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Teacher Certification in Technology Education: Differences in Testing Scores of Alternative and Traditional Certified Teachers

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MEd, Wilmington University, 1999

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Abstract

New Jersey has utilized alternative certification to combat the shortage caused by technology education (TE) teacher attrition. Research has examined the effectiveness of alternative certification preparation programs for the core academic programs; however, very little research has been performed in the area of TE. The purpose of this study was to (a) evaluate the Praxis scores of teacher candidates in New Jersey seeking licensure in technology education, and (b) determine if there were differences between the TE among teachers completing different preparation programs. The theoretical framework that guided this quantitative study was rooted in Knowles' theory of andragogy, which supported learning methods for the teacher as a learner. The guiding question of this study was whether there existed a significant difference in Praxis II test scores among group A (traditionally certified teachers) versus group B (alternatively certified teachers). This causal-comparative design took place among 164 TE teacher candidates from the 2 groups. Instrumentation was a praxis assessment for TE teacher candidates. Data collection included a random sampling of archival scores on the TE test that were analyzed with a t test. Findings revealed that teachers who completed the alternative route preparatory programs (group B) scored within a similar narrow range as compared to the TE teachers completing the traditional preparatory programs (group A). Implications for positive social change include providing the Teacher Advisory Mentor Program (TAMP) for TE teachers, which may reduce attrition of TE teachers and facilitate more effective teaching in the classroom.

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Dedication

This doctoral study is dedicated to my parents, Kathleen and Olen Avant. With love and support they taught me that the price of success is hard work. It is that lesson that has allowed me to accomplish many goals throughout my academic career.

Elida, Jean, Kia, Cathy, Sharon, Rodriquez, Tijuana, Malia, and Calito, thank you for being an endless force of motivation, support, and encouragement. Thank you to my friends and family, because if they didn't pull me out of the house to take in a movie or two, I would have gone insane working on the computer hour after hour. To my lovely and hilarious brother, Kahson, I am grateful for the love and laughter you provided.

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My deepest appreciation and love goes to my parents for their patience, support, and lifelong untiring love and faith. In my moments of reservation, they were my inspiration. They always stressed the importance of education and holistic knowledge. I greatly appreciate you for supporting me and believing in me. Mom, you are my heroine for your triumph over breast cancer. Dad, thank you for keeping me of sound mind and the many, many prayers when I thought I would never finish.

I acknowledge that without God, nothing is possible. For God placed the people acknowledged above in my life, the perseverance in my heart, and the knowledge in my head. A wise man will hear, and will increase learning. –Proverbs 1:2

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Section 1: The Problem

Introduction

School districts in the United States are faced with a shortage of highly qualified teachers (Darling-Hammond & Ducommun, 2011), and as a result they are compelled to dedicate an extensive amount of effort, time, and financial resources to attract new professionals who can replace those who departed the field (Hirshberg, 2011). Throughout New Jersey, school districts are seeking to increase the number of qualified technology education teachers (Stephens, 2015). Ruhland & Bremer (2008) considered alternative certification (AC) a suitable solution to address the vacancies in technology education (TE), but recent test scores have exposed possible deficiencies. This may be an effect of the many alternative programs available for those considering teaching TE. While these programs are available in hope of eliminating the vacancy in the programs such as TE, candidate performance on standardized TE licensure tests may indicate a need for additional support. The focus of this project study was to develop a teacher advisory and mentorship program designed to improve the transition and preparedness of new TE teachers entering the classroom setting.

Each year 50% of new teachers leave the workforce for a plethora of reasons (Wilkin & Nwoke, 2011). A Teacher Shortage report prepared in 2013 by the U.S. Department of Education indicated that collectively, public school districts required 7.2 million new teachers in order to meet demand (U.S. Department of Education, Office of Postsecondary Education [OPE], 2013). Provost (2011) projected the need for 8 million new teachers worldwide by 2015. Connor (2011) suggested that the projected increase was due to changes in the teaching workforce, a rapid increase in the number of public school students, and updates to federal legislation.

The No Child Left Behind Act (NCLB; 2001) mandated that states place highly qualified teachers in every core academic classroom and, when possible, in special subject classrooms as well. To be considered highly qualified, a teacher must meet three requirements, which include (a) earning an undergraduate degree, (b) obtaining state certification, and (c) acquiring proficiency in a subject or content area (U.S. Department of Education, Office of Vocational and Adult Education [OVAE], 2012). The first requirement specifies that a bachelor's degree must be obtained from an accredited college or university. The second requirement is based on the need and discretion of the individual state. Each state has the ability to adjust the certification requirements to address the current vacancies (Chair & McLaughlin, 2009). Also, the state can use alternative methods to grant certification (Ng & Peter, 2010). The third requirement is a measurement tool approved by a state that evaluates a professional's ability and competencies in a subject or content area, generally through standardized assessment.

The New Jersey Department of Education (NJDOE) relies on Educational Testing Service (ETS) to develop the standardized test that measures the knowledge, skills, and abilities of an eligible teacher candidate. This standardized test is used to assess traditionally and alternatively prepared professionals pursuing certification in both core content and specialty areas such as TE, the focal specialty area for this research project. Data obtained from ETS reflected a decline in the number of alternatively certified TE teachers passing the standard Praxis TE licensure exam from 1999 to 2009, which exacerbated the existing TE teacher shortage in the state.

In addition to New Jersey, many other states have used alternative certification (AC) as a strategy for recruiting atypical candidates not found in traditional teacher education programs (Bireda & Chait, 2011). While each AC program varied in design, they shared a common goal of using a fast-track training system to prepare professionals to legally teach in a classroom (O'Conner, Malow, & Bisland, 2011). The process requires that the professional completes an accelerated teacher program, pass a standardize licensure test, and undergo a series of mentor or administrative observations. After completing the AC program, the professional must demonstrate a mastery of educational methodology and participate in a mentor program. As in New Jersey, however, many of the professionals were not attaining a score sufficient to pass the standardized TE licensure exam (Greenberg, Walsh, & McKee, 2014).

The teacher shortage was not evenly distributed across New Jersey (OPE, 2013). Although there seemed to be a balance in teacher supply and demand for the core subjects, there were districts facing a deficit of specialty teachers (Organization for Economic Co-operation and Development [OECD], 2011). Many school districts had a surplus of elementary education, English, and social studies teachers but were experiencing a shortage of highly qualified teachers in areas such as special and technology education (Darling-Hammond & Ducommun, 2011). New Jersey forecasted that approximately 27% of technology education teachers in middle and high schools would retire within the next five years with an additional 50% estimated to retire in the next 10 years (Voss & Malone, 2008).

Recent changes in the state pension system resulted in an increased teacher retirement rate (Shuler, 2013). The accelerated teacher retirements created a surfeit of Technology Education (TE) vacancies in New Jersey that could be filled by alternatively certified professionals (Lau, Dandy, & Hoffman, 2009). In particular, new TE teachers were needed to fill vacancies in specialty content areas. For specifically, TE teachers were needed to address an acute shortage of Science, Technology, Engineering and Mathematics (STEM) teachers . Watson (2012) reported that the top education advocates pursued a variety of measures to reduce the

STEM teacher shortages, including the recruitment of highly qualified professionals from the occupational area of Health Science, Manufacturing, Science, Technology, Engineering and Mathematics.

With thousands of teaching vacancies in the TE and STEM classrooms, New Jersey was in critical need of technology-savvy teachers capable of implementing a curriculum focused on core academics and technology (New Jersey Institute of Technology [NJIT], n.d.). The statewide deficit and the adoption of the federal legislation, NCLB (2001), motivated a change in criteria for teacher recruitment and preparation. In New Jersey, education officials worked towards placing highly qualified teachers in all classrooms, but highly qualified teachers were not available for all specialty or elective classrooms (NJIT, n.d). Nor were highly qualified teachers required. For example, New Jersey did not require technological literacy and technical education teachers to demonstrate content expertise (NJDOE, 2011). In 2011, NJ adopted new technological literacy standards and requirements for licensure in technology education (NJTC, 2011). Technology Education Teacher Loan Redemption Program [TETLRP] (2004) has afforded public school districts the support needed to prepare candidates with training in content knowledge for the TE certification. In order to reduce attrition after the completion of AC programs, new teachers require ongoing support beyond passing the licensure assessment and earning state certification (Wilkin & Nwoke, 2011).

Clarification is necessary when identifying the role of licensure and support in regard to teacher recruitment and retention. New Jersey recruits individuals from business and industry to teach career and technical education (CTE) courses (River, 2014). Each candidate pursuing a career as a CTE teacher is required to successfully pass the Praxis I: Pre-Professional Skills test and the Praxis II: Content specific test. An entry-level teacher pursuing a TE certification is required to earn a passing score on the Praxis II TE test which measures the knowledge, skills, and ability in the specialty area (Educational Testing Service [ETS], 2009a).

Truesdell (2014) indicated that a TE teacher, formerly known as an industrial arts teacher, is required to teach middle through senior high school students in the areas of information and communication technologies, construction, manufacturing, energy, power, and transportation. The TE teacher must also be aware of the impact of technologies on individuals, the environment, and society. In addition to this content knowledge, a basic understanding of pedagogical and professional studies is required for a new TE teacher (Kelley & Kellam, 2009). Thus, TE teachers are required to possess a high level of knowledgeable of the content and have the pedagogical skills to deliver quality lessons in the hands-on classroom (National Association of State Directors of Career Technical Education Consortium, 2012). Clearly defined, the new TE teacher is required to teach computer skills, engineering concepts, design applications, and repair of equipment. Broadly defined, the TE teacher may have to instruct all courses in the TE career pathway, which include biotechnology, agriculture, manufacturing, construction, and transportation.

A TE career pathway is designed to increase a student's technological literacy and awareness within a career cluster. A career cluster is a grouping of occupational courses that share a commonality of skills needed in a field of work (NASDCTEC 2009). "Career clusters are used as an organizing tool by schools, small learning communities, academies, and magnet programs to identify pathways from secondary schools to postsecondary institutions and the workplace" (Maguire, Starobin, Laanan, & Friedel, 2012, p. 236). An effective CTE, STEM, or TE teacher should be prepared to teach courses and use contextual learning to focus on careers that are in high-demand within the 16 Career Clusters™ or 79 Career Pathways (Association of Career and Technical Education [ACTE], 2010).

While TE students receive the benefits of career clusters and pathways leading them through a preparation program, Berry (2010) revealed there were factors in the teacher preparation programs that undercut overall effectiveness. One factor was the lack of a prevalent methodology or a prominent pathway for teacher-preparation and certification programs (Hightower et al., 2011). Another factor was the lack of career and technical teacher education (CTTE) programs in New Jersey, which contributed to the shortage of certified technology education teachers. Having identified factors weakening teacher programs, it was important to examine the results of teacher training for certification purposes.

Definition of the Problem

The law of supply and demand indicates that if there is a low supply and a high demand, the cost will be high. This law has served as the problem seed for this study. Currently, the supply of TE teachers in New Jersey is insufficient due to high attrition rates. The National Commission on Teaching and America's Future (NCTAF) estimated the annual cost as $7.3 billion for teacher turnover in U.S. schools (Kain, 2011). Due to the increased number of students enrolled in TE courses, TE teachers are in high demand for CTE and STEM programs (Moye, 2009). The high demand and lack of teachers has placed instructional quality and student achievement in jeopardy (Blackboard, 2010).

The New Jersey State Board of Education adopted a student achievement initiative that requires one high school credit in technology literacy (State Board of Education, email communication, February 18, 2009). Therefore, each student attending public high school in the New Jersey must successfully complete a year in career and technology skills, including technology education, as well as a half of a year of economics and financial literacy before graduation (Steinke & Putnam, 2010). Additionally, there is an initiative to integrate high-level technology skills into core and elective courses (Garvis, Twigg, & Pendergast, 2011). In pursuit of that initiative, the New Jersey Core Curriculum Content Standards for Technology (CCCS-T) released two central standards for technology (NJDOE, 2011).

The first standard, Educational Technology, requires each student to use digital media as a tool to acquire, manage, valuate, and integrate data when problem solving on an individual and collaborative basis. The standard also requires students to acquire the skill to generate and transfer information with a variety of technology modes. Six indicators for preschool and grades 2, 4, 8, and12 guide the standard. They are as follows:

- Technology processes and concepts.
- Technology use for creation and invention.
- Communicative and collaborate technology tools.
- Responsible digital citizenship.
- Exploration and information literacy.
- Decision making, critical thinking, problem solving. (p. 4)

The State of New Jersey provides teachers with the content statements and cumulative progress indicators as a guideline for measuring technology standards. For example, the cumulative progress indicator states that a second grade level student should be able to identify the basic parts of a computer and explain how they are used (Core Curriculum Content Technology Standards [CCCTS], 2012). In the 21st century, general education teachers are expected to possess an understanding of how to use the variety of technologies and to measure computer skills as listed in the student standards (Flamand, 2013). While the basic technology skills are acceptable for general education teachers, TE teachers must exceed basic technology standards.

The second standard, Technology Education, Engineering, and Design (TEED), requires that each student will establish an interpretation of the attributes and influences of technology, engineering, and technological design, as they relate to individuals, society, and the environment (NJDOE, 2010). The TEED standard includes a summative expectation which targets achievement at four different levels, grades 2, 4, 8, and 12. The seven indicators are as follows:

- Attributes of technology: create and innovate.
- Design using decision-making, critical thinking, problem solving.
- Technological and digital citizenship.
- Research and information processing.
- Communicative and collaborative skills.
- Resources for a technological world.
- The world of design. (p. 12)

Sample technology education cumulative progress indicators vastly differ from those of educational technology. For example, a sample cumulative progress indicator for a secondary student is to explain the use of technology (i.e. products, systems, and resources) in different work environments (CCCTS, 2012). In order to successfully deliver a complex technology curriculum that will support the cumulative progress indicator, a teacher must possess a specific set of skills and knowledge (ITEEA, 2011).

Currently, TE teachers receive skills and knowledge through two preparation programs; Traditional Certification Route (TCR) and Alternative Certification (AC). Darling-Hammond (2010) had concern that AC programs are not equal to the quality present in TCR preparation programs. However, research indicated that the difference in student academic achievement of teachers completing the different certification routes was not significant (Constantine et al., 2009). The American Education Research Association (AERA) (2005) reported a difference of nominal to low in the effectiveness and confidence of teachers completing AC and TCR preparation programs.

The mixed guidelines for TE teacher certification presented a variance in teacher preparation throughout New Jersey (Hightower et al., 2011). In order to understand this problem, the differences in the certification requirements necessitated review. Since New Jersey required each candidate to pass the licensure test for certification (NJDOE, 2011); the results of the required test were used for the comparison between the two certification processes. During the comparison, the professional entering the field through traditional certification and alternative certification methods were examined for score performance. A data summary report indicated an increased failure rate for AC candidates from 1999 to 2009 (ITEEA, 2010). This study compared the archival data on a Praxis II Technology Education licensure assessment for teacher candidates (TCs) completing each method of certification.

Rationale

Evidence of Problem at the Local Level

Data submitted by NJDOE to the National Center for Education Information (NCEI) (2011) showed that New Jersey increased the number of issued licenses during 1999 to 2009 for teaching TE. Many of the professionals receiving the new licenses were listed as AC candidates (NCEI, 2011). During 1999 to 2009, the number of teachers who entered the field by way of AC in NJ quadrupled. Reeve (2010) expressed concerns that some of the AC candidates had not met the professional licensure standards and did not possess the requirements for adequate performance in the classroom.

New Jersey Administrative Code (NJAC) (2011), Section 6A-9, Professional Licensure and Standards, required that all TCs fulfill three requirements before they were considered for employment. Those guidelines were a bachelor's degree from an accredited institution, a passing score on a state required test, and criminal background clearance. Typically, AC programs included concentrated, abbreviated coursework, supervised training in the classroom, and a passing score on a certification test to earn credentials (Ludlow, 2013). Sass (2011b) reported that both AC and TCR programs have a designated time by which the candidate must successfully pass a licensure assessment.

This quantitative research project studied the results from candidates' first attempt on the ETS developed standardized licensure assessment. Only candidates who registered to take the TE licensure assessment as a requirement for New Jersey teaching certification were included. In addition, this evaluation analyzed the results to determine if a difference existed among candidates who completed an AC or a TCR preparation program.

