ABSTRACT

BOWEN, BRADLEY DAVIS. Measuring Teacher Effectiveness When Comparing Alternatively Licensed and Traditionally Licensed High School Technology Education Teachers in North Carolina. (Under the direction of Dr. V. William DeLuca).

The purpose of this study was to compare the effectiveness of alternatively licensed and traditionally licensed technology education teachers in North Carolina. Current research shows mixed data on the effectiveness of alternatively licensed teachers when compared to traditionally licensed teachers. Some researchers believe alternatively licensed teachers lack the pedagogical knowledge and classroom management techniques they would receive through a traditional university educational program. Other researchers believe alternatively licensed teachers have more content specific and practical application knowledge because of relevant work experience in the field. There is a need for additional research in this area so students are provided the best possible educational opportunities in technology education.

This study used a mixed-methodology approach to show if there are any statistical differences between alternatively licensed and traditionally licensed technology education teachers in North Carolina. Quantitative analyses were used to compare the percent of students proficient on the end of course standardized exam in five different courses taught by technology education teachers in North Carolina. Quantitative analyses were also used to compare the time on task of students as a measure of pedagogical management and qualitative analyses were used to compare demographic data of a sample of technology education teachers as well as to compare principals’ perceptions of the preparation, performance, and professional development needs of these teachers.
The comparison of alternative licensed and traditionally licensed teachers has been a topic of debate for a long time. The researcher’s goal is to contribute knowledge in this area so there is a better understanding of teacher effectiveness when comparing alternatively licensed and traditionally licensed technology education teachers in North Carolina.
Measuring Teacher Effectiveness When Comparing Alternatively Licensed and Traditionally Licensed High School Technology Education Teachers in North Carolina

by
Bradley Davis Bowen

A dissertation submitted to the Graduate Faculty of North Carolina State University in partial fulfillment of the requirements for the Degree of Doctor of Education

Technology Education

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APPROVED BY:

Dr. V. William DeLuca
Committee Chair

Dr. William J. Haynie, III

Dr. Aaron C. Clark

Dr. Nelson W. Couch
DEDICATION

I would like to dedicate this dissertation to my Lord and Savior Jesus Christ, whose spirit led me into the field of education. With his guidance, a clear path of my future career was laid out before me, and his timing allowed for progress towards the fulfillment of that vision. His wisdom and encouragement have been a continuous source of support throughout this long and challenging endeavor. I pray for his leadership as this milestone marks the beginning of a career that I hope is pleasing to him.

I also dedicate this dissertation to my beautiful bride Brandi. Without her encouragement and support, the completion of this degree and dissertation would not be possible. I thank her for her patience during the many hours of work and dedication needed to finish this study. Thanks Babe!
BIOGRAPHY

Bradley Davis Bowen was born on August 10, 1974, in Raleigh, North Carolina. After graduating high school in 1992, he attended Virginia Tech where he received a bachelor’s degree in Civil Engineering. Graduating in 1996, he returned to Raleigh and entered graduate school at North Carolina State University, where he received a master’s of Civil Engineering. Bradley then began his career by working for a structural steel fabricator in Raleigh. After four years, he joined another steel fabricator where he worked for another year.

Following five years in the structural steel business, Bradley realized it was time to decide where he wanted the path of his career to continue. After a lot of personal reflection, he decided that even though he liked his job, this was not the position in which God had intended for him to remain. Therefore, in early 2004, he left his position in the structural steel business to begin a new season in his life. Not having another job lined up, he thought of all the possible opportunities. Without a clear understanding why, except for the feeling of being led in this direction, he pursued all the educational opportunities available. In August of 2004, he was privileged to get a job in the Construction Management Department at Wake Technical Community College. This, however, was a one semester contract because he was filling in for a professor on medical leave. Therefore, in December of 2004, he was again looking for another educational position. As December came around, there was a position that opened up at Enloe High School in the technology education department. After the interview, he was hired based on his engineering degrees and work experience, even though
he did not have a teaching license. Over the next two years, he had to take courses through NC State to fulfill the requirements of the lateral entry program and receive a full teaching license.

After receiving a full teaching license, Bradley decided that education was where he wanted to be. So in the fall of 2006, he applied for and was accepted into the technology education doctoral program at NC State University.

Bradley is currently a lecturer at North Dakota State University specializing in K-12 STEM and Engineering Education. Once the dissertation defense is complete, he will assume a role of Assistant Professor and begin his journey in higher education.
ACKNOWLEDGEMENTS

I would like to thank the professors at NC State who have shaped my knowledge and understanding of education. Without their guidance and support, I would not have the confidence to continue my journey in the education field.

