations concerning the CTE program
- Develop and maintain a program social media presence

Category H – Career and technical student organizations

- Supervise activities of the CTSO
- Guide participation in CTSO
- Prepare CTSO members for leadership roles
- Develop a personal philosophy concerning CTSOs
- Assist CTSO members in developing and financing a yearly program of activities
- Develop creative/effective alternatives to official CTSOs (local or regional competitions and/or service learning projects)
- Establish a CTSO

Category I – Professional role and development

- Keep up-to-date professionally
- Serve the school and community
- Obtain a suitable teaching position
- Serve the teaching profession
- Develop an active personal philosophy statement
- Mentor new CTE teachers

- Supervise student-teachers
- Build a network of supportive resources such as a mentor teacher, as well as state and national organizations (MBEA, MHOEA, etc.)
- Provide lab experiences for prospective teachers
- Plan the student teaching experience
- Work summer externships to keep up-to-date with industry trends and changes

Category J – Coordination of cooperative education

- Prepare for students' related instruction
- Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible
- Establish guidelines for a cooperative CTE program
- Secure high-quality training stations for the co-op program
- Place co-op students on the job
- Develop the training ability of work site instructors
- Supervise an employer/employee appreciation event
- Manage the attendance, transfers, and terminations of co-op students

Category K – Serving students with special needs

- Improve teacher communication skills
- Promote peer acceptance of students with special needs
- Use instructional techniques to meet the needs of students with special needs
- Assess the progress of students with special needs
- Prepare to serve students with special needs
- Provide appropriate instructional materials for students with special needs
- Modify the learning environment for students with special needs
- Prepare special education students for employability

- Work collaboratively with special education personnel including assisting in the development of IEPs and accommodations
- Assist special education students in developing career planning skills
- Counsel special education students with personal-social problems
- Promote a CTE program for students with special needs

Category L – Assisting students in improving their basic skills

- Assist students in improving their career ad employability skills
- Assist students in improving their oral communication skills
- Assist students in improving their survival skills
- Assist students in developing technical reading skills
- Assist students in improving their math skills
- Assist students in improving their writing skills
- Assist students in achieving basic reading skills

Category M – Teaching adults

- Prepare to work with adult learners
- Manage the instructional process
- Plan instruction for adults
- Evaluate the performance of adults
- Determine individual training needs
- Market the adult education program

APPENDIX C

Preliminary Email Communication with Virginia School Division CTE Directors

In order to help distribution of this survey achieve the most reach possible, a preliminary email will be sent to CTE directors providing them with an overview of the study, allowing them to respond with questions about the study, and providing details on how they can assist with the future distribution of the survey to public school CTE teachers across the state of Virginia.

Dear Virginia School Division CTE Directors,

Hello, my name is Gary Lupton. I am a doctoral student at Virginia Tech planning to conduct a research project titled "Self-Identified Professional Development Needs of Virginia Career and Technical Education Teachers." This research project will be conducted in partial fulfillment of the requirements for a Ph.D. in Curriculum and Instruction with a focus in Career and Technical Education. This email is intended to make you aware of the study and to allow you to ask any questions you have about the study in order to help ensure this study reaches as many Virginia CTE teachers as possible.

In August, I will send an email requesting your assistance distributing this survey to the Career and Technical Education (CTE) teachers in your school division. Your assistance distributing this survey will greatly assist in helping this study meet its intended goals. The overall purpose of this study is to identify the self-identified professional development needs of Virginia CTE teachers. The results of this study may help schools and school divisions plan and provide targeted professional development based on CTE program area, years of teaching experience, and pathway to entry into the profession.

Participants will be asked to complete an online survey through Qualtrics©. The survey consists of seven demographic questions and 136 questions adapted from research on CTE teacher competencies conducted by Manley and Zinser (2012). The questions use a Likert scale allowing each teacher to select the importance of the competency and their current self-perceived competency level for that competency. The survey takes approximately 30 minutes to complete.

The research study is approved by the Virginia Tech Institutional Review Board. Participation in the study is voluntary. A teacher may choose not to participate or to withdraw from the study at any time. All responses will remain confidential. If you have any questions about the study, you may contact me at 757-876-9946 (call or text) or glupton@vt.edu or my faculty advisor, Dr. Bill Price, at wprice@vt.edu. For questions about human subject rights, email the Virginia Tech IRB at irb@vt.edu. Thank you for your consideration and assistance with this study.

Regards,

Gary Lupton

APPENDIX D

Email Communication with Virginia School Division CTE Directors

In order to distribute the survey to public school CTE teachers across the state of Virginia, the following email communication will be sent to school division CTE directors to solicit their assistance distributing the survey instrument to their school division's CTE teachers.

Dear Virginia School Division CTE Directors,

Hello, my name is Gary Lupton. I am a doctoral student at Virginia Tech planning to conduct a research project titled "Self-Identified Professional Development Needs of Virginia Career and Technical Education Teachers." Previously this year you received an email from me concerning a research study I am conducting involving the professional development needs of CTE teachers in Virginia. This research project will be conducted in partial fulfillment of the requirements for a Ph.D. in Curriculum and Instruction with a focus in Career and Technical Education. This email is intended to provide you information about that study, some of which is repeated from the original email, and ask for your assistance distributing the survey to your CTE teachers.

The primary purpose of this email is to request your assistance distributing this survey to the CTE teachers in your school division. Your assistance distributing this survey will greatly assist in helping this study meet its intended goals. The overall purpose of this study is to identify the self-identified professional development needs of Virginia CTE teachers. The results of this study may help schools and school divisions plan and provide targeted professional development based on CTE program area, years of teaching experience, and pathway to entry into the profession.

Participants will be asked to complete an online survey through Qualtrics©. The survey consists of seven demographic questions and 136 questions adapted from research on CTE teacher competencies conducted by Manley and Zinser (2012). The questions use a Likert scale allowing each teacher to select the importance of the competency and their current self-perceived competency level for that competency. The survey takes approximately 30 minutes to complete. An email template with the survey link you can use to send to your CTE teaching staff can be found below this email's signature line.

*Please distribute this communication to teachers by Monday, August 31, 2020 and include my email address (glupton@vt.edu) on the email communication to teachers.

**If you prefer the email comes directly from me, please share your CTE teacher distribution list with me and I will send the email directly from my email account.

***For best results, I would recommend providing teachers time to complete this survey in a pre-service meeting prior to the start of the school year. I recognize this time is precious. I also hope the recognition of the importance of this research for the work of CTE teachers across the state makes this worth the time and effort.