Evidence of Problem from the Professional Literature

Between 1999 and 2009, approximately 2.25 million teachers were hired across the nation, but approximately 2.7 million teachers walked away from the profession during that same time (Carroll & Foster, 2010). Reeve (personal communication, May 25, 2010) indicated that many new TE teachers who entered into the field through AC programs were not equipped to handle teaching in the TE labs, and the result was high attrition rates. Many tagged high teacher attrition as a serious detriment to reform efforts in public school districts across the United States (Martinez-Garcia & Slate, 2009). Many of the reform efforts were introduced to address initiatives delegated by U.S. federal legislation such as NCLB (2001), the Individuals with Disabilities Education Improvement Act (IDEA) (2004), and the Higher Education Act (HEA) (Eppley, 2009). The support received for those federal initiatives were structured to improve student performance in the core academic programs, but they were not as focused for the CTE programs. ITEEA recognized that highly qualified teachers were instrumental in improving performance of all students; including students enrolled in CTE programs. Also recognized was the negative influence teacher attrition had on student improvement. Due to the amount of contextualized learning required in a TE classroom, a viable solution to the high attrition was to adopt the AC certification method as means to transition highly qualified professionals from the technology industry into the teaching field (Bottoms, Egelson, Sass, Uhn, & Board, 2013). However, research or testing data for teachers who entered the profession through routes other than the traditional CTE methods of training were almost nonexistent (Rojewski, Lee, & Gemici, 2012). Ludlow (2013) concluded that such research was warranted in order to prepare CTE or TE teachers effectively.

Definitions

The terms listed below were specifically related to this study. As the field evolves some terms develop multiple meanings or references. For the use of this study, the following terms were defined as:

Alternative certification (AC) program was defined as a college or university based program that accepted candidates with a bachelor's degrees and employer recommendation. This program combined intensive class sessions with supervised internships and/or mentorships for a period of at least one year that will prepare each professional to become a newly certified teacher (Roth, 2009).

Career and technical education (CTE) was a term used to identify a program or contextualized learning courses that provided secondary level students with skills and knowledge needed for entry into the workforce or a postsecondary educational institution. These courses were previously known as vocational-technical education courses (OVAE, 2012).

Career and Technical Education (CTE) teacher was a certified individual who was licensed to instruct courses in the area of agriculture, business, family, and consumer sciences, marketing education, or technology education for a public and vocational school (NASDCTEC, 2009).

CTE Concentrator was a student who had successfully completed two courses or three courses of study in a CTE program (New York State Education Department, 2013).

HOUSE was the standardized system used for New Jersey High Objective Uniform State Evaluation (NJDOE, 2008).

License was “a permit granted by a governmental agency to an individual who has met the specified requirements for an occupation” (NJDOE, 2011, p. 19).

Licensure tests are measurement tools used by state agencies to access the basic knowledge and skills required by an individual seeking teaching credential (ETS, 2009).

CTE Non-concentrator was a student who successfully completed only one course in a CTE program but had not enrolled or completed a sequence of CTE courses (NYSED, 2013).

Teacher certification was the process accountable for ensuring that individuals met minimum competency standards before entering the teaching profession (Wilkin & Nwoke, 2011).

Teacher attrition was a reduction or decrease of teachers in the learning environment due to reasons other than retirement, school closing, and involuntary or voluntary termination. (Ingersoll & May, 2011).

Traditional certification (TCR) program was a college- or university-based program that provide students with a four- or five-year program of study upon completion of which they earned an undergraduate and/or postgraduate degree and initial teacher certification (Roth, 2009).

Significance

The purpose of this study was to determine if there was a significant difference in the scores of teacher candidates in New Jersey seeking certification in technology education. This study was particularly significant as New Jersey pursued ways to address the TE teacher shortage by filling the existing vacancies (Wynn, 2010). Flanigan, Becker, & Stewardson (2012) indicated that TE teachers encompassed more than 15% of the new CTE teaching staff. Experienced TE teachers feared that the new teachers licensed through AC programs might not possess the pedagogical knowledge and classroom management skills necessary to successfully function in the CTE classroom (Hirshberg, 2011). In addition, the testing results for an individual seeking AC for TE reflected an increase in failures during 1999 to 2009. Another factor of concern was the lack of mentorship programs for new TE teachers in many of the public school districts. If new TE teachers were expected to successfully teach students enrolled in TE courses; suitable resources; support; and training was required. Without effective resources, new TE teachers were at a disadvantage before they entered the classroom and therefore had a negative effect on the retention rates in NJ school districts. Without the appropriate resources, new teachers were expected to struggle in the areas of classroom performance and management (Waterman & YeHe, 2011).

Research Question

NASDCTEC (2012) indicated that the shortage of TE teachers created a heightened need for AC programs. It became critical that alternative methods be provided in order to recruit, prepare, and certify new TE teachers (NCEI, 2011). Because the need to recruit and prepare new CTE teachers was paramount, it became vital to evaluate the available data concerning the new TE teacher candidates. Sass (2011) identified the licensing assessment as the common thread between the certification methods. Therefore, that assessment served as the key measuring tool for analyzing the differences among beginning teachers in this quantitative study. The data acquired from this study of TE teachers will be vital to guiding public school systems through strategic solutions that will minimize the attrition rates of TE teachers.

In order to acquire a certificate of eligibility (CE) for teaching in New Jersey, the TE teacher candidate needed to earn a degree from an accredited program of academic study with grade point average (GPA) of 2.5 or higher and pass the Praxis II TE test. As a requirement, each candidate takes the Praxis II TE test at the end of the accredited program of study. For this study, the Praxis II test is used as the common measurement tool since all candidates must pass this assessment prior to being granted licensure. Each candidate must obtain the cut score identified by the state in order to meet the licensing requirement. The central focus of this quantitative causal-comparative project study was to examine the differences between the test scores of AC versus TCR teacher candidates on the Praxis TE assessment.

In support of the common requirement, the question that guided this research and project study was:

Question 1: Is there a significant mean difference between the group A (traditional certified teachers) and group B (alternatively certified teachers) on the Praxis II TE test?

H_1: There is a significant mean difference between control group A and treatment group B on the Praxis II TE test.

H_{01}**:** There is no significant difference in the mean scores between the control group A and the treatment group B on the Praxis II TE test.

New Jersey Department of Education offered alternative licensing options for CTE programs since the mid1980s. However, no significant research on AC programs for CTE and TE has been completed over the last two decades. According to the ITEEA (2010), the lack of or limited amount of existing research on the CTE alternative certification programs was of concern (. O'Connor (2012) also revealed an absence of available research during a study of alternative licensing options for CTE teachers. After an exhaustive search for additional research, it became evident that there was little to no literature produced in the past 5 years evaluating the certification testing of TE teachers. This lack of available research fostered my desire to pursue a positive social change in the CTE programs. In order to promote such a change within CTE programs, research was needed on the Praxis II TE testing results of AC candidates. The data from this research provided information on the possible needs of TE teachers and resources required for supporting their pedagogical development.

Review of the Literature

This review of the literature provided the framework for this quantitative study regarding certification methods for TE teachers. The review identified the genesis of the shortage of TE teachers and the effects on the public school systems. Within the literature review, topics such as the evolution from vocational education (VE) to CTE, the CTE federal legislation, and the theory of andragogy were explored. Additionally, the study of technology literacy and the technological requirements for the public school systems were reviewed within the section.

This literature review has been organized into four focal points. The first point addressed the development of CTE, providing its history and theoretical framework . The second focal point reviewed supply and demand in relation to CTE, TE, and STEM teachers. The third point focused on teacher certification with a focus on AC. This section was written to cultivate an understanding of how TE teachers were certified and prepared for teaching in the classroom. It also covered the correlation between STEM and TE. The last point focused on certification testing and how testing results can be used for professional development.

This literature review was written using a broad based synthesis of the literature on teacher shortage, teacher certification, technology education, and technology literacy, including podcast presentation, seminal works, websites, eBooks, journal articles, and government published materials. Articles from journals identified as peer-reviewed by the Walden University library were also used for this literature review. Philosophies for the study were based on the seminal works of Knowles's andragogy theory (1980) and Kolb's experiential learning theory (1984). Keywords and descriptors used for research included: technology education, andragogy, career technical education, technology literacy, STEM, teacher certification, teacher learning, alternative certification, and experiential learning theory.

Career Technical Education

Career Technical Education (CTE) is a program of study that provides a sequence of courses that integrate technical skills, core academic knowledge, and real occupational concepts (Kuchinke, 2013). CTE was a multifaceted program that offered 16 career clusters that focused on careers such as business and skilled-trade, including STEM (Maguire et al., 2012). The federal programs for CTE, adult education including community college and adult literacy, were under the direction of the Office of Vocational and Adult Education (OVAE). As a component of the OVAE, CTE was responsible for preparing all students with academic and technical skills in order to pursue occupations in the 21st century (Lewis & Stone, 2013). The OVAE (2013) issued the following initiatives for CTE programs:

- Administering grant programs under federal legislation.
- Providing support and assistance to improve accountability, implementation, and quality.
- Supporting states to develop and sustain rigorous curriculum. (para. 2)

Despite the increase of CTE programs, there was a shortage of research focused on CTE teacher training or preparation programs. As a result, CTE continued to work toward establishing a theoretical framework that supported the root of the program (Al-Saaideh & Tareef, 2010). As a component of OVAE, CTE programs had a determination for educating secondary level students and possibly adults entering the postsecondary level. When planning for adult instruction, it was imperative to acknowledge and integrate the principles of adult learning theory. Therefore, Knowles' (1980) theory of andragogy was the underpinning of the theoretical framework for this study.

Andragogy is recognized as the theory and practice of educating adults as lifelong learners (Sharvashidze & Bryant, 2011). This theory promotes an understanding of adult learning by conceptualizing how and why adults learn (Harper & Ross, 2011). Understanding the concept of adult learning affords an opportunity to make a substantial impact on teacher preparation and professional development planning (Quinney, Smith, & Galbraith, 2010). When preparing teachers for safe and effective practice, the differences in learning styles and adult learning principles should be considered (Cercone, 2008). Teachers require an environment that promotes both learning and professional development. Grounded in humanistic learning, Knowles (1980) inferred that adult learning was autonomous and self-directed toward a goal (Sharp, 2009). Hence, the development of a curriculum for CTE teachers required the incorporation of individual life and work experiences, a variety of learning styles, and achievable goals paced for the adult learner (Luna & Cullen, 2011).

Another viewpoint of adult learning to consider was Kolb's (1984) theory of experiential learning. Kolb (1984) recognized experiential learning as a continuous development process based on practice. The experiential learning theory organized learning into two themes, practical skills and theoretical knowledge. Practical skills were influential to adult learning and were considered an essential component to every teacher education program (Ryan, 2012). Theoretical knowledge, in turn, explains why one teaching strategy worked where another failed. The combination of theoretical knowledge and practical skills provides CTE educators with meaningful preparation.

The integrative theories of Knowles (1980) and Kolb (1984) on adult learning structured the philosophies and framework of CTE. An understanding of these foundational philosophies illuminated the evolution of the CTE program and the initiatives set forth by the OVAE. Historically, CTE was known as Vocational Education (VE) and was intended to expand productivity and increase wage-earning among youth (Urban, 2011). The public school education system looked to VE for assistance in transfiguring a student in a position of unskilled labor which required little to no education to a skilled worker in an occupation sought by the industry. This transfiguration generated a conflict among the philosophies in VE (Lucas, Spencer, & Claxton, 2012).

There were three theorists who appeared to have a profound effect on the evolution of the VE to CTE program. The first theorist, David Snedden, served as an influential writer during the development of VE programs which supported the drive to meet the needs of the labor force (Labaree, 2010). His philosophies motivated the division of the VE program based on different occupations (Kuchinke, 2013):

- The professional track structured to prepare lawyers, doctors, engineers, and educators.
- The commercial track structured to prepare accountants, office administrators and business leaders.
- The agricultural track structured to prepare botanists, farmers, and ecologists.
- The industrial track structured to prepare bricklayers, machinists, and, metal workers.
- The household track structured to prepare seamstresses, chefs, and landscapers. (p. 23)

The second theorist, John Dewey, developed ideas that polarized the writings originated by Snedden. Dewey's theories did not support the possibility of social stratification within the public school system (Higgins, 2010). Dewey's philosophy identified that social stratification was destructive to society and that society should seek ways that make opportunities easily accessible to all. The philosophy from Dewey focused on VE as a broader program of study, which included any activity that had a learning purpose, including life roles such as family member, friend, and citizen (Rich, 2013).

The theories of Snedden and Dewey gained the attention of federal Commissioner of VE, Charles Prosser (Labaree, 2010). Prosser, an advocate of Snedden's theories, supported a vocational training model that specifically addressed the needs of the industrial labor market and advocated for the Smith-Hughes Act in 1917, also referred to as the Vocational Act of 1917.

Under this Act, appropriation for a national VE program in public schools was established and separate VE teacher preparation and certification were required (Lewis & Stone, 2013).

Major CTE Legislative History and Reforms

Forces from several federal policies governed the CTE program after the early legislation of the Smith Hughes Act of 1917 (Gordon, 2008). During the beginning of the modern era, the Vocational Education Act of 1963 and Vocational Education Amendments (VEA) of 1968 were established. The outcome of this combination of legislation allocated funds for training and new program development in addition to support for existing programs. Congress strongly supported this legislation as it influenced the development of CTE and helped build a workforce (Stone & Lewis, 2013).

In 1976, the legislation for CTE continued with the Vocational Education Amendment. About this time, the legislation for CTE programs faced challenging times due to political and social issues related to the ending of the war in Vietnam. At this point, most legislation focused on planning and accountability for CTE programs at the state and national level. In order to acquire funding, each state agency was required to generate a five-year plan along with an annual program plan and accountability report. After 6 years, Congress changed the structure for federal funding by transferring part of the authority to the local level. The guidelines and regulations for funding were defined in the Career and Technical Education Improvement Act of 2006, also known as the Perkins Act Public Law 98-524.

The Perkins Act endured three reforms, which were considered the driving force behind the shift from VE to CTE (Vanderbos, 2013). The birth of the legislation prescribed the federal spending regulations and funding allocations for the CTE program (Manley, 2011). The reform of the Perkins Act I increased services to target special populations in order to improve educational foundations and computer literacy for vocational students. Continuing the direction of reform, Perkins II (1990) and Perkins III (1998) provided provisions for improving student achievement and supported school reform (Kotamraju, Richards, Wun, & Klein, 2010). As a result of the reauthorization of Perkins IV in 2006, CTE programs increased the requirements for accountability, academic achievement, and connections between secondary and postsecondary education.

The Perkins legislation provided more benefit to the CTE program than NCLB. NCLB did not give consideration to the CTE program or the training of CTE teachers (Blowe & Price, 2012). The NCLB (2001) compelled some school districts to reallocate resources to subject areas like math and English and reduce the number of CTE classes offered at the secondary level. While CTE programs were not the direct focus of NCLB, the new provisions included teacher quality and the authority to reallocate funds for programs providing technology literacy, including CTE (McGrew, 2012).

In addition, NCLB (2001) was in alignment with the Perkins requirement for comprehensive professional development and teacher preparation for CTE teachers, faculty, administrators, and career guidance (Aldeman, 2011). Perkins IV (2006) identified the following focal points for TE teachers:

- Providing technical assistance for improving the quality of CTE teachers. (p. 2)
- Increasing the number of certified CTE teachers. (p. 36)
- Providing professional development that is high quality for CTE teachers. (p. 36)
- Providing assistance for preparation programs that aim to integrate academic and CTE courses. (p. 53)

These focal points were an effort to increase teacher quality and accountability (Howlett, 2008). “In September 2011, the Obama administration outlined how states can get relief from provisions of the Elementary and Secondary Education Act (ESEA), also known as No Child Left Behind (NCLB).” One of the recommended revisions released in the blueprint promoted accountability for teacher preparation programs and state certification. NCLB required increasing the rigor of teacher certification requirements in an effort to deliver highly qualified teachers (USDOE, 2012). Under ESEA, states are required to a) measure the extent to which all students have highly qualified teachers, b) adopt goals and plans to ensure all teachers were highly qualified and, c) publicly report plans and progress in meeting teacher quality goals. States are permitted to develop an additional way for teachers to demonstrate subject-matter competency and meet highly qualified teacher requirements (National Dissemination Center for Children with Disabilities, 2010). While Perkins IV (2006), NCLB, and ESEA supported the increase of highly qualified teachers, the role preparation and certification for the CTE teacher requires formalization. (Bottoms et al, 2013).