I especially want to thank my committee members in the technology education department. Dr. Deluca, Dr. Haynie, and Dr. Clark have all been an inspiration for me. Their enthusiasm is inspiring and I appreciate their dedication to our field. Their professionalism has shown that conducting myself in a manner worthy of being a professor is imperative and I hope to live up to their expectations of a NC State graduate. I would like to particularly thank Dr. DeLuca for agreeing to be my chair and for his guidance and support. I would also like to thank Dr. Couch for being my committee minor representative. He was a good teacher and I thoroughly enjoyed the material I learned from his engineering courses.

I would also like to thank my family for their support and encouragement throughout this process. This process is too difficult to accomplish alone, and my family was a continued source of support.
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Chapter 1

Introduction

Every child deserves the opportunity for a quality education. In order to achieve this, every classroom needs a teacher that is qualified to teach the subject matter as well as have basic pedagogical knowledge in order to deliver the content effectively. That is why in today’s educational system, there is a need for qualified teachers in all courses. In recent years, the terminology has shifted from needing “qualified teachers” to needing “highly qualified teachers”. The definition of what a highly qualified teacher is has been a topic of debate for several years. This meaning was more clearly defined by the passing of the No Child Left Behind Act (NCLB) of 2001. According to NCLB, the definition of a highly qualified teacher includes three components; obtaining a bachelor’s degree, having full licensure as defined by the State, and demonstrating competency, as defined by the state, in each subject taught (U.S. Department of Education, 2004). However, NCLB does not specifically include career and technical education. NCLB focuses on the core courses students take during their high school career. These core courses are defined as English, reading or language arts, math, science, foreign languages, civics and government, economics, arts, history, and geography (U.S. Department of Education, 2004). Since career and technical education, of which technology education is a part, does not fall directly under NCLB, the highly qualified teacher requirement does not directly apply to technology education. However, in North Carolina, all fields of career and technical education, except trade and industrial, follow NCLB’s requirements for achieving the highly qualified teacher
status (North Carolina Association of Teachers, 2005; North Carolina Department of Public Instruction, 2009c).

**Alternative Licensure**

There are currently not enough highly qualified teachers to fill all available teaching positions. To accommodate this demand for teachers, an alternative licensure program was established to allow individuals without a degree from a university-based teacher preparation program to transfer their skills from the workplace into the classroom (Hoepfl, 2001). Alternative programs are defined by the U.S Department of Education as “teacher preparation programs that enroll non-certified individuals with at least a bachelor’s degree, offering shortcuts, special assistance, or unique curricula leading to eligibility for standard teaching credentials” (Bradshaw & Hawk, 1996). These programs offer the opportunity for a person who is interested in teaching, and has obtained a bachelor’s degree in a field other than education, to transition from the corporate workplace to become a classroom teacher.

The alternative licensure program was originally developed to quickly fill open teaching positions in an emergency situation when traditionally licensed teachers were not available. Employees of industry, who wanted to make the transition into teaching, were given the opportunity through alternative methods. This was beneficial to vocational education because the knowledge needed for the curriculum was primarily skill-based. Vocational education teachers could come from industries in which manual skills were the focus. This is why alternative licensure has been used in vocational education for most of the last century (Hoepfl, 2001; Haber & Southerland, 2008; Reese, 2010).
In recent years, the alternative licensure program has become a crucial component for filling teaching positions in critical need areas. It is now being used more readily for filling teaching positions, even when it is not an emergency situation. This has caused some concern about whether or not alternatively licensed teachers are as effective as those who received licensure through a traditional education program. Many researchers feel that an alternatively licensed teacher does not have the necessary understanding of pedagogical theories and practices that would be obtained when completing a traditional education program (Darling-Hammond, Holtzman, Gatlin, & Heilig, 2005). Because of this lack of pedagogical knowledge, this teacher would have difficulty fully accommodating students’ educational needs. This may include the lack of understanding different learning styles and behaviors, difficulty developing activities to accomplish the curriculum objectives, and lack of knowledge for pacing the curriculum to cover the material in the allotted timeframe. Therefore, a teacher would not be able to develop and deliver effective lesson plans, which in turn would result in lower student achievement.

Darling-Hammond et al. (2005) found the other side of the debate is, through specialized work experiences, alternatively licensed teachers have gained content knowledge about the course content that is more in-depth than the knowledge gained in the traditional education program. From working in the corporate field, a teacher would have learned more practical applications of the content knowledge and could therefore be able to provide the students a more relevant experience in the classroom than would a traditionally licensed teacher. An alternatively licensed teacher would then be able to increase their pedagogical knowledge through professional development and teaching experience. The researcher seeks to determine if there are any differences in the student
achievement and pedagogical management techniques based on whether they obtained a teaching license through an alternative licensure process or a traditional education program. By conducting the quasi-experiment proposed here, the researcher will determine if there are any differences in how the teachers from each licensure type manage their classroom that leads to increased student achievement.