The research study is approved by the Virginia Tech Institutional Review Board. Participation in the study is voluntary. A teacher may choose not to participate or to withdraw from the study at any time. All responses will remain confidential. If you have any questions about the study, you may contact me at 757-876-9946 (call or text) or glupton@vt.edu or my faculty advisor, Dr. Bill Price, at wprice@vt.edu. For questions about human subject rights, email the Virginia Tech IRB at irb@vt.edu. Thank you for your assistance with this study.

Regards,

Gary Lupton

Dear CTE Teachers,

This email originated from Gary Lupton, doctoral student at Virginia Tech and 16 year CTE teaching veteran in the state of Virginia. I am contacting you to request your participation in a study of the professional development needs of CTE teachers in Virginia. The overall purpose of this study is to identify the self-identified professional development needs of Virginia CTE teachers. The results of this study may help schools and school divisions plan and provide targeted professional development based on CTE program area, years of teaching experience, and pathway to entry into the profession. My hope, as an aspiring researcher and current CTE teacher, is to help CTE teachers and programs improve on the existing world class work we are doing to support students, families, communities, and businesses.

The research study is a Qualtrics© survey that consists of seven demographic questions and 136 Likert scale questions on teaching competencies identified in existing research as important to the success of a CTE teacher. The survey takes approximately 30 minutes to complete. Please find the survey link in the following box:

Survey link: **https://virginiatech.qualtrics.com/jfe/form/SV_bel2zSd85tygMN7**

The deadline to compete this survey is Sunday, September 27. Please note this survey may be distributed by your school division CTE Director as well as the VDOE CTE Program Coordinator for your CTE discipline. This survey should only be completed once. Once you have completed the survey please disregard any future communications requesting your participation in the study.

The research study is approved by the Virginia Tech Institutional Review Board. Participation in the study is voluntary. You may choose not to participate or to withdraw from the study at any time. All responses will remain confidential. If you have any questions about the study, you may contact me at 757-876-9946 (call or text) or glupton@vt.edu or my faculty advisor, Dr. Bill Price, at wprice@vt.edu. For questions about human subject rights, email the Virginia Tech IRB at irb@vt.edu. Thank you for your participation in this study.

Regards,

Gary Lupton

APPENDIX E

Follow-Up Email Communication for Undistributed Survey Communications

Email communication sent to CTE directors and VDOE program coordinators includes instructions to send the communication to CTE teachers by Monday, August 31, 2020 and to include the email address (glupton@vt.edu) on the email distribution to teachers. The following email will be sent to as a reminder email to CTE directors and VDOE program coordinators who have not verified survey distribution to CTE teachers by Monday, August 24, 2020.

Dear CTE Directors and/or VDOE Program Coordinators,

This email is a reminder to please distribute the Virginia CTE teacher professional development needs survey to your CTE teachers by Monday, August 31, 2020. Your assistance with this is needed and greatly appreciated. If you have already sent the email and simply forgot to include glupton@vt.edu on the distribution, please reply to this email to let me know. If you have any additional questions or concerns, please let me know as well. A copy of the original email is provided under this email's signature line.

Regards,

Gary Lupton

Dear CTE Teachers,

This email originated from Gary Lupton, doctoral student at Virginia Tech and 16 year CTE teaching veteran in the state of Virginia. I am contacting you to request your participation in a study of the professional development needs of CTE teachers in Virginia. The overall purpose of this study is to identify the self-identified professional development needs of Virginia CTE teachers. The results of this study may help schools and school divisions plan and provide targeted professional development based on CTE

program area, years of teaching experience, and pathway to entry into the profession. My hope, as an aspiring researcher and current CTE teacher, is to help CTE teachers and programs improve on the existing world class work we are doing to support students, families, communities, and businesses.

The research study is a Qualtrics© survey that consists of seven demographic questions and 136 Likert scale questions on teaching competencies identified in existing research as important to the success of a CTE teacher. The survey takes approximately 30 minutes to complete. Please find the survey link in the following box:

Survey link: **https://virginiatech.qualtrics.com/jfe/form/SV_bel2zSd85tygMN7**

The deadline to compete this survey is Sunday, September 27. Please note this survey may be distributed by your school division CTE Director as well as the VDOE CTE Program Coordinator for your CTE discipline. This survey should only be completed once. Once you have completed the survey please disregard any future communications requesting your participation in the study.

The research study is approved by the Virginia Tech Institutional Review Board. Participation in the study is voluntary. You may choose not to participate or to withdraw from the study at any time. All responses will remain confidential. If you have any questions about the study, you may contact me at 757-876-9946 (call or text) or glupton@vt.edu or my faculty advisor, Dr. Bill Price, at wprice@vt.edu. For questions about human subject rights, email the Virginia Tech IRB at irb@vt.edu. Thank you for your participation in this study.

Regards,

Gary Lupton

APPENDIX F

Professional Development Needs of Career and Technical Education Teacher in Virginia – Survey Instrument

The survey instrument used for this research study was developed in Qualtrics © and is based on research on CTE teacher competencies conducted by Manley and Zinser (2012). The following content is screenshots of the survey questions taken from the Qualtrics © survey.

Professional Development Needs of Virginia CTE Teachers

Start of Block: Introduction

IntroMessage

Self-Identified Professional Development Needs of Virginia Career and Technical Education Teachers

Thank you for your willingness to participate in this study. The survey you are about to complete consists of two sections. The first section will ask you questions about current teaching assignment and how you entered the teaching profession. The second section will ask you about specific knowledge and skills associated with working as a Career and Technical Education (CTE) teacher. For this study, those items will be referred to as competencies.

For each competency identified, you will rate two aspects of that competency on a rating scale of one (low) to five (high). The first aspect is the importance of the specific competency to your work as a CTE teacher. The second aspect is your current comfort level applying that competency to your work as a CTE teacher. The survey will ask you about 136 competencies divided among 13 categories.

About This Study

The purpose of this survey is to determine the self-perceived professional development needs of public school CTE teachers in the state of Virginia. The goal of collecting this data is to support the work of those who develop professional development opportunities for CTE teachers, as well as those who make decisions about which professional development opportunities to offer.

Page Break

InformedConsent **Your Participation In This Study**

Participation in this survey is voluntary. If you choose not to participate or if you choose to withdraw from the study, you may do so at any time. This survey will take approximately 30 minutes to complete.

Survey Anonymity

This survey will only collect and store responses you enter for the specific survey questions presented. No other identifying information will be collected. Raw data collected in the survey will not be distributed. Only the results calculated from the data analysis will be presented in the final report.