Technology Education and STEM

Many school districts experienced a change in instructional planning as a reaction to the advancements in our technology-based society (Baartman & Ruijs, 2011). The demand for technology proficiency requires school systems to increase the opportunities for finding suitable professionals. CTE played a vital role in the delivery of computer and technology literacy in secondary education (Manley, 2011). CTE programs provided over 9.2 million secondary level students with courses that support literacy in technologies (U.S. Department of Education, 2008). Based on course offerings within the CTE programs, school leaders and other teaching staff expected CTE teachers to have a role in developing and instructing the competencies necessary for successful student use of educational technologies (Isreal, Myer, Lamm, & Galindo-Gonzalez, 2012).

Educational technology and technology education represented two distinct spectrums of technology for students (Strobel, Tillberg-Webb, & Pan, 2010). Educational technology focused on the spectrum of technology utilized for communicating and disseminating information (Redford, 2013). Technology Education focused on the spectrum of innovating, changing, or modifying the environment to address society's needs and wants (Davis, 2011). A major distinction between the two concepts of technology was the goal for each (TFAAP, 2011). The principal goal for technology education was to develop technological literacy and its effect on society. Enhancing the teaching and learning process was the primary goal for education technology.

Technology education (TE) is often defined in a broad sense due to the spectrum of content covered (Workman & Stubbs, 2012). Our society is more technologically empowered and as a result, students are required to understand how technology works, the implications of usage, and the origin. As a result, the development of TE and CTE programs are a vital piece of the educational system (Nze & Ginestie, 2011). The TE curriculum prepared students to become proficient users of technology with an understanding of its implications on society (Mosley, Draper, & Waller, 2012). The unique TE curriculum offered courses in communication, construction, manufacturing, transportation, and technology with real work experience projects in scientific or mathematical processes, energy systems, robotics, or computer systems (Akpan, Essien, & Okure, 2012). Many of the concepts taught in the "TE courses were interchangeable with science, technology, engineering, and math (STEM) curriculum" (Koebler, 2012, p. 1).

Deemed as important by the Change the Equation (CTEq) initiative, STEM curriculum provides students with an interdisciplinary approach to learning academic concepts and real-world lessons while applying each component of STEM (Nadelson et al., 2012). In support of the development of STEM and TE is the Educate to Innovate campaign (OPS, 2014), which motivates students to participate and excel in STEM courses (Tsupros, 2009). Both education initiatives encouraged the use of the TE components, which were within STEM, as one approach to providing 6th through 12th grade students with the scientific and engineering educational needs (Moye, Dugger, & Starkweather, 2012). The Obama administration (2012) identified the principal priorities for engineering, TE and STEM education. They were as follows:

- Increase STEM literacy in schools as a means for supporting the student's ability to use critical thinking in science, math, engineering, and technology.
- Improve the teaching quality in math and science in order to prepare students to perform and excel with global competition.
- Expand STEM and TE education so that all groups including women and minorities were prepared for career opportunities. (Flanigan, Becker, & Stewardson, 2012, para. 1)

If these priorities were contiguous to TE, the struggle facing TE to gain recognition for its instructional value should diminish. TE has long battled as an equal partner in general education, specifically with science and technology (Wynn, 2009). While science was not typically considered an influence to the origin of technology education, the instructional strategies and activities used in it were in close harmony with that of cognitive science (Silk, Schunn & Cary, 2010). For example, a student enrolled in TE would use engineering approaches to complete the design of a prototype, perform construction, then evaluate and test the prototype. Similarly, cognitive activities and approaches were used that supported student learning with the application of science and technology as an abstract principle. CTEq identified the interdisciplinary skills and activities taught in STEM as vital to our prosperity when competing globally. As a nonprofit organization, CTEq understood that there was a need to improve the quality of each STEM component in academic programs and that the community provided a mechanism for supporting the interdisciplinary approach.

Challenges of CTE and STEM programs

The Obama Administration and the Change the Equation initiative expressed the need for professionals with STEM, TE, and Engineering expertise to teach students the employability skills necessary to remain globally competitive (Koebler, 2012). STEM and TE educators are expected to prepare students for career opportunities in science, technology, engineering, and mathematics (Watson, 2012). At the middle and high school levels, STEM and TE educators instruct the integration of disciplines through applied learning concepts and activities. These educators are expected to utilize project-based learning and problem solving to teach STEM disciplines (UCSE, 2013). In addition, Career Technical Teacher Education (CTTE) programs expect TE and STEM teachers to demonstrate

- An extensive knowledge and aptitude in education concepts and philosophies.
- A comprehensive and advanced knowledge of technology.
- A broad understanding of the evolution of technology and the utilization, significance, and relationships in regards to individuals, society, and the environment.
- The ability and knowledge to teach competencies that meet the individual needs of all students.
- The ability to create, implement, and evaluate content and strategies for teaching students to design, manufacture, operate, and evaluate technology. (p. 6)

CTTE programs prepared new TE and STEM teachers to demonstrate the objectives listed, in addition to providing instructional methods and strategies that support project development, problem-based learning, and critical thinking at the middle school and high school levels (Warner & Gemmill, 2011).

In preparing to teach CTE courses, it is ideal to have a teacher candidate complete a traditional CTTE program that includes the methodology of contextual teaching. However, many colleges and universities that provide training programs for CTE, TE, and STEM teachers are experiencing drastic reductions in funding and sudden closures (Gordon, 2009). Organizations such as the Association of Career and Technical Education (ACTE), International Technology and Engineering Educators Association (ITEEA), and National Association of State Directors of Vocational Technical Education Consortium, (NASDCTE) recognized the detrimental effect of closing CTTE programs for the education system (Asunda, 2011). The decline in the number of CTTE programs contributed to a lack of highly qualified teachers, the TE teacher shortage, and the increase of alternative certified teachers (Retallick & Miller, 2010).

Highly Qualified Teachers

NCLB required that all teachers were highly qualified (HQ) to teach in their respective content areas. To be considered highly qualified, teachers were required to have a bachelor's degree, hold the appropriate state-level certification or license, and demonstrate competence in the subject matter that he or she taught (Wighting, 2011). In New Jersey, the certificate of eligibility (CE) and the certificate of eligibility with advanced standing (CEAS) were considered the main state certifications. The CE credential is for alternatively prepared individuals who met the requirements for licensure but did not complete a traditional teacher preparation program. The CEAS credential is for individuals who were prepared in a traditional teacher preparation program and met the minimum certification requirements. Those who possess an emergency or conditional certificate are not considered highly qualified until a standard certification in obtained. Additionally, NCLB (2001) required states to evaluate the following when issuing teaching credential:

- Measure the extent to which all students have highly qualified teachers, particularly minority and disadvantaged students
- Adopt goals and plans to ensure all teachers are highly qualified
- Publicly report plans and progress in meeting teacher quality goals. (p. 2)

Currently, the NCLB requirement for highly qualified applies to core academic subjects. *NCLB* allows states to use HOUSE, High, Objective, Uniform State Standard of Evaluation, as a way to measure a teacher's ability to demonstrate subject-matter competency. NJ HOUSE accepts a variety of evidence when evaluating if a candidate is highly qualified. The evidence can consist of teaching experience, professional development, and knowledge in the subject gained over time in the profession. Teachers who successfully satisfy the NJ HOUSE requirement prior to the expiration date retain their highly qualified status permanently (NJDOE, 2008).

The NJ HOUSE requirements for TE teachers differ from the surrounding states. New York and Pennsylvania require a teacher to meet a cut off score on the Praxis II TE licensing test in order to obtain HQ status. California considers that CTE teachers who teach any core subjects meet the HQ requirements. California defined core subjects as English, Mathematics, Reading, Science, Social Studies, and Foreign Languages. However, NJ HOUSE (2008) does not require teachers to demonstrate content expertise for technological literacy and TE (NJDOE, 2013). The nonexistent HQ TE requirement in NJ allowed any professional to teach TE content. In order to teach TE, these individuals are required to pass the Praxis TE exam and meet other certification requirements. This study of the results on the Praxis TE exam analyzed the difference between teachers completing TCR and AC preparation. The result of this analysis provided data on whether AC programs were a viable method for preparing new staff to teach TE content knowledge.

Teacher Shortage and Attrition

The decline of CTTE programs and the NJ HOUSE requirements exposed students to uncertified personnel teaching TE courses (Bound, 2011). Research reveals that the highest annual turnover rate is related to uncertified and unqualified professionals attempting to teach TE (Boe, Cook, & Sunderland, 2008). The increase in student enrollment and the need to incorporate 21st century technology skills made it difficult for New Jersey high schools to meet the vocational needs of all students (Smith & Evans, 2009). In the near future, 60% of the TE vacancies will be filled with professionals who are not highly skilled teachers (Martinez-Garcia &Slate, 2009). The National Center for Education Statistics (2011) noted that approximately 30% of TE teachers in public high schools did not major in a technical field and were using an emergency certificate while in the process of earning a standard licensure to teach TE. The limited research in the field of TE prohibits more exploration of the percentages noted earlier.

Tiala & Harris (2011) indicated that the demand for new TE teachers will exceed the supply over the last decade throughout much of the US. The supply of TE teachers in the Northwest, Great Lakes, and South Central are well adjusted, while the opposite is true with the western and eastern states, which have reported a shortage of certified beginning TE teachers. In fact, TE educators, along with other CTE teachers, are reported as having the highest attrition rates overall (Bottoms et al, 2013). It was noted that a higher percentage of CTE teachers return to industry for better pay and flexible work hours (Brill & McCartney, 2009).

The factors contributing to attrition and the limited supply of teachers must be evaluated. Current research has identified the lack of support, overwhelming technical requirements, and lack of teacher preparation as reasons for high attrition (Grossman & Loeb, 2010). However, some researchers indicated that another reason for high attrition was the quality of the pre-service preparation. Ingersoll & Merrill (2012) reported that teachers who are prepared well are more likely to remain in the field, which supports a reduction in the attrition rate. A high quality pre-service preparation program is essential to the reduction of beginning TE teachers leaving the profession (Gumbo et al., 2012). The key components to a strong pre-service program are appropriate planning and the ability to deliver tools that would combat the factors that contribute to teacher attrition (Bound, 2011). For TE teachers, pre-service program that supports students, instruction, and innovation are needed (Saunders, 2012). In an effort to minimize the destabilized effect of the teacher shortage, NJ turned to alternative certification (AC) as a solution to the decline in CTTE programs and a method of pre-service training for new TE teachers (Kane et al., 2009).

Alternative Certification

The combination of educational policies, increasing student enrollments, and teacher attrition imposed vexing classroom staffing problems. This left many NJ school districts in search of strategies to adequately staff classrooms with quality teachers. In response to the shortage of qualified teachers, national and state legislative bodies, in conjunction with educational policymakers, started making provisions to attend with shortages of teachers in the classroom (Kane, 2009). Klein (2012) noted that AC certification was a promising solution and remained vital when ensuring that each student had access to an effective teacher.

As the AC programs increased due to factors, such as teacher shortages and policies under (NLCB) (2001), more non-traditional teachers enrolled in approved teacher preparation programs. There was some concern that teachers who completed the AC programs were not making adequate progress toward certification (Connelly, 2010). More of a concern was the idea that those who earned certification through an alternative route were not as highly qualified as a teacher completing the traditional route to certification (Constantine et al., 2009). As a result, the use of AC programs as a viable solution for the teacher shortage sparked a debate on teacher quality and efficacy (NCAC, 2010).

The AC debate had two main positions: advocates for the AC preparation approach and proponents of the TCR preparation approach. The advocates of AC approach supported the position that effective quality control mechanisms were needed for all teachers (Feistritzer & Haar, 2010). These mechanisms should not serve as barriers that restricted entry to the field but as a tool to identify potential successful teachers. Johnson (2009) supported the use of AC programs as a way of improving teacher quality. Reese (2010) indicated that AC programs encourage quality and authenticity of the student learning by enlisting highly qualified candidates from the workforce with the working career knowledge. They are professionals who typically would not normally work in the teaching field. The AC program had the ability to respond to local district needs and train new professionals to use the standards and implement the curriculum efficiently (NRC, 2010).

The proponents for TCR programs questioned whether teachers completing AC programs were ready to enter the classroom (Chait & McLaughlin, 2009). Advocates for TCR programs supported higher performance standards and extensive pre-service preparation as mechanisms needed for improving teacher quality (Blazer, 2012). While advocates acknowledged the teacher shortage, they had a strong concern regarding teacher effectiveness of AC teachers (Provost, 2011). However, current research indicated that the traditional hiring practices used to recruit new teachers had not provided a reliable solution to staffing challenges and may be contributing to the decline of teacher effectiveness (Tirozzi, Carbonaro, & Winters, 2014).

Johnson (2009) noted that teachers completing an AC program have minimal pedagogical preparation with a focus on practice rather than theory, which limits their ability to be effective in the classroom. Darling-Hammond (2010) argued that by reforming standards of licensure and certification, the teaching profession is more prepared and enticing to highly qualified candidates. The American Federation of Teachers (AFT) (2012) proposed that increased standards and preparation before classroom entry would support a quality teaching force. National Commission on Teaching and America's Future (NCTAF) (2011) recommended certification standards for TE teachers connect to student standards; in addition to having rigorous standards for teacher preparation. Another recommendation was to modify pre-service programs so that a highly qualified teacher is placed in every classroom. Pedagogical ability, knowledge, and skills are essential to teaching quality as they ensure teachers are equipped to provide quality instruction (Darling-Hammond & Rothman, 2011). Reformed certification standards should clarify the knowledge, skills, and abilities that were core to effective and efficient teaching, and a license should signal a prepared teaching candidate to the field (Hightower et al., 2011).

Spielberger, Baker, Winje, and Mayers (2009) supported the importance of TCR programs as a safeguard for teacher quality. Scribner and Heinen (2009) claimed that the AC teacher was a product of a short-term goal such as enrollment and district official satisfaction, rather than longer-term goal of improving teacher competence. Education reformers argued that TCR programs are a way to improve the quality of the teaching field (Pullmann, 2012). A teacher completing a TCR program is considered well prepared and more likely to remain in the field longer (AACTE, 2012). Garcia and Huseman (2009) indicated that AC teachers have higher attrition rates and require a stronger support system.

Advocates for AC programs accepted alternative certification routes as a plausible solution to the teacher shortage. Podgursky (2009) argued that traditional preparation programs raised barriers and discouraged possible qualified candidates with practical experience from entering the field of teaching. Berry, Daugherty, and Wieder (2010) indicated the qualified AC candidates possessed a key element, which is job experience. River (2014) reported that there was desire for AC candidates from the TE field due to their occupational experience.

When evaluating the CTE curriculum, some researchers compare the effectiveness of traditional teacher preparation against alternative methods that include real-life situations (OECD, 2011). The National Research Council (2010) indicated that coursework as well as other educational requirements supported the maintenance of NJ's high level AC programs statewide. Additionally, National Center for Alternative Certification (NCAC) (2010) reported that AC programs were as rigorous as the TCR programs. However, as the turnover rate in new TE teachers remain high, the number of AC candidates failing the standardized licensure test appears to be increasing (Feistritzer & Haar, 2010). Thus, it is imperative to provide research to the career and technical teacher education programs who are preparing the next generation of CTE teachers. In order to determine the necessary and useful components of a teacher preparation program, it is critical to look at all aspects of preparation in relation to assessment (Asunda, 2012).

There was an existing need to research the efficacy of AC programs that produce technology education teachers who teach students in grades six through twelve (Alhamisi, 2011). Al-Saaideh and Tareef (2010) indicated that higher standards in AC programs are required in order to have a positive impact on teacher shortages. Researchers have recognized AC programs as the new gateway for imposing high-quality standards (Darling-Hammond & Ducommun, 2011; Nadler & Peterson, 2009).