**Technology Education**

Technology education evolved from the industrial arts as a subset of vocational education with a general education focus (Pannabecker, 2004; Foster, 1994; Kirkwood, Foster, & Bartow, 1994). With recent developments in technology, it is necessary to transform the curriculum to accommodate these developments to make the content more relevant for students. Vocational education, now called career and technical education, is a field that ranges from having trade related curriculums to courses more focused on the academic aspect of the design process. The content knowledge required to accommodate this range of knowledge lends itself to using characteristics of both alternatively licensed and traditionally licensed teachers (Darling-Hammond et al., 2005; Bradshaw & Hawk, 1996). If we can better understand what characteristics of technology education teachers make them more successful in the classroom, we can better prepare our alternatively licensed teachers as well as adjust the traditional education curriculum to meet these needs.

**Teacher Effectiveness**

Current research shows mixed data on the effectiveness of alternatively licensed teachers as compared to that of traditionally licensed teachers (Bradshaw & Hawk, 1996; Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2009). This research project studied the key
components of teacher effectiveness and determined if there are any statistically significant differences between alternatively licensed teachers and traditionally licensed teachers when comparing student achievement and pedagogical management within the field of technology education. In this study, achievement is measured by whether or not the student obtains proficiency on the end of the course North Carolina Vocational Competency Achievement Tracking Systems (VoCATS) exam. Pedagogical management refers to how the teacher demonstrates skills other than content knowledge, including the teacher’s ability to understand different learning styles, behavior management, and overall classroom management, to more effectively keep students engaged in the classroom activities. Prior research has concluded that increasing a student’s classroom engagement time, will increase the opportunity for achievement (American Association of School Administrators, 1982; Biderman, Nguyen, & Sebren, 2008; Heck, 2007; Huitt & Segars, 1980; Opdenakker & Damme, 2006; Prater, 1992). This research project used this principle as a base for researching the teacher’s ability to engage the students during class to make the most use of the instructional time. Throughout this research experiment, the term pedagogical management refers to the teacher’s ability to use various instructional strategies to increase a student’s engagement time in the classroom. In this study, the student’s classroom engagement time will be referred to as “time on task”. By comparing exam results, the students’ time on task, and qualitative data, a conclusion was drawn as to whether or not there are any significant differences in alternatively licensed technology education teachers and traditionally licensed technology education teachers concerning student achievement and using pedagogical management techniques to keep students on task.
Research Questions

One main influence in the development of the research questions was work conducted by John B. Carroll. Carroll studied how engaged learning time affected the aptitude of students (American Association of School Administrators, 1982). By developing The Carroll Model, discussed further in chapter 2, he allowed fellow researchers to empirically study the amount of time students are engaged in the lesson plan activities and its relationship to student achievement (American Association of School Administrators, 1982). The idea of how time on task affects student achievement was reported by the U.S. Department of Education in the monograph What Works (Carroll, 1989; U.S. Department of Education, 1986). One of the findings reported in this manuscript was about managing classroom time. The report states:

How much time students are actively engaged in learning contributes strongly to their achievement. The amount of time available for learning is determined by the instructional and management skills of the teacher, and the priorities set by the school administration” (U.S. Department of Education, 1986, p. 43).

These findings provided a base for the justification for the research questions in this study. In this study, the researcher answered the following research questions:

1. Are there significant differences in achievement, as measured by percent proficiency on the end of course exam, of students taught by alternatively licensed technology education teachers versus those taught by traditionally licensed technology education teachers in North Carolina?
2. Are there significant differences in the pedagogical management practices, as measured by time on task, of alternatively licensed technology education teachers versus traditionally licensed technology education teachers in North Carolina?

3. Are there significant differences in the preparation, performance, and professional development needs, as measured by the principal’s perception, of alternatively licensed technology education teachers versus traditionally licensed technology education teachers in North Carolina?