Page Break

End of Block: Introduction

Start of Block: DemographicQuestions

DemographicsIntro **Section 1: Teacher Demographics**

The questions presented on this page ask for demographic information. These questions are required to move to the next section of the survey. Please answer each question as best you can. All questions except the question related to years of experience have an "Other" or "Unlisted" option if you need to provide a response that is not listed.

Gender Which of the following best describes your gender?

- ○ Female (1)
- ○ Male (2)
- ○ Gender Non-Conforming (3)
- ○ Other (4)
- ○ Prefer Not to Answer (5)

Ethnicity Which of the following best describes your ethnicity?

- ○ White (1)
- ○ Hispanic or Latino (2)
- ○ Black or African American (6)
- ○ Native American or American Indian (3)
- ○ Asian Pacific Islander (7)
- ○ Other (4)
- ○ Prefer Not To Answer (5)

Q55 Do you plan to remain in the teaching profession for the next five years (if you plan to retire in the next five years please answer "yes" to this question)?

- ○ Yes (1)
- ○ No (2)
- ○ Unsure (3)

ContentArea Which of the following choices most accurately describes the CTE content area you currently teach in?

- ○ Agricultural Education (1)
- ○ Business & Information Technology (2)
- ○ Family & Consumer Sciences (3)
- ○ Health & Medical Science (4)
- ○ Marketing Education (5)
- ○ Technology Education (6)
- ○ Trade & Industrial Education (7)
- ○ *Other (if "Other" please select this choice and describe the content area in the field below) (8)

Display This Question:

*If Which of the following choices most accurately describes the CTE content area you currently teach in = *Other (if "Other" please select this choice and describe the content area in the field below)*

ContentAreaOther If you selected "Other" form the choices above, please specify that content area here.

_____

SchoolDivision Please select the school division you are currently employed by.

- ○ Accomack County (Region 2) (1)
- ○ Albemarle County (Region 5) (2)
- ○ Alexandria (Region 4) (3)
- ○ Alleghany County (Region 6) (4)
- ○ Amelia County (Region 8) (5)
- ○ Amherst County (Region 5) (6)
- ○ Appomattox County (Region 8) (7)
- ○ Arlington County (Region 4) (8)
- ○ Augusta County (Region 5) (9)
- ○ Bath County (Region 5) (10)
- ○ Bedford County (Region 5) (11)
- ○ Bland County (Region 7) (12)
- ○ Botetourt County (Region 6) (13)
- ○ Bristol (Region 7) (14)
- ○ Brunswick County (Region 8) (15)
- ○ Buchanan County (Region 7) (16)
- ○ Buckingham County (Region 8) (17)
- ○ Buena Vista (Region 5) (18)

- ○ Campbell County (Region 5) (19)
- ○ Caroline County (Region 3) (20)
- ○ Carroll County (Region 7) (21)
- ○ Charles City County (Region 1) (22)
- ○ Charlotte County (Region 8) (23)
- ○ Charlottesville (Region 5) (24)
- ○ Chesapeake (Region 2) (25)
- ○ Chesterfield County (Region 1) (26)
- ○ Clarke County (Region 4) (27)
- ○ Colonial Beach (Region 3) (28)
- ○ Colonial Heights (Region 1) (29)
- ○ Covington (Region 6) (30)
- ○ Craig County (Region 6) (31)
- ○ Culpeper County (Region 4) (32)
- ○ Cumberland County (Region 8) (33)
- ○ Danville (Region 6) (34)
- ○ Dickenson County (Region 7) (35)
- ○ Dinwiddie County (Region 1) (36)
- ○ Essex County (Region 3) (37)

- ○ Fairfax County (Region 4) (38)
- ○ Falls Church (Region 4) (39)
- ○ Fauquier County (Region 4) (40)
- ○ Floyd County (Region 6) (41)
- ○ Fluvanna County (Region 5) (42)
- ○ Franklin County (Region 6) (43)
- ○ Franklin (Region 2) (44)
- ○ Frederick County (Region 4) (45)
- ○ Fredericksburg (Region 3) (46)
- ○ Galax (Region 7) (47)
- ○ Giles County (Region 7) (48)
- ○ Gloucester County (Region 3) (49)
- ○ Goochland County (Region 1) (50)
- ○ Grayson County (Region 7) (51)
- ○ Greene County (Region 5) (52)
- ○ Greensville County (Region 8) (53)
- ○ Halifax County (Region 8) (54)
- ○ Hampton (Region 2) (55)
- ○ Hanover County (Region 1) (56)

- ○ Harrisonburg (Region 5) (57)
- ○ Henrico County (Region 1) (58)
- ○ Henry County (Region 6) (59)
- ○ Highland County (Region 5) (60)
- ○ Hopewell (Region 1) (61)
- ○ Isle of Wight County (Region 2) (62)
- ○ King George County (Region 3) (63)
- ○ King and Queen County (Region 3) (64)
- ○ King William County (Region 3) (65)
- ○ Lancaster County (Region 3) (66)
- ○ Lee County (Region 7) (67)
- ○ Lexington (Region 5) (68)
- ○ Loudoun County (Region 4) (69)
- ○ Louisa County (Region 5) (70)
- ○ Lunenburg County (Region 8) (71)
- ○ Lynchburg (Region 5) (72)
- ○ Madison County (Region 4) (73)
- ○ Manassas (Region 4) (74)
- ○ Manassas Park (Region 4) (75)

- ○ Martinsville (Region 6) (76)
- ○ Mathews County (Region 3) (77)
- ○ Mecklenburg County (Region 8) (78)
- ○ Middlesex County (Region 3) (79)
- ○ Montgomery County (Region 6) (80)
- ○ Nelson County (Region 5) (81)
- ○ New Kent County (Region 1) (82)
- ○ Newport News (Region 2) (83)
- ○ Norfolk (Region 2) (84)
- ○ Northampton County (Region 2) (85)
- ○ Northumberland County (Region 3) (86)
- ○ Norton (Region 7) (87)
- ○ Nottoway County (Region 8) (88)
- ○ Orange County (Region 4) (89)
- ○ Page County (Region 4) (90)
- ○ Patrick County (Region 6) (91)
- ○ Petersburg (Region 1) (92)
- ○ Pittsylvania County (Region 6) (93)
- ○ Poquoson (Region 2) (96)