The NCEI (2011) an organization that conducted an annual survey of AC programs estimated that more than 125,000 teachers have received some sort of training prior to certification. Federal and state CTE leaders have identified professional development training programs as a critical priority to develop of high-quality CTE teachers (Bottoms et. al, 2013). An effective alternative preparation program for CTE teacher licensure that provides efficient training is a viable method for transitioning those with highly valued industry experience into the teaching profession, and meeting the demand for more highly qualified CTE teachers (Bottoms et al, 2013). An expected result of an AC program is that a school district is more likely to acquire experienced professionals, who could provide the next generation with a combination of theory-based lessons and background experience (Lewis & Young, 2013). As a result, the AC program delivers more qualified individuals into the field to teach these hard to staff subjects like STEM (Baron, 2012).

Research indicated that programs like Teach for America recruits professionals who earned a degree from a competitive college are somewhat successful with classroom preparation (Heilig & Jez, 2014). Teach For America (TFA) is one program working towards addressing the demand to increase effective AC educators in STEM and TE classrooms by recruiting, training, and supporting committed individuals (TFA, 2012). TFA is a nonprofit organization that recruits and trains qualified professionals and then positions them in the low income urban and rural schools districts with a two-year teaching commitment (Strauss, 2013). The New Jersey division of TFA increased the number of certified teachers who strengthen the core academic and CTE programs while improving the learning achievement of students. As 2015 approaches, TFA aspires to recruit and train 5,000 new STEM or TE teachers (NJTFA, 2012). Since TFA serves over 48 communities worldwide, a percentage of the expected 5,000 recruited TE or STEM teachers will serve the seven TFA New Jersey communities. Faced with the realization that 5,000 STEM teachers will leave areas currently experiencing a radical deficit of certified of teachers, TFA designed the following initiatives to target qualified teachers:

- Use leadership and effective alumni to better support the STEM and TE staff
- Improve the preparation and support program for STEM and TE teachers
- Increase the number of STEM and TE teachers and leaders in education. (p. 3)

One partnering organization that supported the STEM recruitment initiative is 100Kin10. This organization was named after the primary goal of recruiting 100,000 STEM teachers in 10 years. Carnegie Corporation of New York and Opportunity Equation assembled a group of organizations to establish the 100kin10 organization and fund a national initiative to hire, train, and retain 100k STEM teachers by 2021 (OE, 2009). These organizations realize that resources directed at the STEM teacher shortage would provide for an opportunity to improve learning for all students. These STEM teachers who prepare to teach courses in Science, Technology, Engineering, and Math are exposed to the technology and engineering that are the core components for teaching TE courses.

The TFA and 100kin10 do not require individuals to have a degree in education prior to recruitment. Though many states have varied requirements for STEM teacher credentials, New Jersey Department of Education has well defined specific requirements for TE and STEM teachers. Each TE or STEM teacher candidate is required to receive a state-issued license prior to being hired by a NJ school district. In addition to basic teaching credentials, each participant was required to achieve highly qualified status as defined by federal law. Since most participants did not complete a TCR, they earn teacher certification through an AC program. TFA and 100kin10 prepares candidates to meet the HQ teacher certification requirements. The organization covers the cost associated with the certification programs, which includes tuition for AC programs at the local colleges or universities.

Certification and Testing

Given the variety of teaching preparation programs, NJ imposed requirements for candidates seeking certification. New Jersey also increased the number of licensure paths in efforts to lessen the teacher shortage of TE and STEM teachers (Feistritzer, 2011). NCLB (2001) has a provision that allows each state to implement an AC program in order to acquire highly qualified teachers during a teacher shortage (USDOE, 2010). The Federal Department of Education (2001) has developed strict guidelines that force unqualified teachers out of the classroom (Quigney, 2010). For example, the NCLB (2001) legislation requires that teachers earn a credential before teaching any subject including special subjects such as music or technology education (TSNC, 2007). The National Research Council (NRC) (2008) noted that earning a credential is one of the three ways for encouraging effective teaching practices. The first way is professional accreditation through preparation programs. The second is through state licensing of applicants to the profession. The third is through certification of practitioners (NRC, 2008). Considering the definitions provided by the NRC, one would think the first way is related to traditional preparation programs, while the second and thirds ways could be considered related to alternative certification programs.

The process of state licensing serves as a pathway into the teaching profession. Endorsing teachers with a license to practice is a function of the State Department of Education (NRC, 2008). A teaching license is required for effective and safe practice in the classroom (Johnson, 2009). In order for a candidate to be eligible for a teaching certification in TE, the candidate must earn a passing score on the Praxis II TE exam. After the teacher candidate completes the TE test, the data is collected, the scores are analyzed, and the results are distributed to the permitted recipients designated by the candidate (NJDOE, 2011). Ultimately, the state department of education has the authority to decide on granting certification; not those who create the Praxis II TE test or process the Praxis II TE test results. When a candidate earns the minimum passing score for a state, the candidate is considered eligible for certification consideration. The candidate is required to meet the additional requirements set forth by the department of education within a state.

While licensure requirements can vary, a common requirement is that a standardized test or tests are taken to verify knowledge, skills, and abilities. Many state organizations used Praxis series of exams as a benchmark for professional licensure. As the licensing agency, each state set its own passing scores for each Praxis test. States used the Praxis test results as the deciphering tool that distinguishes between the competent teacher candidate and individuals not ready for the classroom (AEE, 2008). States are making changes in the teacher credentialing and re-certification process that allows for more teachers with STEM and TE knowledge to enter the classroom (Ruhland & Bremer, 2008).

New Jersey used licensing systems to grant professional credentials to teachers who completed certain mandated requirements. For each licensure path, there was variability in the education and experience required for certification (ETS, 2009). In accordance with most of the 50 states, New Jersey Department of Education issued an initial license to a teacher candidate who presented evidence of a bachelor's degree from a regionally accredited 4 year college or university; successful completion of a student teaching program, or teaching experience consisting of a minimum of 91 days assignment or enrollment in an AR program (NJSDOE, 2011). This capstone requirement for the certification process included earning a passing score on a subject specific teacher examination (Darling-Hammond, 2009).

Proficiency Testing for State Certification

Currently, there were two main commercial producers of teacher licensure tests: Educational Testing Service (ETS) and Pearson's National Evaluation Systems, Inc. Pearson is a testing company that develops and administers customized educator testing programs and other assessment programs in higher education. Pearson assessments covered more than one hundred content fields, professional teaching skills, and the basic skills of reading, writing, and mathematics. While Pearson is used by a few states to measure teacher knowledge, skills, and abilities, New Jersey uses the Praxis Series™ tests produced by ETS to measure individuals seeking certification so they can enter the teaching profession as a technology education teacher. Currently, Pearson does not produce a standardized assessment that measures the skillset for technology education (Pearson, 2014). Pearson produces an essential skill assessment that measures the technology literacy competencies of a new general education teacher. The Praxis II TE test framework has 2 major concepts which include 1) understanding computer operations and productivity software and 2) understanding computer-based technology for research and communication (Pearson, 2011). Pearson does not currently produce a secondary assessment for a technology education teacher entering the career and technology education program.

As a nonprofit company, ETS works to advance quality and equity in education for individuals globally by creating fair and valid assessments based on research current in the field. ETS has a key focus of developing, administering and scoring over 50 million assessments in more than 180 countries annually. Their products and services are geared to measure knowledge and skills, advance learning and educational performance, and encourage education and professional development. Their work is divided into five extensive areas of proficiency including research, assessment development, test administration, test scoring, and instructional products and services. In each of the five divisions, ETS conducts rigorous research in education in order to develop a variety of products for teacher certification.

The ETS Praxis Series had two divisions for teacher licensure assessments: Praxis I® and Praxis II® (ETS, 2009). The Praxis I assessments measures basic academic knowledge and skills in reading, writing and mathematics. Licensing tests are designed "to provide the public with a dependable mechanism for identifying practitioners who have met particular standards" (American Educational Research Association et al., 1999, p. 156). The Praxis I assessments are designed to provide a comprehensive tool that can measure the skills and content knowledge of a teacher candidate. Praxis II measures the content knowledge, general pedagogical knowledge and content- specific pedagogical knowledge. Praxis II provides a variety of over 120 assessments covering different subjects ranging from art to world foreign languages. The Praxis II tests includes three groups of tests: subject assessments, principles of learning and teaching (PLT) tests, and teaching foundations tests.

The Praxis II subject assessments are used to measure the general and subject-specific skills and knowledge needed for entry level teaching. The PLT assessments are used to measure the general pedagogical knowledge of a TC at four different grade ranges including early childhood, K–6, 5–9 and 7–12. Both the subject and PLT tests include a variation of question styles including innovative multiple selection, multiple choice, and constructed-response or essay questions. The teaching foundations tests are used to measure pedagogy and knowledge in multiple subjects, mathematics, English and science. These foundation tests include multiple-choice and constructed-response style questions.

Validation of licensure assessments used for certification decisions are based largely on evidence that the content of the assessment represents knowledge and skills important for practice upon entry into the profession. As a part of validity evidence, a job analysis was conducted to identify knowledge and skills important for practice (ETS, 2009). A collection of statements validated the Praxis II TE test specifications against the standards in the field as presented by ITEEA, NETS, and CCCS-T. A survey of technology education teachers and the educators for technology education in higher education confirmed the validity of these statements. The statements were surveyed nationwide and a team of experts drafted the final TE test specifications based on the results of the survey. The final TE test specifications were used during the development phase of each test form. This validity evidence is important in order to make sure the assessment is being used appropriately, and measures what it is designed to measure.

“Proper assessment use means there is adequate evidence to support the intended use of the assessment and to support the decisions and outcomes rendered on the basis of candidates’ assessment scores” (ETS, 2009, para. 2). Proper assessment use of the Praxis TE test is the responsibility of the users of assessments and ETS. The ETS Praxis Division is responsible for developing valid and fair assessments in accordance with technical guidelines established by the American Educational Research Association, the American Psychological Association, and the National Council on Measurement in Education (SEPT, 1999). Each ETS test endures laborious statistical analyses. These analyses include scaling, equating, Preliminary Item Analysis (PIA), and Differential Item Functioning (DIF). These analyses are required to ensure that test scores are longitudinally comparable and perform without ambiguity or bias.

To support accuracy and validity, all test forms endure internal and external content reviews for PIA and DIF (Zwick, 2012). DIF and PIA analyses are required ETS procedures for evaluating the fairness and validity of each licensing assessment. After each administration but before scores are reported, assessment content specialists receive preliminary item analysis (PIA) data. The PIA data identifies a list of flagged questions that assessment content specialist (ACS) must research to validate that each question contains a single best answer or set of answers depending on the item type. The ACS checks each question based on content resources and statistics. The questions may had been flagged for any of the following reasons:

- Low average item scores (very difficult items)
- Low correlations with the criterion
- Possible double keys but not an innovative item type
- Possible incorrect keys. (p.12)

The goal of this review was to detect any ambiguities in the wording, keying, or other possible egregious errors in a question. Items that did not meet ETS's testing standards were excluded from the final scoring process. In addition to a review by the ACS, external content experts in the field reviewed the flagged questions for validity. The combination of reviews were documented and the decisions on scoring was submitted for a psychometrical final analysis. If the question was not scored, a Problem Item Notice (PIN) was issued and distributed. That PIN would result in an updated official test key and that question would be removed from the report process. The statistical data were used for assembling future forms of the test. This process confirmed that flawed questions were removed from the scoring report when necessary.

Another review performed that affected scoring was Differential Item Functioning (DIF) (ETS, 2010). DIF analysis is used to decide if a subgroup demonstrates a difference in performance affected by factors that were beyond intended use of the test. Internal and external content experts serve as a DIF panel member who decided whether a question is considered statistically affected by the DIF analysis. Questions with high DIF are dropped from the scoring process. DIF in combination with PIA are used to make sure that the current and future editions of the test are valid tools of measurement.

As a valid tool, the TE licensure test provides school districts with a way to identify teachers with the appropriate content knowledge during recruitment. As school districts continue efforts to improve teacher recruitment and retention methods, many districts focus on the use of licensure assessments to measure teachers' understanding of different concepts. For TE teachers, incorporating technological concepts into a student's curriculum impacts student achievement (Shechtman et al., 2010). A TE program provides students with technological concepts that were structured to meet the needs of today's society (Kipperman, 2009). By using a technological content test, school districts are able to quickly assess if a teacher demonstrates the content knowledge needed to meet a specific subject (Pittalis, Christou, & Pitta-Pantazi, 2012).

Implications

For the past four years, New Jersey school districts have experienced a teacher shortage in the area of Technology Education. Federal legislation requires that a highly qualified teacher is placed in each classroom regardless of New Jersey's struggles with teacher vacancies (Kain, 2011). As New Jersey suffered the hardships associated with recruiting, hiring, and training new teachers, they evaluated AC as the possible solution to combat the teacher shortage (Ringle, 2012). In order for the current AC programs to increase teacher quality and improve the academic and technical achievement of CTE programs, effective preparation and professional development must be implemented (Bottoms et al, 2013).

This study has implications for positive social change for CTE programs as it used the results to identify the needs for new TE teachers. This research is needed to help establish a teaching force that effectively prepares students for the workforce. The data provided preparation organizers with the ability to identify the discrepancies between preparation methods and prepare the required framework needed for TE teacher certification. Also, the research provided an opportunity to support new TE teachers that may need instructional or methodological reinforcement.

Summary

Ritz (2009) indicated that an effective instructional TE program necessitated goals that direct the outcomes of curriculum development and teaching. TE programs should meet goals that offer direction so content is delivered effectually for students. Asunda (2012) reported that TE programs should provide students with

- the technical knowledge necessary for the work place;

- the cross-functional skills necessary for success in a career (i.e., problem solving, teamwork), and
- a robust and flexible curriculum. (p. 3)

It seems paramount to understand the knowledge, skills, and abilities of CTE teachers in regards to licensing before the teacher instructs a lesson in the classroom.

Because of the decline of CTE programs, highly qualified individuals with specific training or undergraduate degrees in career/ trade related fields are in great demand. Hightower et al. (2011) stated that the preparation of a TE teacher is strongly influenced by two trends: "growing teacher shortages and the need for greater teacher accountability" (p. 13). Research indicated that a variety of factors such as high turnover rates and the working conditions of schools had an impact on the shortages of new TE teachers (Ingersoll & May, 2011). The exodus of technical type teachers had brought about the largest demand for new teachers for engineering and the highest concern for the quality of education (Flanigan, R., Becker, K., & Stewardson, G., 2012).

The vacant teaching positions and the low supply of technical teachers have forced school districts and educational instructions to search for strategies to maintain quality (Thankachan, Sharma, & Singh, 2010). About half of the teaching population was expected to leave the field within five years (TNTP, 2012). Additionally, about 30% of new technical teachers left the professional by the third year of practice and resulted in a dwindling in the numbers of available new technical teachers (Goldhaber et. al., 2014).

Research indicated that the recurring problem for New Jersey was that demand surpassed the number of qualified teachers entering the field (Shaw, 2010). Teacher shortage and certification have been critical agenda items for most state legislatures. New Jersey took action to increase teacher education programs and made changes in the credentialing and re-certification processes (NJTFA, 2012). One of those changes was the use of alternative teacher certification programs to address the teacher shortage and meet the unique needs of CTE teachers.

Using the alternative certification methods to grant teacher credentials are more likely to attract those professionals who were able to teach in shortage areas. After working a successful first career, these non-traditional professionals are capable of bringing a breadth of practical knowledge and experience in subjects like technology, science, and math. Because wages are considerably higher in sectors outside of education, the candidates with STEM specialties are not typically drawn to teach for financial reasons. However, the discontent from their primary career can motivate an interest in a teaching job.

Effective practice remains a prominent concern when a variety of teaching certification and preparation methods are available (Barnett, 2013). NRC (2010) distinguished three major ways that states could encourage effective practice. The focus of all is what criterion is most likely to prepare the TE teacher for effective classroom instruction. This study provided fundamental data that helped state officials decide whether the AC candidate was comparable to the traditional candidate based on testing results. The research of this data was critical in understanding if restrictive guidelines are maintained during times of critical shortage. This knowledge will contribute to the development of a program providing professional support for teachers. If school districts are provided adequate research, they can promote an environment where students and teachers are well served (Connelly, 2010).

Section 1 focused on understanding the teacher certification requirements for a technology education teacher and the related licensure assessments. There was a lapse in research on TE programs and the use of AC programs to provide for these programs. Such research could contribute to teacher growth in the field of education and increased student achievement. The background delivered in Section 1 inferred the need to understand the process of teaching certification and the existing TE teacher shortage.

Section 2 outlined the use of a quantitative study to investigate teacher certification and shortage. Section 3 provided a detailed description of the project. Finally, section 4 outlined the project study's strengths and limitations in addressing the problem, and offered for ways to address the problem.

Section 2: The Methodology

Introduction

The results of the Praxis Technology Education test (2010) was used for this causal comparative designed project study. By examining the results of the Technology Education (TE) licensure assessment, a more accurate assumption for future professional development and support needed for New Jersey TE novice teachers could be made.

Section 2 discussed the reason for choosing a quantitative approach for this project. Because archival data was used for the study, a number of measures were taken to ensure the protection of the participants and their identities. Also this section provided a comprehensive explanation of the setting and population from which the sample was drawn. Other topics covered in this section were data collection and analysis, instrumentation and materials, assumptions, and limitations.

Quantitative Design

Research Design and Approach

This causal-comparative ex post facto study was designed to examine the variance between candidates completing different teacher preparation pathways (Traditional and Alternative) based on the Praxis TE test. Since the data for this study was collected from predetermined instruments, registration bulletin and Praxis TE test, the most appropriate approach for handling the derived statistical data was quantitative (Creswell, 2003). The quantitative approach was used to analyze the archival data (Creswell, 2003). If a significant difference between the teacher preparation pathways existed on the Praxis II TE test, it was defined in the results.

A quantitative model was the most appropriate research method for this study because the research design incorporated data collection methods that were appropriate for statistical analysis (Teddlie & Tashakkori, 2009). Causal-comparative research is best used to identify an existing condition or existing data (Lumpkin, Goodwin, Hope, & Lutfi, 2014). “In causal comparative design, two groups that differ are selected and a comparison is done” (Ragin, 2014). Furthermore, qualitative and mixed methods did not support the research question identified or statistical differences in scores. For example, interviewing participants in a study cannot provide the most accurate and valid data collection of assessment scores necessary to yield reports and analysis concerning the measures of central tendency and variation.

A causal-comparative design appeared better suited to support the comparison of differences between the two groups. Blowe and Price (2012) indicated that a causal-comparative design looked to discover the difference between independent and dependent variables after an event happened. For this study, the independent variables were the certification pathways: alternative (a), and traditional (b). The dependent variable was the Praxis II TE test scores.

Setting and Sample

Archival data was used for this causal comparative project study. The candidates’ information was acquired from the ETS reporting database. This data provided the teacher preparation program, geographic teaching area, undergraduate grade point average, and highest education level. It did not contain the name, age, or specific job location. The data was coded to remove such information to protect the privacy of the candidates. The archival data was collected for the Praxis II Technology Education Assessment.

Because convenient accessibility of archival data, proximity, and job pertinence, the sampling selection method for this project study was convenience. The non-probability sampling technique included 264 teacher TE certification candidates for this study. In non-probability sampling, candidates were chosen arbitrarily. This eliminated a way to approximate the probability of any TC being included in the sample. Random sampling allowed for missing sections of the data due to the randomness of selection, and therefore it was not used.

Of these candidates, 160 completed a traditional certification program and were referred to as Group A. Group A was considered the control group and contained candidates who met the NJ criteria. Group A candidates earned a bachelor's degree from a four-year traditional teacher preparation program in an accredited postsecondary institution. In addition, the candidates met the New Jersey Administrative Code (NJAC) requirement of a 2.75 grade point average or higher.

Group B included 104 candidates who completed an alternative route program. Group B was considered the treatment group and contained candidates who met the New Jersey criteria. Group B earned a four-year degree in technology, engineering, or a related subject area from a postsecondary institution. However, the degree program did not include studies in education. Group B candidates completed at least 2 years of experience in the field of technology, engineering, or related industry. In addition, the candidates earned a grade point average of 2.50 or higher.

Groups A and B were considered novice teachers; therefore they were required to participate in the Provisional Teacher Program (PTP). The purpose of the PTP was to prepare NJ teacher candidates for a career in education. While enrolled in the PTP, the TCs from Groups A and B were required to have a certificate of eligibility (CE) or a certificate of eligibility with advanced standing (CEAS). Groups A and B must successfully complete the PTP prior to receiving a standard teaching license. The PTP required mentorship during the first two years. In turn, New Jersey school districts provided the novice teachers with mentors and support in the hope that the assistance would allow the candidates to obtain certification and attain teaching mastery.

Instrumentation and Materials

The Praxis II Technology Education Assessment was designed to assess knowledge and skills in the following six content categories (ETS, 2010b).:

- Technology and Society
- Technological Design and Problem Solving
- Energy, Power, and Transportation
- Information and Communication Technologies
- Manufacturing and Construction Technologies
- Pedagogical and Professional Studies. (p. 1)

Therefore, the score reported a raw number-correct score for each of the 6 domains. The total score for the Praxis Technology Education (0050) was reported on a scale range of 250-900. The total scaled score was used by New Jersey to determine if an examinee could be granted certification.

The TE test was developed as a national licensure assessment to examine the teacher's knowledge of the content found on the Praxis II TE test. A candidate registered online or via mail for this 2-hour exam which was offered 12 times annually. During the registration process, each candidate made a test selection and provided their background demographics including, teacher preparation program, degree with grade point average, and current teaching status. ETS did not limit the number of retest registrations for each candidate; however, some states did restrict the number of times a candidate could retest. During the final stage of registration, the candidate provided verification of identification and permission to use any results as secured data in future research.

The Praxis II TE test consisted of 120 four-option multiple-choice (MC) items. The test contained 110 MC questions that were scored and 10 MC questions that were used for pretesting and did not count towards a TC score. Pretest questions in this test were used to assess how test takers respond to the questions in the actual testing conditions. The following table indicated the distribution of items across the content categories.

Table 1.

Praxis II Technology Education Scoring Content Categories

Scoring Categories	Approximate% (*n*)
Technology and Society	15% (18)
Technological Design and Problem Solving	20% (24)
Energy, Power, and Transportation	15% (18)
Information and Communication Technologies	15% (18)
Manufacturing and Construction Technologies	15% (18)
Pedagogical and Professional Studies	20% (24)

Note. *Adapted from* the Praxis II Test at a Glance for Technology Education (0050) by ETS, 2009b, Educational Testing Service (ETS), p 1. Copyright 2010 by ETS

Category-level data signified the questions correctly answered within a relatively small subsection of the exam. Being grounded on small numbers of questions, the category scores were less reliable than the official scaled scores, which were based on the full set of questions. Furthermore, the questions in a category may have varied in difficulty from one test form to another. Therefore, the category scores of individuals who have taken different forms of the test were not necessarily comparable. The primary source of validity evidence for the TE license test was derived from the alignment the content on the test and the knowledge and skills needed for safe practice (ETS, 2010).

Creswell (2003) indicated that content validity is established once the instrument measures what it was intended to test. A licensure test provides decision makers with relevant data before credentials are issued to a candidate. The licensure test evaluates the candidate's level of knowledge and skills necessary for instructing safely and effectively. While it is not designed to cover every aspect of content knowledge; it is expected to cover a subset of test specifications deemed necessary for safe practice. The subset of test specifications are used for test development as a part of the evidence-centered design (ECD). ECD is a constructed centered method that adds to the validity of the test.

Because the Praxis II TE test is based on content experts in the field and ECD method, the content validity is clearly established (ETS, 2010). According to the ETS Praxis Technical Manual (2010), the reliability of the Praxis Technology Education test is 0.91. A job analysis survey of technology education teachers and educators is conducted every five years, which supports the reliability for this test. Another way reliability is by established was the consistent test administration and scoring (Creswell, 2003).

If there is evidence that a test measures what it was intended to access, the score results should be consistent with the intended use. Results of the Praxis II TE test are reported to the state and licensing agencies once the scoring process is complete. The final scores are distributed as indicated by the TC. To maintain security and confidentiality, state licensing agencies receive TC scores without background data from ETS. However, an overview of the generic background data is available to the public from ETS per security clearance and several approvals.

Data Collection and Analysis

Permission was obtained from Educational Testing Service to collect the archival data for this study. Before the data was acquired, a permission request for the study was submitted to the ETS Praxis Program Product Director. Upon receipt of approval to pursue the study, the approval notification was submitted to ETS General Counsel’s office for data use authorization and agreement documentation. The data use agreement was signed and the IRB approval (02-04-14-0080055) was acquired before the data was obtained. After the IRB approval, the letter of approval and the signed data use agreement were submitted to the client data service coordinator for access of aggregated Praxis data. The completed research results were reported to the ETS Praxis Program Product Director.

At the beginning of the Praxis II TE test, the TC signed a statement permitting their data to be used for confidential research. With the completion of the acceptance user statement, the participants’ demographic information was collected by Educational Testing Service. TC data was purged of all identifying factors prior to being made available to the researcher.

Most published CTE research reflects an extensive use of t-test and analysis of variance (ANOVA) procedures (Kim, Asunda, & Rojewski, 2009). To remain comparable to the limited published works, t-test was used to compare the groups in this CTE study. Rojewski, Lee, and

Gemici (2012) indicated that “t-test evaluated whether mean scores of two groups were statistically different from one another relative to an estimate of sample variability” (p. 264). The following research question guided this project study:

Question 1: Is there a significant mean difference between the group A and group B on the Praxis II TE test?

H_1: There is a significant mean difference between control group A and treatment group B on the Praxis II TE test.

H_{01}**:** There is no significant mean difference in the scores between the control group A and the treatment group B on the Praxis II TE test.

Assumptions

The following assumptions were identified as possibly affecting the results of the study. First, the focal point of this study was an ongoing topic for many school districts within New Jersey. Even if the teacher shortage was not an issue for all school districts, attrition continued to be a factor for TE teachers statewide (Steinke & Putnam, 2010). Second, the archival data gathered from the database was correctly coded for each TC’s test results.

Limitations

The following limitations were considered as constraints that were beyond the control of the researcher. First, the archival data was collected by ETS and was archived as secure raw data. Second, this archival data did not represent a complete population of TE teachers entering the field.

Delimitations

The scope of this study was to identify any differences in test scores of group A and B on standardized teacher licensure assessments. Although the results were generalized by other states that required the Praxis II TE assessment as one part of the certification requirement, it was intended to research the TE teacher candidates in the state of New Jersey.

Delimitations of the study included how groups A and B performed on the Praxis TE licensure assessment based on the certification path followed. When considering the cut score in the study, the TC must earn a score of 570 or higher. This cut score was established by the state. A TC that earned below the cut score may retake the assessment until the required score was reached. Finally, the study included only TCs from New Jersey.

Measures for Participant Protection

In order to maintain confidentiality, ETS provides coded data before release to any researchers in order to protect the identification of the test taker. Only the state receives the score reports with the teacher candidates' name and related score(s). As a researcher, I followed the ethical guidelines provided by the Walden University's Institutional Review Board (IRB) to complete this study. After five years of storage in a secured electronic black box at the researcher's residence, all data will be safely destroyed.

Results

Teacher certification is important for a licensing state to consider when addressing the challenge of staffing CTE programs. According to Atteberry, Loeb, and Wyckoff (2013), evidence suggested that teacher certification is the initial indicator of effectiveness. The purpose of this quantitative study was to (a) determine if there was a significant difference in the scores of teacher candidates in New Jersey seeking certification in technology education and (b) determine if there are significant differences between the TE teachers completing different preparation programs. By analyzing the Praxis II Technology Education test scores for new teachers completing alternative preparation program, versus those who completed a traditional preparation program, this study indicated whether the preparation program was a factor for new TE teachers as they transition into a CTE classroom. The Praxis II TE test, that must be passed before licensure is granted, was created and scored by Educational Testing Service (ETS). Comparing the individual scores against the 570 cut score, which was set by the state, validates teachers' competency.

This research study was guided by one research question: Is there a significant difference in the test scores between the control group (A) and the treatment group (B) on the Praxis II Technology Education licensure test? The null hypothesis (*H*0) is that there is no difference in the scores between the control group A and the treatment group B on the Praxis II TE test.

In order to determine if there was a significant difference, the Statistical Package for Social Sciences (SPSS) data analysis program issued by Walden University was used to perform a paired-sample *t* test on 264 TE teachers from two preparation programs. Additionally, Excel spreadsheet software was used as a tool to further analyze the *t* test results. The 264 professional candidates registered for the Praxis Technology Education test. These professional candidates sought certification to teach in the CTE classroom setting. Some had occupational certifications in the technology field while others never received official occupational training. Following the procedures submitted in the approval IRB and the guidelines presented by ETS, the study was conducted on the archival data. The data agreement provided the consent necessary to analyze the archival data of the TE teachers.

The result of analysis of the research question, displayed in Figure 1, indicated that the mean score for alternative prepared teachers (Group B) was above the passing cut score of 570; (*M*= 630.96, *SD* = 62.26). The mean score was not significantly greater than the mean for traditionally prepared teachers (Group A) level; (*M*= 628.88, *SD* = 54.98). Chart 1 reflects the difference in the mean score of 104 AC teachers (group A) compared to 160 TCR teachers (group B). While the mean of AC teachers passed the test, the number of AC teachers passing the Praxis TE test has decreased. In the past 7 years, the number of failures for the AC teachers increased from 5% to 18%.

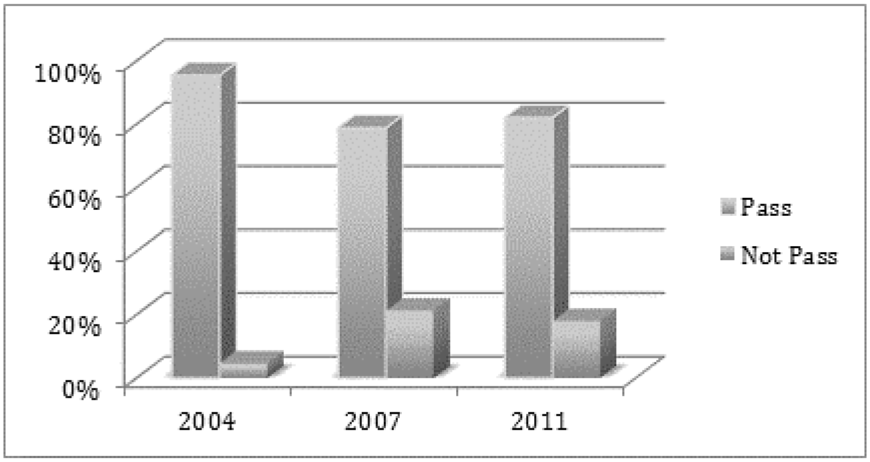

Figure 1. Percentage of failures on the Praxis TE test from 2004 to 2011 for AC candidates. Note. Adapted from ETS, 2010b by, Educational Testing Service (ETS), p 1. Copyright 2010 by ETS

This data indicated that 39% of TE teachers in the study completed an AC program. Many of the AC teachers in this study had field experience or completed an occupational training program. The 104 alternatively trained TE teachers had prior work experiences. The other TE teachers completed traditional training and had a class assignment prior to the start of the school year (see Table 2). The data indicated that 79 (30%) of all candidates earned a bachelor's degree. The data also indicated that forty of the 264 (15%) of the candidates earned a master's degree (see Table 3). The other educational levels identified were vocational programs, apprenticeship, etc.

Table 2.

Composition of Analyzed Teachers

Teachers	Frequency	Percent
Traditionally certified teachers	160	61.0
Alternatively certified teachers	104	39.0
Total	264	100.0

Note. Adapted from ETS, 2010b by, Educational Testing Service (ETS), p 1. Copyright 2010 by ETS

Table 3.