- ○ Portsmouth (Region 2) (94)
- ○ Powhatan County (Region 1) (95)
- ○ Prince Edward County (Region 8) (97)
- ○ Prince George County (Region 1) (98)
- ○ Prince William County (Region 4) (99)
- ○ Pulaski County (Region 7) (100)
- ○ Radford (Region 7) (101)
- ○ Rappahannock County (Region 4) (102)
- ○ Richmond (Region 1) (103)
- ○ Richmond County (Region 3) (104)
- ○ Roanoke (Region 6) (105)
- ○ Roanoke County (Region 6) (106)
- ○ Rockbridge County (Region 5) (107)
- ○ Rockingham County (Region 5) (108)
- ○ Russell County (Region 7) (109)
- ○ Salem (Region 6) (110)
- ○ Scott County (Region 7) (111)
- ○ Shenandoah County (Region 4) (112)
- ○ Smyth County (Region 7) (113)

- ○ Southampton County (Region 2) (114)
- ○ Spotsylvania County (Region 3) (115)
- ○ Stafford County (Region 3) (116)
- ○ Staunton (Region 5) (117)
- ○ Suffolk (Region 2) (118)
- ○ Surry County (Region 1) (119)
- ○ Sussex County (Region 1) (120)
- ○ Tazewell County (Region 7) (121)
- ○ Virginia Beach (Region 2) (122)
- ○ Warren County (Region 4) (123)
- ○ Washington County (Region 7) (124)
- ○ Waynesboro (Region 5) (125)
- ○ West Point (Region 3) (126)
- ○ Westmoreland County (Region 3) (127)
- ○ Williamsburg-James City County (Region 2) (128)
- ○ Winchester (Region 4) (129)
- ○ Wise County (Region 7) (130)
- ○ Wythe County (Region 7) (131)
- ○ York County (Region 2) (132)

○ *Unlisted (if your school division is not listed, please select this choice and list the division in the field below) (133)

Display This Question:

*If Please select the school division you are currently employed by. = *Unlisted (if your school division is not listed, please select this choice and list the division in the field below)*

SchoolDivisionUnlist If you selected "Unlisted" from the choices above, please specify that school division here.

_____

YearsExperience How many completed years of teaching experience do you have? (Your answer must be in the form of a whole number.)

_____

TeacherTraining Which of the following best describes your entry pathway into the teaching profession in Virginia public schools?

- ○ Preservice training program at a college or university in fulfillment of degree requirements (1)
- ○ Alternative licensure program, such as the Career Switcher program (2)
- ○ Technical professional license (3)
- ○ Use of three-year provisional license (4)
- ○ Reciprocity from another state (5)
- ○ *Other (if "Other" please select this choice and describe the entry pathway in the field below) (6)

Display This Question:

*If Which of the following best describes your entry pathway into the teaching profession in Virginia... = *Other (if "Other" please select this choice and describe the entry pathway in the field below)*

TeacherTrainingOther If you selected "Other" form the choices above, please specify that entry pathway here.

_____

Page Break

End of Block: DemographicQuestions

Start of Block: CompetencyQuestions

CompetenciesA **Section 2: CTE Teacher Competencies**

Questions in this section ask you to rate each of the teacher competencies listed based on their importance to your work as a CTE and based on your current level fo comfort using that competency in your work as a CTE teacher. Ratings range from a low of 1 to a high of 5.

Category A: Program Planning, Development and Evaluation

CatACompetency Rate the importance of each of the following competencies and your current ability to implement each of these competencies with regard to your current role as a CTE teacher.

	Importance					Ability to Implement				
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)

Develop program goals and objectives (1)	○	○	○	○	○	○	○	○	○	○
Conduct a course of study based on industry or state standards (2)	○	○	○	○	○	○	○	○	○	○
Develop long-range plans (3)	○	○	○	○	○	○	○	○	○	○
Evaluate CTE programs (4)	○	○	○	○	○	○	○	○	○	○
Collaborate with other CTE teachers and adminstrators to plan, develop, and evaluate a CTE program (5)	○	○	○	○	○	○	○	○	○	○
Organize and maintain an occupational advisory committee (6)	○	○	○	○	○	○	○	○	○	○
Search for existing regional employment forecasts (7)	○	○	○	○	○	○	○	○	○	○
Conduct an occupational analysis (8)	○	○	○	○	○	○	○	○	○	○
Prepare, conduct, and report community survey (9)	○	○	○	○	○	○	○	○	○	○

Page Break

CompetenciesB **Section 2: CTE Teacher Competencies**

Questions in this section ask you to rate each of the teacher competencies listed based on their importance to your work as a CTE and based on your current level fo comfort using that competency in your work as a CTE teacher. Ratings range from a low of 1 to a high of 5.

Category B: Instructional Planning

CatBCompetency Rate the importance of each of the following competencies and your current ability to implement each of these competencies with regard to your current role as a CTE teacher.

	Importance					Ability to Implement				
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)

Develop a unit of instruction (1)	○	○	○	○	○	○	○	○	○	○
Research and select instructional materials (2)	○	○	○	○	○	○	○	○	○	○
Develop student performance objectives (3)	○	○	○	○	○	○	○	○	○	○
Determine needs and interests of students (4)	○	○	○	○	○	○	○	○	○	○
Prepare teacher-made instructional materials (5)	○	○	○	○	○	○	○	○	○	○
Develop a lesson plan (6)	○	○	○	○	○	○	○	○	○	○
Integrate academic instruction within CTE courses (7)	○	○	○	○	○	○	○	○	○	○

Page Break

ComptenciesC **Section 2: CTE Teacher Competencies**

Questions in this section ask you to rate each of the teacher competencies listed based on their importance to your work as a CTE and based on your current level fo comfort using that competency in your work as a CTE teacher. Ratings range from a low of 1 to a high of 5.

Category C: Instructional Execution

CatCCompetency Rate the importance of each of the following competencies and your current ability to implement each of these competencies with regard to your current role as a CTE teacher.

	Importance					Ability to Implement				
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)

Direct students in applying problem-solving techniques (1)	○	○	○	○	○	○	○	○	○	○
Present information using instructional videos (2)	○	○	○	○	○	○	○	○	○	○
Employ reinforcement techniques (3)	○	○	○	○	○	○	○	○	○	○
Introduce a lesson (4)	○	○	○	○	○	○	○	○	○	○
Demonstrate a concept or principle (5)	○	○	○	○	○	○	○	○	○	○
Direct student lab experience (6)	○	○	○	○	○	○	○	○	○	○
Provide instruction for slower and more capable learners (7)	○	○	○	○	○	○	○	○	○	○
Employ oral questioning techniques (8)	○	○	○	○	○	○	○	○	○	○
Summarize a lesson (9)	○	○	○	○	○	○	○	○	○	○
Employ the project method (10)	○	○	○	○	○	○	○	○	○	○
Direct field trips (11)	○	○	○	○	○	○	○	○	○	○
Employ simulation techniques (12)	○	○	○	○	○	○	○	○	○	○