Educational Level of TE Teachers

Educational Levels	Frequency	Percent
Alternate route program	104	40.0
Bachelor's degree	79	30.0
Master's degree	40	15.0
Other	11	4.0
Non educational program	25	9.0
Post-baccalaureate program	4	2.0
Total	264	100.0

Note. Adapted from ETS, 2010b by, Educational Testing Service (ETS), p 1. Copyright 2010 by ETS

A completed t-test statistical analysis resulted in t = .7804, *p* = .435. The $p \geq .05$ which indicated a significant difference was not evident between the A and B group mean scores. There was not a significant difference in the scores between the control group A and the treatment group B on the Praxis II Technology Education licensure test.

Table 4

Paired-Samples Statistics t test for Praxis II Technology Education licensure assessment.

Variable	Alternative Route Certification	Traditional Route Certification
N=	104	160
Average	630.9615385	628.875
STDEV=	62.26344329	54.93263456
High	693.2249818	683.8076346
Low	568.6980952	573.9423654
t test	0.78042589633238	

*P.>05

Conclusion

The purpose of this project study was to explore the scoring differences between group A (TCR candidates) and group B (AC candidates) on the Praxis II TE test. During the data analysis, t-test was conducted to compare data between group A and B. The software applications, Excel and SPSS, were used. The t-test statistics determined there was not a significant difference between the groups. Throughout the study, the protection of participants' rights was maintained.

Section 3 provided a detailed description of the project including evaluation procedures, and implications for social change.

Section 3: The Project

Introduction

Section 3 presented an epigrammatic description of the project, as well as a literature review. Between 1999 and 2012, the number of Technology Education teachers who entered the profession by way of alternative certification (AC) in NJ steadily increased. There was concern that the AC candidates did not possess the required pedagogical skills for efficiency and efficacy in the classroom (Reeve, 2010). The purpose of this project study was to evaluate the difference in test scores of those following a traditional path versus an alternative path to certification in New Jersey. Because certification was required prior to entry to the teaching profession in New Jersey, this project reviewed the standardized assessment used to measure candidates pursuing alternative certification (AC) and traditional certification (TCR).

Hirshberg (2011) suggested that AC candidates have greater content knowledge due to the combination of coursework and occupational experience. However, Reeve (E. Reeve, personal communication, May 12 2010) indicated, "the typical AC TE teacher has the industrial experience but lacks the necessary pedagogy or methodology for instruction." The most controversial discussion in TE surrounds the reliability of alternative certification programs in comparison to traditional programs that prepared new teachers (Sass, 2011). In order to prepare teachers of elementary levels, a traditional program may work more appropriately; however, for secondary programs that require specific content knowledge and practical instructional methodology, an alternative preparation program may be more appropriate (Shuls & Ritter, 2013). The decline in scores on the TE assessment supports the need for an induction program that will provide instructional and mentoring support for new TE teachers. The program should incorporate all practical aspects of the TE programs: science, technology, engineering, and math, as they are part of the comprehensive approach to teach Career and Technical Education (CTE) students (NJDOE, 2013).

Since new TE teachers are responsible for educating students enrolled in CTE courses, it is important to evaluate the curriculum framework as well as the new teacher's knowledge when developing a preparation program. Before this study, I could not determine if there would be a significant difference between the alternative and traditional candidates and if a teacher pre-service program would be needed for the two different pathways to certification. However, the data indicates that the mean scores on this standardized assessment have steadily declined. A decline in the available CTTE programs and the mean test scores created an environment where new TE teachers are considered less prepared for the first year of teaching, which is considered critical to teacher retention. This decline translates into a need for peer support and professional development for candidates pursuing the subject matter licensure. Based on the literature, the AC candidates have more industrial knowledge, decision-making skills, and higher innovative technology skills (Bottoms et al, 2013).

Another driving factor for increasing support and professional development was higher attrition rates for new TE teachers, which exceeded that of many other groups (Wiseman, 2012). Collective research indicated the rates were highest in the first 5 years of teaching technology education. Wilkin & Nwoke (2011) indicated that 33% of new CTE teachers left the teaching within the first 3 years and 46% left within 5 years. Darling-Hammond (2012) reported that AC teachers also have a high attrition rate since many new CTE teachers leave by their third year. There were approximately 15% of new TE teachers that left within the first year and an additional 15% expected to leave each school year (Ingersoll, 2011). Research has also shown that new TE teachers were more likely to remain in the classroom if they were supported during the first five years of teaching (NEA, 2012).

Project Description

New Jersey used the Provisional Teacher Program (PTP) to support all new teachers that completed alternative and traditional pathways to certification. While under a provisional certification, new teachers are supervised by experienced educators. Successful completion of the PTP is a requirement for standard NJ certification. In New Jersey, each new teacher that earned alternative certification is required to participate in 20 days of mentoring prior to working in the classroom (NJDOE, 2013). During that 20-day period, the candidates are required to receive mentoring and concentrated instruction, which prepares them for the first year of school. Many NJ school districts were faced with providing a 20-day mentor program for each new AC teacher preparing to teach TE.

For many school districts, staffing for mentoring programs often include experienced and retired CTE teachers. The experienced CTE teachers are considered staff that worked fulltime with students in the classroom setting. The retired CTE teachers are former educators who previously worked in a school system as a successful CTE educator. Many districts faced complications with finding experienced and retired CTE staff to perform mentoring. For current teachers, the burden of the existing workloads caused a barrier. The New Jersey pension system limits the amount of worked hours for retired teachers. This resulted in new AC teachers not receiving adequate support, which was considered critical for student success and teacher retention (Doolan, 2012). Many districts were in need of a viable solution to effectively prepare both AC and TCR novice teachers.

NJ School Districts developed creative solutions to address the 20-day requirement for novice teachers. Some school districts recognized the hours used for summer school observations prior to the start of school as a part of the 20-day requirement. Other school districts permitted AC teachers hired midyear to meet the 20-day requirement by observing a mentor or another highly effective veteran teacher during instruction. This solution allows each district to share the mentoring responsibility, so that multiple mentors are used throughout the day or week. Another popular solution was the extension of the 20-day mentoring requirement over a longer period of time. As another viable solution for new TE teachers, this project study provides data to support the development of a research-based teacher advisor and mentor program.

In section 2, I compared the certification preparation programs in tandem with the results on the Praxis II TE exam. The outcome indicated there was no significant difference between the knowledge and skills of new TE candidates completing either preparation program. Since a significant difference was not identified within the standardized licensing test data, the interpretation is that more attention is required on other strategies that will improve and support teaching Technology Education. Providing high-quality professional development is a strategy that combats high attrition while improving teaching instruction (Hightower et al., 2011). Based on this data, I structured a new pre-service program that would be suitable for all new TE teachers. TE teachers who completed a traditional or alternative preparation program would use the new pre-service program as a resource for pedagogical and classroom support.

Teacher Advisory Mentor Program (TAMP) is a pre-service program designed to prepare new TE teachers for the transition into a classroom. TAMP incorporates both an experienced classroom teacher mentor, who provided the theoretical or methodological support, and an occupational experienced advisor, who provided practical support for the TE teachers in the CTE program. TAMP included key topics in a TE classroom: classroom management, technology efficacy, student organizations, communication tools, and contextual learning. In addition, TAMP covered other topics related to professional support and growth including work place articulations, inventory and equipment maintenance, and balancing teaching-life responsibilities. Experienced TE teachers who are knowledgeable of the district policies and CTE program requirements will be recruited to deliver instructional workshops. Occupational experts who are knowledgeable of current practices in the industry are motivated to participate in the occupational learning sessions.

TAMP follows the strategy of many New Jersey school districts in recognizing hours used as a way of meeting the 20-day requirement. Twenty days of contact time is equivalent to 90 hours of mentoring time (NJDOE, 2014). This program follows the same provision that allows school districts to count orientation, induction sessions, and summer clinical experiences towards achieving the 20-day requirement. TAMP is scheduled for a total 100 professional development hours.

During the orientation sessions of TAMP, a new TE teacher attends a collection of workshops that run 1 to 2 hours in length. The new TE teachers received a variety of teaching strategies and protocols that are useful in a TE classroom. These strategies and protocols include peer-to-peer planning, media simulations, and understanding contextual teaching and learning (CTL). Additionally, a new TE teacher works with an occupational advisor from the field to plan correlating or supporting activities for the TE classroom environment.

The new TAMP is offered during three terms, two in the summer and a third during winter break for midyear hires. The TAMP requires new TE teachers to complete 100 hours of mentoring and a portfolio of lessons and activities generated. During the first day, a new TE teacher attends a split day orientation: The first half of the day focuses on general teaching orientation and the second half on CTE orientation. Following the two orientation sessions, a new TE teacher is assigned a teacher mentor from the CTE program. A new TE teacher spends week 1 in workshops learning strategies and skills needed to teach in a technical classroom setting. During week 2, a new TE teacher identifies and develops activities that can link the outside world to the classroom. In week 3, a new TE teacher and the mentor work together to plan units and classroom strategies based on lessons learned during weeks 1 and 2.

For week 2, an advisor from the occupational field is assigned. This advisor is not an employee of the school district but is an active member from the business community. The main role of the advisor is to provide occupational knowledge and to serve as a connector to the current work practices. The field advisor works with a new TE teacher during week 2 of TAMP and follows up throughout the year. The main purpose for the subsequent follow up sessions is to provide a new TE teacher with an opportunity to update classroom related activities and skills according to current practices. A new TE teacher contacts the field advisor throughout the year via a preferred communication mode. During the scheduled professional development days, a new TE teacher continues to work with the school mentor and the external field advisor assigned. Journals are used to record reflections and information gleaned from the professional development experience. This reflective journal is stored in the new teacher portfolio.

Each New Jersey school district is responsible for implementing professional development plans, which subsumes mentoring programs. The New Jersey regulations for mentoring specified in N.J.A.C.6A:9-8, mandates that districts provide support to novice teachers and allocate funds to accomplish practices that align with the Professional Standards for Teachers. The training and mentorship programs are supported and funded by the Carl D.

Perkins Career and Technical Education Improvement Act of 2006 (NASDCTEc, 2013). In addition to federal Perkins funding, a school district is allocated $180 for each new teacher (NJDOE, 2013). Districts that cannot fund CTE mentorships are able to partner with local businesses and educational institutions for voluntary advisors. Occupational advisors are considered critical for ensuring the efficiency and relevance of all CTE programs (National Research Center for Career and Technical Education [NRCCTE], 2010). A key benefit of the occupational advisor is the zero cost since they are volunteers from the local and regional business communities. For TAMP, a classroom mentor receives a stipend, while the occupational advisor is a volunteer. Many CTE programs use advisory boards to make recommendations on the academic programs. Therefore, a member of the advisory board is the ideal candidate to serve as a TAMP advisor.

Rationale for choosing this project

The teacher shortage has had a detrimental impact on the quality of education that a student receives in New Jersey school districts (Ingersoll & May, 2011). The school districts have used a variety of recruitment incentives to attract new talent, but the shortage of TE teachers has remained. Alternative certification was cited as an effective solution to combat the TE teacher shortage problem; however, there were debatable concerns regarding the preparation method (National Council for Accreditation of Teacher Education, 2012). Statistical evidence was needed to identify the significant difference, if any, rather than relying on the assumptions of an experienced TE teacher or teacher educator. State officials noticed that a one size fits all solution would not increase or support teacher quality (Klein, 2012). Research indicated an increase in the use of alternative certification programs; however, the mentoring programs available to support the AC programs varied (Brown & Ratcliff, 2011; Levy, 2008).

It was not clear if a mentor program existed that addressed the uniqueness of a TE learning environment. With so many new TE teachers exiting the profession in the first three years, a concern developed regarding a lack of professional support (Martinez-Garcia & Slate, 2013). According to Darling-Hammond (2011) it was important to provide program and professional support that strengthened the CTE program and reinforced the TE educational goals and classroom structure. In order to provide appropriate professional support in the TAMP, the statistical results were necessary.

The findings from the data collected in Section 2 demonstrated that there was no significant difference between the test scores of the candidates completing a traditional or an alternative teacher preparation program. As a result, a professional development program was established to support new TE teachers. Pappa (2014) affirmed that professional development is an essential link to teaching efficiency and student learning success. Furthermore, Pappa contended that professional development, as a subject-specific support system will train replacement TE teachers who are needed. Accordingly, the newly developed TAMP would provide a subject-specific support system for new TE teachers.

I chose to pursue this quantitative study in an effort to work towards social change in teacher certification by developing a program that may improve the knowledge of new TE teachers as well as support teacher retention in CTE. The suggested project was designed to provide data and research that supported the professional development of a new TE teacher. By providing state officials with information needed to make data driven decisions, a valid program can be established to meet the needs of all new CTE teachers.

Scholarly Rationale for How the Problem was Addressed in this Project

Knowles' (1984) theory of andragogy and Kolb's (1978) experiential learning theory provided the outline for developing an induction program for TE teachers. The use of induction and mentor programs has proven beneficial for supporting novice teachers (Fantilli & McDoudall, 2009). Such programs support professional growth and work towards the retention of new teachers (Stanulis & Ames, 2009). A system that included advisors and mentors supports transition of an occupational professional from a novice teacher to a master (Iordanides &Vryoni, 2013). For the past decade, research has supported mentorship as a tool for new teacher retention (Waterman & Ye, 2011).

In summary, the TAMP was designed to reflect a program that was based on collected quantitative data. The data results provided insight into the knowledge, skills, and support needed for new TE teachers.

Review of the Literature

The concepts of mentoring in business and education are examined in this review. A variety of database searches completed through the Walden University library, Education Resources Information Center, and Internet searches were used to conduct this review. The search terms included: mentorship, teacher mentoring, and teacher induction programs. This literature review examined studies that documented the impact of induction and mentoring programs, effects of mentoring programs, and essential components of mentoring programs.

Theoretical Framework

Knowles's Theory of Andragogy (1980) supported the theoretical framework of professional development for a new teacher. According to Khanal (2013), teachers need to receive feedback on their improvement and see the results of their learning. The professional development activities should contain opportunities that allow the new teacher to apply the learning and receive constructive feedback. According to Rizk (2011), many new AC teachers function as advanced beginners using experiential learning to adapt to subject specific classroom settings.

Kolb's (1984) philosophy of experiential learning focused on experience as the most important tool for teaching. Kolb's (1984) philosophy supports a teacher using their occupational knowledge to instruction in the classroom. As more TE teachers entered the field, the need for preparation, support, and mentoring increased (Workman & Stubbs, 2012). According to Waterman and He (2011), the purpose of the teacher mentorship is to increase pedagogical knowledge and provide a support system for the new teacher.

Mentorship

Mentoring is a process that focuses on providing professional guidance in a new career or occupation (Ralph & Walker, 2013). According to Ingersoll and Strong (2011), mentors provide support to new teachers through modeling instruction. Connor, Malow, and Bisland (2011) indicated that mentorships for new teachers provided an opportunity to form a connection and work toward a common goal of teacher quality. In order to support technical teachers and increase teacher retention rates, a mentorship must include strategies and components grounded in adult learning and experiential learning theories. (Wallen et al., 2010). The literature indicated that teachers who participated in a mentorship experienced less stress and felt more supported (Alansari & Langdon, 2012).

A mentorship can be both formal and informal (Smith & Evans, 2010). A formal mentorship matches a new teacher with an experienced teacher that can help to develop the goals and skills of the new teacher. Typically, a mentor agrees to complete the established mentoring activities throughout the predetermined time period. This time period is usually 6 months to24 months (Ryde, Dinsmore, Alexander, & Langdon, 2012). The advantages of a formal mentorship include greater job satisfaction and the development of a strong support system. A disadvantage is that some professionals are not compatible. In this situation, the new teacher most likely disconnected from the mentor (Froman, 2011).

The informal mentorship is a self-imposed relationship based on similar experiences or a common interest. These relationships typically extend beyond the time required for a formal mentorship. The informal mentorship exists for one to six years depending on the new teacher's needs. Informal mentoring allows a mentor to be an experienced teacher or a supervisor (Baumert, 2013). The reciprocal voluntary connection in informal mentoring is the most favorable (Desimone, et. al., 2014). An unfavorable factor is the nonexistent recognition of the mentorship. Another unfavorable factor is the misinterpretation of the relationship for nepotism by colleagues. Formal and informal mentorships serve a role in developing a highly qualified CTE teacher (Billingsley, Crockett, & Kamman, 2014).

Business versus Educational Mentorships

For a CTE professional, mentoring is most beneficial when derived from different environments. One environment is business, which uses mentoring as a means of supporting newer colleagues in their career planning. A mentorship in this environment is considered a tool to support a professional in the workplace (Aldeman, 2011). The ideal outcome of a business mentorship is the development of the new employee's self-esteem, confidence, and support in the workplace (de Janasz & Godshalk, 2013). Another environment that supports a mentorship is the educational system. In education, the concept of mentoring is used as a means of preparing and supporting newer teachers adapting to the first year of teaching. A mentorship is considered important for retaining staff and professional development (Billingsley, Crockett, & Kamman, 2014). Both mentorships, in business and education, are driven to support new staff members (DeAngelis, Wall, & Che, 2013).

The principal design of a mentorship for a TE teacher is focused on benefiting the new teachers but it can be beneficial to both parties. Mentoring requires a willingness to share, listen, and learn in order to build a flexible relationship between the mentor and new teacher (ASHA, 2013). The literature indicates that mentoring results in retention and job satisfaction in addition to growth for both the mentor and new teacher (Aldeman et.al, 2011). In addition, another role of the mentorship in a CTE program is the creation of a field advisor (Foster et. al., 2013). A field advisor serves on the CTE advisory board and establishes a connection between the occupational work and the classroom setting (Duncan, Cannon, & Kitchel, 2013).

Potential Resources and Existing Supports

Completing this project successfully required the archival data from Educational Testing Service, which included the scoring results for teachers participating in the certification examination for licensure. The Technology Education teacher licensure exam is a national test. Only teachers from New Jersey were chosen for this study. The participating teachers and data collection were completed in an ethical manner. Before I acquired the data, I submitted a permission request to perform the study to the ETS Praxis Program Product Director. After I received the approval to complete the study, the approval was submitted to ETS General Counsel's office for data use authorization and agreement documentation. The data use agreement and the IRB approval (02-04-14-0080055) were received before the data was accessed. After receiving IRB approval and a signed data use agreement, I requested the aggregated Praxis data from the ETS data service coordinator.

Potential Barriers

A variety of barriers could have presented problems in the completion of this project study. For example, TC may provide false certification program information or may be reluctant to provide background information. Fortunately, this study did not have evidence of such barriers. An additional barrier with a high possibility was the TC's awareness of different technologies available in the classroom. Pre-service technology training would assist in decreasing this barrier. Many new AC teacher candidates were not aware of the limited technologies equipment students have access to in the technology education classroom. AC teacher candidates may be more familiar to new technology available in the field but some school districts do not own such technologies and technical support. Finally, a barrier to this study is the limited number of candidates taking the Praxis II TE test. The higher salary offered in the technology and engineering fields has served as a deterrent in TE recruitment. As the salaries increase for professionals in the technology field, many professionals are reluctant to enter the field of teaching (Goodman, & Turner, 2013).

Proposal for Project Implementation and Time Table

This project should be implemented the first 20 days after the hire date of new TE teacher. This ongoing project would be used to support the new TE teacher for one year. The primary goal is to use this project with the new hire orientation. The new TE teacher could potentially start in the program twice a summer, specifically July and August. The detailed timetable in Appendix A proposed the activities of the TAMP. The new TE teachers would complete the evaluation documentations in Appendix B. At the close of each school year, the school districts could review the statistics regarding the retention of the new TE teachers.

Roles and Responsibilities

Teachers were not directly involved in this project study so they did not hold any roles or responsibilities. However, teachers' test scores were gathered with the intention of supporting the quantitative findings. Teacher participants signed a statement of consent informing them that their scores might be used for future research. The Product director for the Praxis program and the general counsel provided approval before accessing the test data. During the process of obtaining the data, the privacy of the TC was ensured. Moreover, the researcher signed a data use agreement form that requested access to aggregated data. In order to conduct the data analysis for this research study, the research was compliant with the regulations set forth by Walden University and Educational Testing Service.

Project Evaluation

Summative data is included in the evaluation plan of this project study. Sawyer (2012) explained how "data for summative evaluation is used to facilitate collecting more precise information" (para 3). This quantitative data incorporated test scores of TCs as well as the background information collected via the registration bulletin. Sawyer described how summative evaluation "focuses on gathering specific kinds of outcome data, such as test scores, to determine whether the project had impact on programs or interventions" (para. 2).

An outcomes based evaluation plan was used for this research study, which collected summative data and provided an analysis of teacher candidates' performance on the Praxis II TE exam. The outcomes used as indicators included teacher certification methods and how preparation methods affected teacher performance on a standardized licensure assessment. The performance measures included the teachers' testing results and any significant differences in the quantitative data. The overall evaluation goals of this project study included an analysis of the differences in certification testing results and a professional development resource for new TE teachers. Another evaluation goal of this project study included comparing the certification pathways used to certify new TE teachers. Another stakeholder considered was the local business community, which has a vested interest in developing the future workforce.

Implications for Social Change

The New Jersey Department of Education (2014) identified two major pathways for new TE teachers seeking standard certification. The pathways (alternative and traditional certification) have a range of requirements, which included the successful completion of a preparation program and a passing score on the Praxis II TE licensure exam. The licensure exam assessed the core level of knowledge and skill required for a new teacher to enter the classroom. The exam served as the common thread amongst the pathways that were used when analyzing the variance in preparation and planning for a professional development plan. The preparation required for a new TE teacher was prescribed by a collection of teaching standards and core content competencies (AFT, 2012). By offering a mentoring program within a professional development plan might reinforce the standards and competencies (Neapolitan, 2011).

At the secondary level program, TE teachers are required to use technology as a tool for production as well as in methodology for their teaching practices. In support of this, a new TE teacher should receive the necessary professional development and support, which is provided in a mentor program. The availability of professional support for new TE teachers has a profound impact upon student achievement; therefore, in order to address teacher retention, quality, and efficacy, as well as technological requirements within the classroom, Aldeman et al. (2011) proposed the mentoring aspect of professional development. The mentoring program would function to better prepare and support new TE teachers for the profession. To support this goal of providing appropriate professional development opportunities for new CTE teachers, there was a reauthorization of the Carl Perkins Career and Technical Education Act of 2006 (Perkins IV). Perkins IV supports structuring a process and program to ensure mentoring and support services that are provided for CTE staff, which includes TE teachers. The federal law “ensured that secondary and postsecondary programs build the academic, career, and technical skills of students” (p. 1). The objective of Perkins IV was driven by teacher quality, which Perkins IV “recognized as imperative for efficacy and sustainability of CTE programs” (p. 3). The outcomes of this study seek to contribute to positive social change in that it utilized data analysis of new teachers’ test results on the TE licensure exam to prepare a viable solution for professional development in the form of a mentor program.

Local Community

Results from this study contributed to positive social change by showcasing differences in the certification programs and providing viable support for preparing new TE teachers. State officials appraising this research should find it beneficial when trying to understand the effects of the teacher shortage in career and technical education. State officials are encouraged to provide pre-service support and programs conducive to preparing teachers for a variety of courses taught in the TE curriculum. State officials, administrators, and mentors reviewing this research will become aware of the requirements for new TE teachers.

Far-Reaching

The research study underwrites the far-reaching objective of positive social change, in that it is helping to eliminate the gap between AC and TCR teachers working in NJ public education. Understandably, TCs entering the teaching field through AC and TCR programs have a different understanding of the procedures necessary for new educators. However, many school districts provide a core set of technological standards and policies that must be upheld. Unfortunately, many new TE teachers become overwhelmed due to a lack of preparation to cover all of the required courses within the career pathways. This research will help school districts prepare new TE teachers for most aspects of the new classroom position in addition to connecting the classroom to the work world, which could help each student to succeed.

Conclusion

This quantitative research was used to explore the difference in test scores of those following a traditional path versus an alternative path to certification. The results and literature review guided the development of a mentoring program for new TE teachers. The quantitative data was collected over the past 5 years as TE teachers registered and completed the Praxis II TE test. The scores represent the first attempt for each TE teacher candidate taking the Praxis II TE test. The testing result data was analyzed using the t-test method.

Many studies identified mentorship as a tool with positive impact on novice teachers. In the business community, mentorship is critical for healthy professional and organizational growth (AAEA, 2011). Likewise in the academic community, mentorship is a key element to professional growth and teacher retention (Benbow, 2012). However, research indicated that the reason why the mentor role was hard to fill was due to pension restrictions on retired teachers and a limited number of experienced TE teachers (Thornton, 2014; Elias, 2013; Hudson, 2013). Overall, this study provided an in-depth analysis on teacher certification and mentorship.

Section 4: Reflections and Conclusions

Introduction

Section 4 summarized the strengths and limitations for this project study. Within section 4, an analysis will be provided for the development and the implications of the project as well as the impact on scholarship and social change. As the researcher, I indicated how the project study affected leadership and change in the Career and Technical Education (CTE) field. Recommendations for future research regarding the development and implementation of new teacher advisory mentor programs are addressed.

Project Strengths

The new teacher advisory mentor program (TAMP) was designed to prepare new TE teachers in the CTE field. The strength of this project is that it can be used to accommodate all TE teachers entering the field. Knowles' (1984) theory of Andragogy and Kolb's (1984) experiential theory provided the framework for this project and supported the developmental learning for the new TE teachers. Other teachers within the CTE program could take the concepts of TAMP and apply them to each of the career clusters or pathways. The capability to adapt this project to other CTE career clusters benefited new teachers. An additional strength for this study was that TAMP could easily adapt for all programs within the CTE program. The prototype allowed state officials and individual school districts the ability to improve the pedagogical knowledge as well as increase retention of new CTE teachers within New Jersey.

Project Limitations

Since the researcher used convenience sampling selection, generalized findings were prevented. Other limitations included not knowing the results of the study due to timing restrictions. Therefore the effect on actual recruitment and retention of new TE teachers will not be known.

Also New Jersey school districts cannot predict the actual cost savings of such a program until more time more has passed. Future longitudinal research should focus on the real rates for recruitment and retention of new TE teachers. This research would determine the efficacy of TAMP and the efficiency of the mentorship. There was a need to continue research on the effectiveness of the TAMP program within the CTE program.

Recommendations for Addressing the Problem

An effective way to address the problem of teacher quality and retention would be to expand the mentoring models to support a new TE teacher. According to the NRCCTE (2010), a mentor program should focus on its effectiveness in preparing a new TE teacher. Additionally the function of the mentor could be extended to include occupational advisors. This extension could be accomplished with the use of TAMP. Also this study should be duplicated and include different CTE programs. Future longitudinal studies should evaluate the mentor program and its effectiveness on teacher retention and quality.

Scholarship

Scholarship involves many forms of academic work (e.g., research activity, teaching). Walden University scholarship involved developing the existing knowledge and research skills of the doctoral candidate, which empowered them to promote social change. My scholarship was developed through the research of a new teacher advisory mentor program designed to increase the support and knowledge of New Jersey teachers in the technology education specialty.

Utilizing methods for synthesizing information, collecting data, and analyzing data taught by Walden University provided the new knowledge needed to develop a project to support new teachers in the profession. The scholarship in teaching “promoted a scholarly endeavor and a worthy subject for research, producing a public body of knowledge open to critique and evaluation" (Mycue, 2014) As this project study progressed, I realized that the completion was contingent on the collaboration of my chair, my family, other members of the Walden faculty, and myself. I also learned that I must be disciplined and patient as I acquired the knowledge and experience needed for the pathway to scholarship.

Project Development and Evaluation

Walden supports the concept of using positive social change to improve the human and social conditions for others (Yob, 2012). The project development allowed for improved conditions for new TE teachers, mentors, and school districts by developing a program that transitions the new teachers into the classroom. While the preparation of new AC teachers in the TE program was questioned, I pursued the idea of providing a unique support system. As the researcher, I experienced a number of challenges at nearly every stage. As a former CTE teacher, I had interest in a new teacher advisory mentor program for new TE teachers that required a support program.

Leadership and Change

As I worked though the development of this study, my leadership skills have evolved. The project was instrumental in implementing a positive change to the retention of new teachers in technology education. This project afforded an opportunity to learn more about the barriers facing new TE teachers. As a result, I began my mission of advocacy for TE teachers receiving appropriate professional development.

I realized that some school districts might be resistant to implementing a new teacher advisory mentor program. However the new teacher advisory mentor program would use the existing professional development hours required by the state. Also, research supported the long term effects of programs such as TAMP resulting in increased retention and a positive impact on new teachers' recruitment (Nasser-Abu Alhija & Fresko, 2014). This change in professional development could lead to a better support system for new TE teachers.

Self-Analysis Scholarship

I experienced many challenges in my journey to becoming a scholar. This project required that I strengthen self-motivation as I worked through the barriers presented by Walden, work, and life. My cultivated support system grew to include coworkers, former colleagues, and Walden classmates. I also learned about focal issues surrounding state licensure and gained understanding of the certification processes. Connor, Malow, and Bisland (2011) indicated that many states are experimenting with certification when considering the use of alternative routes for teacher preparation. Although the certification processes differed for each pathway, my research became more rewarding as I learned more.

My cognitive ability and writing skills have expanded as a result of the revisions and review of this project study. I respected the purpose of having an ongoing plan to document the goals for each semester. As I continued my research, I desired to improve the overview and outline of the new teacher advisory mentor program so that it could accommodate all CTE specialty educators or teachers in other similar programs.

Self-Analysis Practitioner

As a practitioner and a researcher, I collaborated with licensure agencies, assessment organizations, and teacher educators to improve the preparation for new TE teachers not only in New Jersey where I am employed, but also in the national spectrum of research for CTE programs. I hope this collective shared knowledge has contributed to social change. During the development of this project study, I have expanded my work and academic experiences into my assessment and data analysis process. As an educator, I have realized the benefit of fostering partnerships among the preparation institutions and national assessment organizations developing licensure assessments. Doing so promotes social change not only for teacher education but also in licensure assessments. Sharing this research project might result in benefits for new teachers who required assistance prior to becoming engaged in their classroom practices and assignments. My hope was to see other U.S. states develop a new TAMP initiative which could increase the pedagogical knowledge and content skills needed for new TE teachers, and which could ultimately assure retention after recruitment.

Self-Analysis Project Developer

This study afforded the opportunity to take on the role of project developer. Even though I had experience in my current role as an assessment process specialist developing test materials, this project study required that I expand my critical thinking skills and network of colleagues. As the researcher, I improved my capacity to acquire data, analyze information, process assumptions, and interpolate this collective information into a scholarly document. After completing the scholarly document, I recognized that the new TE teacher might be best supported by the new TAMP within the CTE program.

During the development of the scholarly document and the TAMP, I found it challenging to find current literature on TE teachers, as the educational focus has not been on CTE programs for the last five years. Thus, the review and development of the literature for this project study was time consuming. A variety of database searches directed through the Walden University library, Education Resources Information Center, and Internet searches were used to conduct this review. Search terms used include: mentorship, teacher mentoring, and teacher induction programs. The lack of available current literature helped to realize that my research has importance in the CTE specialty field. Having current research in the field was necessary when preparing for new TE teacher preparation.

Impact on Social Change

"Positive social change is defined as a deliberate process of creating and applying strategies to promote the development of individuals" (WU, 2014). A significant goal of this project study was to generate a result that improved social conditions. The result of this study included addressing the needs of new TE teachers transitioning into the classroom and knowledge transfer from expert to novice teachers, which in turn would improve the social condition for school districts experiencing a teacher shortage. New TE teachers appeared to have a set of commonalities that might benefit the new TAMP. The new TAMP would have the aptitude to improve the pedagogical knowledge and content skills for newly recruited TE teachers and support retention. This was imperative for the future success of the TE teachers as well as the permanency of the CTE program. A well-planned TAMP would fulfill the need for a support system for TE teachers.

This project study provided insight regarding the assessed content knowledge of traditional and alternative teachers and supported the existing need for a mentorship program. Despite the different preparation pathways for TE teachers, NJ school districts decided to invest in two things: the teacher induction and the teacher retention. On a larger scale, this project study should provide an example to other CTE programs. Perhaps this research will motivate other CTE programs to take measures to reduce the teacher shortage.

Implications, Applications, and Directions for Future Research

This study may be replicated for other CTE programs in the State of New Jersey. Forthcoming research in CTE programs was recommended based on the results of this study.