Present information using a variety of internet resources (13)	○	○	○	○	○	○	○	○	○	○
Demonstrate a manipulative skill (14)	○	○	○	○	○	○	○	○	○	○
Individualize instruction (15)	○	○	○	○	○	○	○	○	○	○
Guide student study (16)	○	○	○	○	○	○	○	○	○	○
Use subject matter experts to present information (17)	○	○	○	○	○	○	○	○	○	○
Present information using a variety of electronic media (LCD projector, tablet, document camera, interactive whiteboard, clickers, etc.) (18)	○	○	○	○	○	○	○	○	○	○
Direct students in instructing other students (19)	○	○	○	○	○	○	○	○	○	○
Present information with models and real objects (20)	○	○	○	○	○	○	○	○	○	○

Present information using presentation software (PowerPoint, Keynote, etc.) (21)	○	○	○	○	○	○	○	○	○	○
Present an illustrated talk (22)	○	○	○	○	○	○	○	○	○	○
Conduct group discussions, panel discussions, and symposiums (23)	○	○	○	○	○	○	○	○	○	○
Present information with televised and videotaped materials (24)	○	○	○	○	○	○	○	○	○	○
Employ the brainstorming technique (25)	○	○	○	○	○	○	○	○	○	○
Employ a team-teaching approach (26)	○	○	○	○	○	○	○	○	○	○
Prepare programmed instruction (27)	○	○	○	○	○	○	○	○	○	○
Prepare bulletin boards and exhibits (28)	○	○	○	○	○	○	○	○	○	○
Present information with the whiteboard (29)	○	○	○	○	○	○	○	○	○	○

Present information with overhead and opaque materials (30)	○	○	○	○	○	○	○	○	○	○
Present information with audio recordings (31)	○	○	○	○	○	○	○	○	○	○
Employ the question box technique (32)	○	○	○	○	○	○	○	○	○	○
Employ the buzz group technique (33)	○	○	○	○	○	○	○	○	○	○
Present information with a flip chart (34)	○	○	○	○	○	○	○	○	○	○

Page Break

CompetenciesD **Section 2: CTE Teacher Competencies**

Questions in this section ask you to rate each of the teacher competencies listed based on their importance to your work as a CTE and based on your current level fo comfort using that competency in your work as a CTE teacher. Ratings range from a low of 1 to a high of 5.

Category D: Instructional Evaluation

CatDCompetency Rate the importance of each of the following competencies and your current ability to implement each of these competencies with regard to your current role as a CTE teacher.

	Importance					Ability to Implement				
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)

Assess Student Performance - Skills (1)	○	○	○	○	○	○	○	○	○	○
Evaluate instructional effectiveness (2)	○	○	○	○	○	○	○	○	○	○
Assess student performance - knowledge (3)	○	○	○	○	○	○	○	○	○	○
Establish student performance criteria (4)	○	○	○	○	○	○	○	○	○	○
Assess student performance - attitudes (5)	○	○	○	○	○	○	○	○	○	○
Determine student grades using formative and summative assessments (6)	○	○	○	○	○	○	○	○	○	○
Search for industry-related assessments for use in class (7)	○	○	○	○	○	○	○	○	○	○

Page Break

CompetenciesE **Section 2: CTE Teacher Competencies**

Questions in this section ask you to rate each of the teacher competencies listed based on their importance to your work as a CTE and based on your current level fo comfort using that competency in your work as a CTE teacher. Ratings range from a low of 1 to a high of 5.

Category E: Instructional Management

CatECompetency Rate the importance of each of the following competencies and your current ability to implement each of these competencies with regard to your current role as a CTE teacher.

	Importance					Ability to Implement				
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)

Provide for student safety (1)	○	○	○	○	○	○	○	○	○	○
Project instructional resource needs (2)	○	○	○	○	○	○	○	○	○	○
Assist students in developing self-discipline (3)	○	○	○	○	○	○	○	○	○	○
Manage a CTE lab (4)	○	○	○	○	○	○	○	○	○	○
Maintain a filing system (5)	○	○	○	○	○	○	○	○	○	○
Organize the CTE lab (6)	○	○	○	○	○	○	○	○	○	○
Provide for the first aid needs of students (7)	○	○	○	○	○	○	○	○	○	○
Arrange for improvement of CTE facilities (8)	○	○	○	○	○	○	○	○	○	○
Manage budgeting and reporting responsibilities (9)	○	○	○	○	○	○	○	○	○	○
Assist other professionals (teachers, counselors, adminstrators) with student behavioral issues (drug abuse and bullying) (10)	○	○	○	○	○	○	○	○	○	○
Monitor students' use of CTE lab chemicals (11)	○	○	○	○	○	○	○	○	○	○

Page Break

CompetenciesF **Section 2: CTE Teacher Competencies**

Questions in this section ask you to rate each of the teacher competencies listed based on their importance to your work as a CTE and based on your current level fo comfort using that competency in your work as a CTE teacher. Ratings range from a low of 1 to a high of 5.

Category F: Guidance

CatFCompetency Rate the importance of each of the following competencies and your current ability to implement each of these competencies with regard to your current role as a CTE teacher.

	Importance					Ability to Implement				
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)

Provide information on educational and career opportunities (1)	○	○	○	○	○	○	○	○	○	○
Assist students in applying for employment or further education (2)	○	○	○	○	○	○	○	○	○	○
Use conferences to help meet student needs (3)	○	○	○	○	○	○	○	○	○	○
Gather student data through personal contacts (4)	○	○	○	○	○	○	○	○	○	○
Gather student data using formal data-collection techniques (5)	○	○	○	○	○	○	○	○	○	○

Page Break

CompetenciesG **Section 2: CTE Teacher Competencies**

Questions in this section ask you to rate each of the teacher competencies listed based on their importance to your work as a CTE and based on your current level fo comfort using that competency in your work as a CTE teacher. Ratings range from a low of 1 to a high of 5.

Category G: School-Community Relations

CatGCompetency Rate the importance of each of the following competencies and your current ability to implement each of these competencies with regard to your current role as a CTE teacher.