Suggested future research includes examining the advisor and mentorship reflection on the new program and the relationship between the new TE teacher and the mentors. This study may be conducted by a quantitative design, which used collected archival data in the analysis. The quantitative data was collected through the use of a causal comparative research design that examined the difference between the teacher preparation pathways (Traditional and Alternative) *on the Praxis TE test (ETS, 2012)*. The use of these data results could be used to further evaluate the outcomes of TAMP and program revisions and improvements.

Conclusion

Endorsing social change and being part of a solution was imperative to being a change agent in teacher preparation. While this work can be challenging, determination and motivation overcame in the end. The focal points of this section were project strengths, limitations, scholarship, project development and evaluation, leadership and change, and self-analysis.

Based on the analysis of the archival data used in this project study, the implementation of the TAMP would be beneficial for TE teachers in New Jersey. The TAMP was an efficient new mentoring program which has the potential to provide a well-planned, viable solution to the need of a support system for new TE teachers. TAMP was geared to increase the pedagogical knowledge and content skills of new TE teachers and offer a strategy for retention that encouraged the transition into the classroom setting. Once TAMP is in position, the mentor and advisor must continue to work with the new TE teacher to ensure the professional needs were being supported. The new mentorship program was required to secure the success of new TE teachers entering the classroom.

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Appendix A: Teacher Advisory and Mentor Program

Teacher Advisory and Mentor Program
for Technology Education Teachers

Presented by Kenya Avant

Project Plan

- Introduction
- Purpose
- Goals
- Target Audience
- Program Outcomes
- Building Supportive Teams
- Timeline
- Curriculum Map
- Activities
- Resources
- Self-Efficacy
- Professional Portfolio
- Implementation plan
- Evaluation plan
- Training Agenda
- References

Introduction

- This mentor program is expected to be in accordance to the state regulations which indicates all teachers with a provisional certification with advanced standing, acquired through a traditional preparation program, and a provisional certification without advanced standing, acquired through an alternate preparation program, will be mentored under a qualified program.
- In accordance with state regulation, an alternate route teacher must receive more intensive support in the first 20 days and will need additional support throughout the remainder of the year. This program provide the same support to both traditional and alternate route teachers who are new to the profession.

Purpose

- The purpose of the Teacher Advisory Mentor Program (TAMP) is
  - To improve the transition of new TE teachers entering a CTE classroom by providing a support system.
  - To reduce TE teacher attrition by increasing teacher efficacy, readiness and preparation.
  - To familiarize new TE teachers with the career technical education (CTE) policies and federal regulations.
  - To help new TE teachers identify tools that will support an increase in student achievement.

Goals

- To develop a support system that will assist the professional and personal growth of a new TE teacher within the first year.
- To translate the cultural lesson of a school system to novice TE teachers during the first two years.
- To support new TE teachers as they learn and progress from a continuous curriculum of professional development during the beginning years of class assignment.
- To influence an increase in teacher retention during the high risk years by promoting a personal and professional well-being.

Target Audience

- Teacher advisory and mentor program (TAMP) is committed to supporting and training new TE teachers prior to and during the first year of their classroom assignment.
- Participants will include TE teachers who completed both an alternative and traditional preparation program.

Program Outcomes

The program outcomes for the TAMP reflect the New Jersey Mentoring Regulations (N.J.A.C. 6A9-8) goals by aiming for the following:

- Reducing novice teacher attrition by building a support team that consist of an administrator or a CTE department chair, an advisor, and an experienced mentor.
- Fostering an environment of support for a novice teacher which assist in the understanding of TE teacher duties and challenges related to the teaching assignment.
- Improving the effectiveness of new TE teachers by providing a system that supports skills and knowledge specific to the TE curriculum and classroom.
- Enhancing the knowledge and strategies of novice teachers who must incorporate the New Jersey Core Curriculum Content Standards (CCCS) to support student achievement and growth.

The mentoring policies and procedures for new TE teachers better align with the TEACHNJ Act of 2012.

Building a support team - Mentors

The selection of mentors is based on specific criteria. As a member of the TAMP team, the mentor for technology education will be:

- Knowledgeable of CTE programs, especially TE courses.
- Skilled in providing CTE and TE instructional support.
- Effective in different interpersonal contexts.
- Sensitive to the needs of and accepting of the novice teacher.
- Able to model continuous professional learning.
- Committed to the roles and responsibilities of mentoring.

Building a support team - Advisors

The selection of advisors is based on specific criteria. As a member of the TAMP team, the advisor for technology education will be:

- Skilled and licensed in the occupation.
- Knowledgeable of CTE school programs, specifically TE courses.
- Knowledgeable of the current and future workplace needs.
- Effective in communicating workplace skills to new teachers.
- Committed to the roles and responsibilities of advising.

Building a support team - Administrators

As a member of the TAMP team, the administrator or CTE department chair will:

- Serve on the selection committee to identify a mentor or an advisor for each novice teacher.
- Facilitate observations and evaluations of new teachers according to state and district policies.
- Coordinate trainings for advisors, mentors, and novice teachers.
- Monitor ongoing process of the mentorship and team.

Building a support team:
Matching advisors and mentors with novice TE teachers

Successful matching of the mentor, advisor, and the novice TE teacher is pivotal in creating a beneficial learning experience. Beyond familiarity to CTE/TE programs, the criteria for matching the mentors and advisor might include the following:

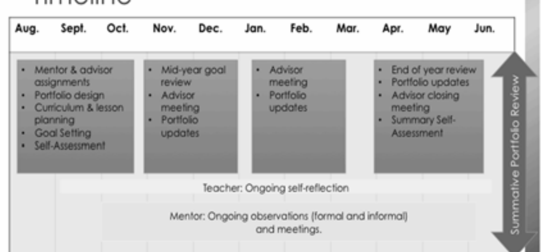
Mentor
- Similar grade level
- Common planning periods
- Close classroom proximity
- Personalities,
- Communication styles

Some districts might have a shortage of qualified mentors. Therefore, mentoring might occur as a group of teachers rather than one-on-one. This can occur as an online session.

Advisor
- Specific content area
- Proximity to the school
- Personalities
- Communication and business styles
- Gender might be considered.

Teacher convenience and advisor availability might play in the criteria.

Timeline



A completed documents and evidence of advisor and mentor meetings must be maintained in teacher's portfolio for 2-3 ears. If applicable, the portfolio should be digital.

Timeline

- Below is the ideal timeline for the first 3 week block of TAMP:
  - Week #1: School District and CTE orientation
  - Week #2: Trainings with assigned mentor in CTE program
  - Week #3: Planning with assigned advisor in the occupational field
- Time may vary based on the district guidelines.

Curriculum map:

Week #1: School District and CTE orientation

Week 1	Monday	Tuesday	Wednesday	Thursday	Friday
Topics:	**Human Resources**	**Digital policies**	**Student academic achievement**		
1	Orientation	Technology and digital resources	Academic plan	Curriculum expectations	Student safety
2	District goals	Computer Usage Agreement	Student Achievement	Data driven planning	Student focused environment
3	Outline for the week	Teacher technical skill expectations	Student Assessments	Instructional resources available	Student Achievement

Curriculum map:

Week #2: Trainings with mentor in CTE program

Week 2	Monday	Tuesday	Wednesday	Thursday	Friday
Topics:	**Mentor assignment**	**Student Technology Needs**	**STEM**	**Technology Issues & Resources**	**Teaching Technology**
1	Establishing a relationship	Cyber safety and security	Science Integration	True Technology Integration	Technology enterprise
2		Assessing technology literacy in students	Engineering principles	Technology standards for education	Decision making for technology courses
3	Goal setting	Career and Technical Student Organizations	Math principles	Funding sources for CTE	Current apps and software for TE/CTE

Curriculum map:

Week #3: Planning with assigned advisor in the occupational field

Week 3	Monday	Tuesday	Wednesday	Thursday	Friday
Topics:	**Identifying Advisor(s)**	**Curriculum planning**	**STEM**	**Integration**	
1	Establishing a relationship	Review program objectives	Engineering skills	Current job needs and CTE related programs	Evaluate TE equipment for program needs
2		Review course outlines and instructional materials/ technologies	Technology skills	Careers in 21st Century	Evaluate safety regulations and requirements
3	Explanation of CTE philosophy and objectives		Global work place skills	Workplace skills	Goal setting

Activities

- Activities that occur during TAMP include:
  - Portfolio maintenance (preferably e-Portfolio)
    - Key components include: journals, observations reflections, sample lesson plans, bi-monthly reflections, sample teacher given and teacher made assessments, and documentation from professional development completed
  - Mentor and Advisor meetings
    - Documentation or outcomes from meetings

Resources

All materials for TAMP are provided by the school's budget with some portions financed by funding from Perkins.

- Journals
- Observations
- Lesson planning
- Sample Assessments
- Professional development
- Technology evaluations
- Career planning
  - *O*NET and Occupational outlook Handbook activities*

The Carl D. Perkins Vocational and Technical Education Act of 2006 provides funding for career and technical education (Gordon, 2014).

Self-Efficacy in Adult Learners

- Knowles' theory of Andragogy suggested that adults need to be involved in the planning and evaluation of their instruction; in addition to being interested in topics that relates to their job (Lumpe et al., 2014).
- Bandura (2005) addressed important aspects to consider when planning professional development for adult learners. Specifically, the influence of motivation and how it affects individual teachers' self-efficacy (van Daal et al., 2014).

Self-Efficacy in Adult Learners

- Kolb's experiential learning theory organized learning into learning cycles that recognized both practical skills and theoretical knowledge (Suleiman & Schultz, 2014).
- Teachers demonstrate effective learning achievement when they progress through a four stage experiential learning cycle: concrete experience, reflective observation, abstract conceptualization, and active experimentation (McLeod, 2012).
- Because each stage of the experiential learning cycle has an impact teacher self-efficacy, professional development training must maximize on the learning that takes place within a group of professionals as well as with the individual teacher (Dochy, 2012)

Self-Efficacy in Adult Learners

- The challenge of preparing a high-quality teaching force in technology education is compounded by teacher attrition and the variety of preparation programs available (Carr, 2013).
- The need to support student achievement in a such diverse population has placed expanding demands and responsibilities on CTE teachers. Demands that can range from integrating grade-level literacy competencies to designing technical projects and real world problems that will challenge and engage a learner as they demonstrate state required proficiencies.

Professional Portfolio

- Middleton (2014) defined an educational portfolio as "a structured collection comprising labelled evidence and critical reflection on that evidence, produced as a part of a process of learning to show evidence of that learning".
- A portfolio maintained by a teacher can serve as a valuable professional development tools as it supports reflection on their own practices as they experience workplace and experiential learning (Khan & Begum, 2015)
- A professional portfolio is used to develop and collect materials during the mentees' time within TAMP.

Implementation Plan

- Identify mentors and advisors.
- Match mentors and advisors with new teacher based on content and experiences.
- Identify goals and responsibilities.
- Provide training and introduce portfolio requirements.
- Schedule mentor and advisor meetings.
- Reviews of the usage of portfolio.

Evaluation Plan

- A minimum of 5 reviews of the portfolio by the mentor and 2 reviews by the advisor.
- The district required formal and informal classroom observations.
- Annual summary review

Evaluation Plan:
Teacher Reflection

At the end of the startup session and each month following, the teacher will document a reflection by answering the questions that follow.

For the startup reflections:

- Was this professional development session beneficial to you....why or why not?
- If this session is done again, what should be done differently to help you learn more?
- Which activity helped you the most? Why?

Evaluation Plan:
Teacher Reflection

For monthly reflection:

- What evidence do I have that my students are learning?
- In what areas can I improve professionally?
- What support do I need to be effective in the classroom?
- What have I done lately to relieve stress and focus on my own mental health, to ensure I remain an effective teacher?

Training Agenda
Day 1

8:00	**Present goals and agenda**
8:15	Exploring technology education classroom
9:30	Building a technology vision
10:30	Implementing a technology plan
12:00	Lunch
1:00	Assessing 21st century skills
2:00	Program planning
3:00	Dismiss

Training Agenda
Day 2

8:00	**Agenda updates and recap**
8:15	Building learning community for students
9:30	Content area reading
11:00	iDevice, apps, and students with special needs
12:00	Lunch
1:00	Career and Technology Professional organization and support team
2:00	Career and Technology Student Organization
3:00	Dismiss

Training Agenda
Day 3

8:00	**Agenda updates and recap**
8:15	Discuss Knowles' theory of Andragogy as it relates to teachers' self-efficacy in TE.
9:00	Challenges in the TE classroom
10:30	Present solution and resources for resolving challenges
12:00	Lunch
1:00	Discuss plans for self-efficacy including teacher reflections
1:30	Portfolio planning and resources
3:00	Dismiss

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Appendix B: Training Materials

TAMP Training

Presented by Kenya Avant

Topics to be covered

- Roles
- Benefits of program
- Responsibilities
- Pairing
- Portfolio
- SMART objectives

TAMP Team

For successful outcomes of the program, each team member will have many roles and responsibilities to address. The team member key roles are defined as follows:

TE Teacher — a new professional with less than two years of teaching experience within the CTE program

Advisor — an occupational professional who provides a connection to the workplace skills and techniques that help new TE teachers implement real work practices and techniques into student learning

Mentor Teacher — an experienced teacher who provides support, strategies, and techniques that help new TE teachers acquire effective practices and techniques that will encourage student learning

Administration -

Benefits of the TAMP

- The New TE Teacher
  - Will gain knowledge about the school and district policies as well as the job responsibilities.
  - Will engage in professional strategies and techniques that builds on successful classroom practice.
- The Mentoring Teacher
  - Is able to transfer the knowledge and skills involved in effective classroom practices.
- The Occupational Advisor
  - Is instrumental in implementing real world situation into the the TE classroom.

Mentor responsibilities

- Participates in summer training for TAMP are expected to help the novice establish goals for the beginning of school.
- Orients the novice TE teacher to district and school policies
- Provides a range of resources for the new TE teacher's collection of effective strategies and techniques to use in a CTE program
- Provides feedback to the new teacher after a peer observation
- Helps to identify the materials needed for the Portfolio, Journals, and Evaluations.

Advisor responsibilities

- Participates in summer training for TAMP to help the novice establish goals for the beginning of school.
- Helps to identify the materials needed for the Portfolio, Journals, and Evaluations
- Serves as a occupational connection to professional and the workforce needs
- Meets with the new TE teacher for the first week, and then at least 3-4 times a year thereafter
- Helps the new TE teacher identify general skills needed for each occupational pathway.
- Maintains continuous involvement in TE curriculum growth

New TE teacher responsibilities

- Meet with the mentor and advisor on a regular basis and document the meeting times
- Observe the mentor and other CTE teachers in different classroom settings
- Allow your mentor to observe your classroom to provide feedback and support
- Maintain a journal within the portfolio that records experiences that build on successful practices
- Demonstrate a commitment to the CTE program, the school, and the district

Pairing

- After the new teacher is paired with a mentor and advisor, the new TE teachers will receive the guidelines for the portfolio from the administrator or mentor.
- Novice teachers will maintain a portfolio of ideal practices that will be reviewed by the mentor, advisor, and possibly the administrators.

Portfolio maintenance

- As a non-evaluative record, this portfolio contains documents and support materials developed during the induction period. The portfolio should include material such as:
  - a statement of goals and educational philosophy for the year
  - SMART objectives for the year
  - effective lesson plans, including lesson recording
  - special projects and special letters from parents or colleagues
  - pictures of bulletin boards
  - student papers
  - letters of commendation

Key Portfolio components

- Journals
- Observations
- Lesson plans
- Sample Assessments
- Professional development

SMART indicators

The objectives developed as a part of the portfolio for TAMP, should use SMART indicators. The SMART indicator is a way to catalog important qualities of useful indicators, which need to be:

- **S**pecific (focused on a clear variable)
- **M**easurable (able to be tracked and verified)
- **A**chievable (practically possible to gather information about)
- **R**elevant (responding to a useful question)
- **T**ime-bound (pertaining to a specific time period)

Appendix C: Data Agreement

ETS Listening. Learning. Leading.

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Princeton, NJ 08541

James Halliday
Copyright Administrator
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June 7, 2011

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BY: Kerry Quast

TITLE: Assessment Process Specialist

DATE: June 7, 2011