	Importance					Ability to Implement				
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)

Develop and maintain a relationship with school guidance counselors (1)	○	○	○	○	○	○	○	○	○	○
Work with members of the community (2)	○	○	○	○	○	○	○	○	○	○
Obtain feedback about the CTE program (3)	○	○	○	○	○	○	○	○	○	○
Give presentations to promote the CTE program (4)	○	○	○	○	○	○	○	○	○	○
Conduct an open house (5)	○	○	○	○	○	○	○	○	○	○
Develop brochures to promote the CTE program (6)	○	○	○	○	○	○	○	○	○	○
Prepare news releases and articles concerning the CTE program (7)	○	○	○	○	○	○	○	○	○	○
Develop a school-community relations plan for the CTE program (8)	○	○	○	○	○	○	○	○	○	○

Develop student-ambassador programs to assist with marketing CTE programs (9)	○	○	○	○	○	○	○	○	○	○
Develop and maintain a program web site (10)	○	○	○	○	○	○	○	○	○	○
Arrange for television and radio presentations concerning the CTE program (11)	○	○	○	○	○	○	○	○	○	○
Develop and maintain a program social media presence (12)	○	○	○	○	○	○	○	○	○	○

Page Break

CompetenciesH **Section 2: CTE Teacher Competencies**

Questions in this section ask you to rate each of the teacher competencies listed based on their importance to your work as a CTE and based on your current level fo comfort using that competency in your work as a CTE teacher. Ratings range from a low of 1 to a high of 5.

Category H: Career and Technical Student Organizations

CatHCompetency Rate the importance of each of the following competencies and your current ability to implement each of these competencies with regard to your current role as a CTE teacher.

	Importance					Ability to Implement				
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)

Supervise activities of the CTSO (1)	○	○	○	○	○	○	○	○	○	○
Guide participation in CTSO (2)	○	○	○	○	○	○	○	○	○	○
Prepare CTSO members for leadership roles (3)	○	○	○	○	○	○	○	○	○	○
Develop a personal philosophy concerning CTSOs (4)	○	○	○	○	○	○	○	○	○	○
Assist CTSO members in developing and financing a yearly program of activities (5)	○	○	○	○	○	○	○	○	○	○
Develop creative/effective alternatives to official CTSOs (local or regional competitions and/or service learning projects) (6)	○	○	○	○	○	○	○	○	○	○
Establish a CTSO (7)	○	○	○	○	○	○	○	○	○	○

Page Break

CompetenciesI **Section 2: CTE Teacher Competencies**

Questions in this section ask you to rate each of the teacher competencies listed based on their importance to your work as a CTE and based on your current level fo comfort using that competency in your work as a CTE teacher. Ratings range from a low of 1 to a high of 5.

Category I: Professional Role and Development

CatICompetency Rate the importance of each of the following competencies and your current ability to implement each of these competencies with regard to your current role as a CTE teacher.

	Importance					Ability to Implement				
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)

Keep up-to-date professionally (1)	○	○	○	○	○	○	○	○	○	○
Serve the school and community (2)	○	○	○	○	○	○	○	○	○	○
Obtain a suitable teaching position (3)	○	○	○	○	○	○	○	○	○	○
Serve the teaching profession (4)	○	○	○	○	○	○	○	○	○	○
Develop an active personal philosophy statement (5)	○	○	○	○	○	○	○	○	○	○
Mentor new CTE teachers (6)	○	○	○	○	○	○	○	○	○	○
Supervise student-teachers (7)	○	○	○	○	○	○	○	○	○	○
Build a network of supportive resources such as a mentor teacher, as well as state and national organizations (MBEA, MHOEA, etc.) (8)	○	○	○	○	○	○	○	○	○	○
Provide lab experiences for prospective teachers (9)	○	○	○	○	○	○	○	○	○	○

Plan the student teaching experience (10)	○	○	○	○	○	○	○	○	○	○
Work summer externships to keep up-to-date with industry trends and changes (11)	○	○	○	○	○	○	○	○	○	○

Page Break

CompetenciesJ **Section 2: CTE Teacher Competencies**

Questions in this section ask you to rate each of the teacher competencies listed based on their importance to your work as a CTE and based on your current level fo comfort using that competency in your work as a CTE teacher. Ratings range from a low of 1 to a high of 5.

Category J: Coordination of Cooperative Education

CatJCompetency Rate the importance of each of the following competencies and your current ability to implement each of these competencies with regard to your current role as a CTE teacher.

	Importance					Ability to Implement				
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)

Prepare for students' related instruction (1)	○	○	○	○	○	○	○	○	○	○
Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (2)	○	○	○	○	○	○	○	○	○	○
Establish guidelines for a cooperative CTE program (3)	○	○	○	○	○	○	○	○	○	○
Secure high-quality training stations for the co-op program (4)	○	○	○	○	○	○	○	○	○	○
Place co-op students on the job (5)	○	○	○	○	○	○	○	○	○	○
Develop the training ability of work site instructors (6)	○	○	○	○	○	○	○	○	○	○
Supervise an employer/employee appreciation event (7)	○	○	○	○	○	○	○	○	○	○
Manage the attendance, transfers, and termination of co-op students (8)	○	○	○	○	○	○	○	○	○	○

Page Break

CompetenciesK **Section 2: CTE Teacher Competencies**

Questions in this section ask you to rate each of the teacher competencies listed based on their importance to your work as a CTE and based on your current level fo comfort using that competency in your work as a CTE teacher. Ratings range from a low of 1 to a high of 5.

Category K: Serving Students with Special Needs

CatKCompetency Rate the importance of each of the following competencies and your current ability to implement each of these competencies with regard to your current role as a CTE teacher.

	Importance					Ability to Implement				
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)

Improve teacher communication skills (1)	○	○	○	○	○	○	○	○	○	○
Promote peer acceptance of students with special needs (2)	○	○	○	○	○	○	○	○	○	○
Use instructional techniques to meet the needs of students with special needs (3)	○	○	○	○	○	○	○	○	○	○
Assess the progress of students with special needs (4)	○	○	○	○	○	○	○	○	○	○
Prepare to serve students with special needs (5)	○	○	○	○	○	○	○	○	○	○
Provide appropriate instructional materials for students with special needs (6)	○	○	○	○	○	○	○	○	○	○
Modify the learning environment for students with special needs (7)	○	○	○	○	○	○	○	○	○	○
Prepare special education students for employability (8)	○	○	○	○	○	○	○	○	○	○
Work collaboratively with special education personnel including assisting in the development of IEPs and accommodations (9)	○	○	○	○	○	○	○	○	○	○

Assist special education students in developing career planning skills (10)	○	○	○	○	○	○	○	○	○	○
Counsel special education students with personal-social problems (11)	○	○	○	○	○	○	○	○	○	○
Promote a CTE program for students with special needs (12)	○	○	○	○	○	○	○	○	○	○

Page Break

CompetenciesL **Section 2: CTE Teacher Competencies**

Questions in this section ask you to rate each of the teacher competencies listed based on their importance to your work as a CTE and based on your current level fo comfort using that competency in your work as a CTE teacher. Ratings range from a low of 1 to a high of 5.

Category L: Assisting Students in Improving Their Basic Skills

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CatLCompetency Rate the importance of each of the following competencies and your current ability to implement each of these competencies with regard to your current role as a CTE teacher.

	Importance					Ability to Implement				
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)

Assist students in improving their career ad employability skills (1)	○	○	○	○	○	○	○	○	○	○
Assist students in improving their oral communication skills (2)	○	○	○	○	○	○	○	○	○	○
Assist students in improving their survival skills (3)	○	○	○	○	○	○	○	○	○	○
Assist students in developing technical reading skills (4)	○	○	○	○	○	○	○	○	○	○
Assist students in improving their math skills (5)	○	○	○	○	○	○	○	○	○	○
Assist students in improving their writing skills (6)	○	○	○	○	○	○	○	○	○	○
Assist students in achieving basic reading skills (7)	○	○	○	○	○	○	○	○	○	○

Page Break

CompetenciesM **Section 2: CTE Teacher Competencies**

Questions in this section ask you to rate each of the teacher competencies listed based on their importance to your work as a CTE and based on your current level fo comfort using that competency in your work as a CTE teacher. Ratings range from a low of 1 to a high of 5.

Category M: Teaching Adults

CatMCompetency Rate the importance of each of the following competencies and your current ability to implement each of these competencies with regard to your current role as a CTE teacher.

	Importance					Ability to Implement				
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)
Prepare to work with adult learners (1)	○	○	○	○	○	○	○	○	○	○
Manage the instructional process (2)	○	○	○	○	○	○	○	○	○	○
Plan instruction for adults (3)	○	○	○	○	○	○	○	○	○	○
Evaluate the performance of adults (4)	○	○	○	○	○	○	○	○	○	○
Determine individual training needs (5)	○	○	○	○	○	○	○	○	○	○
Market the adult education program (6)	○	○	○	○	○	○	○	○	○	○

End of Block: CompetencyQuestions

Start of Block: EndOfSurveyMessage

EoSDirections
Self-Identified Professional Development Needs of Virginia Career and Technical Education Teachers
Thank you for your time and efforts to complete this survey. If you have any additional thoughts or suggestions you'd like to share on this topic, please enter those in the space below. Otherwise, please be to click the "Next" arrow to submit your results.

*****You must click the "Next" arrow for your results to submit correctly.*****

OtherThoughts Additional thoughts or suggestions related to CTE teacher professional development:

_____

_____

_____

_____

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End of Block: EndOfSurveyMessage

APPENDIX G

Table 29: Comparison of MWDS and Mean Average Difference Score for all Competencies

Table 29
Comparison of MWDS and Mean Average Difference Score for all Competencies

	Ranked CTE Teacher Competency	Difference Rank
1.	Counsel special education students with personal-social problems (K.11)	1
2.	Assist special education students in developing career planning skills (K.10)	6
3.	Arrange for improvement of CTE facilities (E.8)	4
4.	Secure high-quality training stations for the co-op program (J.4)	2
5.	Place co-op students on the job (J.5)	3
6.	Prepare special education students for employability (K.8)	10
7.	Promote a CTE program for students with special needs (K.12)	8
8.	Manage the attendance, transfers, and terminations of co-op students (J.8)	7
9.	Develop alternative work-based learning experiences (job shadowing, unpaid internships, etc) where co-op experiences are not possible (J.2)	9
10.	Develop the training ability of work site instructors (J.6)	5
11.	Establish guidelines for a cooperative CTE program (J.3)	11
12.	Provide appropriate instructional materials for students with special needs (K.6)	16
13.	Assist students in achieving basic reading skills (L.7)	15
14.	Assess the progress of students with special needs (K.4)	20
15.	Use instructional techniques to meet the needs of students with special needs (K.3)	21
16.	Plan the student teaching experience (I.10)	12
17.	Develop a school-community relations plan for the CTE program (G.8)	14
18.	Work summer externships to keep up-to-date with industry trends and changes (I.11)	13
19.	Assist students in developing self-discipline (E.3)	24
20.	Modify the learning environment for students with special needs (K.7)	22
21.	Assist students in developing technical reading skills (L.4)	23
22.	Develop and maintain a program social media presence (G.12)	17

Note. MWDS scores take into account the importance mean average for a competency in addition to difference between importance and ability. Competencies with higher mean average importance will rank higher under MWDS compared to only using the difference score.

Table 29
Comparison of MWDS and Mean Average Difference Score for all Competencies

Ranked CTE Teacher Competency	Difference Rank
23. Prepare to serve students with special needs (K.5)	26
24. Work with members of the community (G.2)	27
25. Supervise an employer/employee appreciation event (J.7)	18
26. Assist students in improving their writing skills (L.6)	32
27. Supervise student-teachers (I.7)	31
28. Assist students in improving their math skills (L.5)	35
29. Collaborate with other CTE teachers and administrators to plan, develop, and evaluate a CTE program (A.5)	33
30. Provide lab experiences for prospective teachers (I.9)	29
31. Prepare news releases and articles concerning the CTE program (G.7)	30
32. Provide instruction for slower and more capable learners (C.7)	38
33. Develop student-ambassador programs to assist with marketing CTE programs (G.9)	28
34. Promote peer acceptance of students with special needs (K.2)	42
35. Arrange for television and radio presentations concerning the CTE program (G.11)	19
36. Mentor new CTE teachers (I.6)	43
37. Individualize instruction (C.15)	40
38. Give presentations to promote the CTE program (G.4)	39
39. Organize and maintain an occupational advisory committee (A.6)	25
40. Develop and maintain a program web site (G.10)	34
41. Obtain feedback about the CTE program (G.3)	41
42. Work collaboratively with special education personnel including assisting in the development of IEPs and accommodations (K.9)	45
43. Direct students in applying problem-solving techniques (C.1)	47
44. Search for existing regional employment forecasts (A.7)	36
45. Build a network of supportive resources such as a mentor teacher, as well as state and national organizations (MBEA, MHOEA, etc.) (I.8)	44
46. Conduct an occupational analysis (A.8)	37

Note. MWDS scores take into account the importance mean average for a competency in addition to difference between importance and ability. Competencies with higher mean average importance will rank higher under MWDS compared to only using the difference score.

Table 29
Comparison of MWDS and Mean Average Difference Score for all Competencies

Ranked CTE Teacher Competency	Difference Rank
47. Assist students in improving their oral communication skills (L.2)	54
48. Improve teacher communication skills (K.1)	52
49. Evaluate instructional effectiveness (D.2)	51
50. Develop long-range plans (A.3)	49
51. Develop creative/effective alternatives to official CTSOs (local or regional competitions and/or service learning projects) (H.6)	46
52. Provide for student safety (E.1)	60
53. Assist students in applying for employment or further education (F.2)	57
54. Assess student performance – attitudes (D.5)	56
55. Establish a CTSO (H.7)	48
56. Keep up-to-date professionally (I.1)	63
57. Project instructional resource needs (E.2)	58
58. Use subject matter experts to present information (C.17)	53
59. Assist other professionals (teachers, counselors, administrators) with student behavioral issues (drug abuse and bullying) (E.10)	59
60. Prepare for students' related instruction (J.1)	62
61. Prepare CTSO members for leadership roles (H.3)	55
62. Develop and maintain a relationship with school guidance counselors (G.1)	67
63. Conduct a course of study based on industry or state standards (A.2)	64
64. Assess student performance – skills (D.1)	68
65. Market the adult education program (M.6)	50
66. Assist students in improving their career and employability skills (L.1)	72
67. Provide information on educational and career opportunities (F.1)	69
68. Assist CTSO members in developing and financing a yearly program of activities (H.5)	61
69. Evaluate CTE programs (A.4)	66
70. Develop program goals and objectives (A.1)	73
71. Direct students in instructing other students (C.19)	70
72. Gather student data through personal contacts (F.4)	71

Note. MWDS scores take into account the importance mean average for a competency in addition to difference between importance and ability. Competencies with higher mean average importance will rank higher under MWDS compared to only using the difference score.

Table 29
Comparison of MWDS and Mean Average Difference Score for all Competencies

Ranked CTE Teacher Competency	Difference Rank
73. Serve the school and community (I.2)	77
74. Guide participation in CTSO (H.2)	74
75. Search for industry-related assessments for use in class (D.7)	75
76. Assess student performance – knowledge (D.3)	81
77. Assist students in improving their survival skills (L.3)	76
78. Determine needs and interests of students (B.4)	84
79. Prepare, conduct, and report community survey (A.9)	65
80. Provide for the first aid needs of students (E.7)	82
81. Manage budgeting and reporting responsibilities (E.9)	79
82. Employ simulation techniques (C.12)	85
83. Present information with models and real objects (C.20)	89
84. Monitor students' use of CTE lab chemicals (E.11)	83
85. Gather student data using formal data-collection techniques (F.5)	80
86. Organize the CTE lab (E.6)	88
87. Guide student study (C.16)	86
88. Develop a personal philosophy concerning CTSOs (H.4)	87
89. Establish student performance criteria (D.4)	92
90. Manage the CTE lab (E.4)	91
91. Determine individual training needs (M.5)	78
92. Supervise activities of the CTSO (H.1)	90
93. Research and select instructional materials (B.2)	95
94. Use conferences to help meet student needs (F.3)	93
95. Employ reinforcement techniques (C.3)	96
96. Direct student lab experience (C.6)	97
97. Manage the instructional process (M.2)	94
98. Employ the project method (C.10)	101
99. Employ a team-teaching approach (C.26)	98
100. Conduct an open house (G.5)	100

Note. MWDS scores take into account the importance mean average for a competency in addition to difference between importance and ability. Competencies with higher mean average importance will rank higher under MWDS compared to only using the difference score.

Table 29
Comparison of MWDS and Mean Average Difference Score for all Competencies

Ranked CTE Teacher Competency	Difference Rank
101.Conduct group discussions, panel discussions, and symposiums (C.23)	99
102.Employ the brainstorming technique (C.25)	102
103.Demonstrate a concept or principle (C.5)	105
104.Determine student grades using formative and summative assessments (D.6)	106
105.Prepare to work with adult learners (M.1)	103
106.Evaluate the performance of adults (M.4)	104
107.Develop a unit of instruction (B.1)	107
108.Obtain a suitable teaching position (I.3)	109
109.Employ oral questioning techniques (C.8)	108
110.Integrate academic instruction within CTE courses (B.7)	110
111.Direct field trips (C.11)	111
112.Develop student performance objectives (B.3)	112
113.Plan instruction for adults (M.3)	113
114.Prepare programmed instruction (C.27)	114
115.Serve the teaching profession (I.4)	115
116.Present information using a variety of electronic media (LCD projector, tablet, document camera, interactive whiteboard, clickers, etc.) (C.18)	117
117.Demonstrate a manipulative skill (C.14)	116
118.Prepare teacher-made instructional materials (B.5)	120
119.Maintain a filing system (E.5)	119
120.Develop brochures to promote the CTE program (G.6)	121
121.Present an illustrated talk (C.22)	118
122.Employ the buzz group technique (C.33)	122
123.Summarize a lesson (C.9)	123
124.Employ the question box technique (C.32)	125
125.Introduce a lesson (C.4)	124
126.Develop an active personal philosophy statement (I.5)	126
127.Present information using a variety of internet resources (C.13)	127

Note. MWDS scores take into account the importance mean average for a competency in addition to difference between importance and ability. Competencies with higher mean average importance will rank higher under MWDS compared to only using the difference score.

Table 29
Comparison of MWDS and Mean Average Difference Score for all Competencies

Ranked CTE Teacher Competency	Difference Rank
128.Develop a lesson plan (B.6)	128
129.Present information with televised and videotaped materials (C.24)	131
130.Present information using instructional videos (C.2)	129
131.Present information with audio recordings (C.31)	132
132.Present information with overhead and opaque materials (C.30)	135
133.Present information using presentation software (PowerPoint, Keynote, etc.) (C.21)	130
134.Prepare bulletin boards and exhibits (C.28)	133
135.Present information with a flip chart (C.34)	136
136.Present information with the whiteboard (C.29)	134

Note. MWDS scores take into account the importance mean average for a competency in addition to difference between importance and ability. Competencies with higher mean average importance will rank higher under MWDS compared to only using the difference score.

APPENDIX H

Table 30: *Comparison of Survey Respondents to Virginia's CTE Teacher Population by Content Area*

Table 30
Comparison of Survey Respondents to Virginia's CTE Teacher Population by Content Area

CTE Content Area	Survey	Virginia
Agriculture Education	7%	5%
Business & Information Technology	20%	33%
Career Connections	1%	11%
Family & Consumer Sciences	19%	13%
Health & Medical Sciences	5%	5%
JROTC	2%	N/A
Marketing Education	17%	7%
Technology Education	15%	14%
Trade & Industrial Education	14%	12%

Note: Virginia CTE teacher population data is from a presentation entitled, *Virginia ACTE first-time attendee seminar* presented at the *2020 Virginia Association for Career and Technical Education Professional Development and Leadership Seminar* in Richmond, VA on January 9, 2020.