**Definitions**

The following definitions are listed in order to provide clarification for terms used in the research questions:

- **Alternative licensure** - a process of teacher preparation that trains non-licensed individuals with at least a bachelor’s degree to the level required by the state in order to earn standard teaching credentials (Bradshaw & Hawk, 1996)

- **Traditional licensure** – a result of attending a university-based program that assumes pedagogical content knowledge needs to be developed in a professional atmosphere before allowing a teacher to take control of the classroom (Stoddart & Floden, 1995)

- **Achievement** - student’s ability to master the content of the course

- **Percent proficiency** - the percent of students that obtained a passing score on the end of course exam

- **Pedagogical management** - how the teacher demonstrates skills, other than content knowledge, that contribute to student achievement. These skills include but are not
limited to behavior management, the ability to incorporate an understanding of
different learning styles into a lesson plan, and overall classroom management

- Time on task - the amount of time the student is actively engaged in the learning
  process
- Principal's perception of teacher preparation - refers to whether or not the principal
  believed the teacher had the necessary skills to be an effective beginning
- Principal's perception of teacher performance – refers to the principal’s satisfaction
  with the teacher’s end of course exam scores.
- Principal's perception of teacher professional development needs – refers to whether
  or not the principal believed the teacher would benefit from additional training in one
  or more areas that would make them a more effective teacher.

**Summary of Methodology**

To answer the research questions, the research design included both quantitative and
qualitative analyses. All three research questions were used in combination with one another
in order to provide solid evidence for the results. All three questions addressed the same main
topic, teacher effectiveness, but approached the topic from different perspectives. This
allowed for triangulation in that the results provided support for each of the other questions.
If the outcomes are similar, there is strong evidence the results of the study are valid
(Bryman, 2006; Creswell, 2003; Jick, 1979).

For the first research question, the sample included all of the technology education
teachers in North Carolina. The sample consisted of two groups. One group was the
alternatively licensed technology education teachers and the other group was the traditionally
licensed technology education teachers. A quantitative analysis used the percent of students proficient on the end of course exam as the dependent variable and the teacher’s licensure type as the independent variable. The exam results were from the North Carolina VoCATS exam for the 2009-2010 school year. This exam is a standardized exam prepared by the state for Career and Technical Education courses, including technology education. For this study, achievement will be defined as the student’s ability to master the content of the course. A student is said to have achieved proficiency if they receive a passing score as determined by the North Carolina Department of Public Instruction. The percent proficiency of students, based on the results of the exam from both alternatively licensed and traditionally licensed technology education teachers, were analyzed to determine if there were any statistically significant differences between the two groups. This was achieved by performing a one-way ANOVA on the data set. This allowed for a statistical analysis of the two groups to determine if the percent of students proficient on the VoCATS exam differs significantly.

For the remainder of the research questions, a sub-sample was chosen to participate in quantitative and qualitative components of the research. This sub-sample came from within the original sample and consisted of the same two types of licensure groups, but the smaller sample size permitted the researcher to perform observations and detailed surveys. For research question 2, observations were used to determine the students’ time on task during the delivery of a typical classroom lesson plan. This portion of the experiment included a quantitative component as the observational data was reported as the percent of students on task. Pedagogical management refers to how the teacher demonstrates skills, other than content knowledge, that contribute to student achievement. These skills include but are not
limited to behavior management, the ability to incorporate an understanding of different learning styles into a lesson plan, and overall classroom management. The researcher believed the better pedagogical skills a teacher demonstrates, the more time the students will be on task. The qualitative component reported the pedagogical management strategies that resulted in the particular classroom engagement time. For this portion of the research study, the researcher collected data from surveys to determine various characteristics of the teachers in this sample. A qualitative summary was presented and discussed to demonstrate the findings of the observations. The findings of the time on task of the teacher were reported as a numerical value. Results from the survey were reported in discussion format to explain any differences found in the results of the time on task analysis. Research question 3 involved telephone surveys with the principals of the teachers included in research question 2. This survey gave insight to the principals’ perceptions of the preparation, performance, and professional development needs of the two different types of licensed technology education teachers. Preparation refers to whether or not the principal believed the teacher had the necessary skills to be an effective beginning teacher. The principal’s perception of performance was characterized by whether or not they were satisfied with the teacher’s end of course exam scores. The third component was professional development, or whether or not the principal believed the teacher would benefit from additional training in one or more areas that would make them a more effective teacher. By analyzing data from these three questions, the researcher determined if there are any differences in the characteristics between alternatively licensed technology education teachers and traditionally licensed technology education teachers that may contribute to increased teacher effectiveness and...
student achievement. Using mixed methodology allowed the researcher to determine if one group of teachers obtained higher student achievement as well as a difference in the pedagogical management techniques of the teachers that contributed to the higher achievement.

Chapter 2 gives a thorough review of the current research associated with teacher effectiveness when comparing alternatively licensed teachers and traditionally licensed teachers. It also gives a more in-depth explanation of pedagogical management and how this relates to teacher performance and student achievement. There has been little research, particularly in North Carolina, concerning these comparisons in the field of technology education. This research project used the current research on teacher effectiveness to expand the knowledge base of how alternatively licensed teachers compare to traditionally licensed teachers in technology education.
Chapter 2

Introduction

There has been research in the area of teacher effectiveness when comparing alternatively licensed teachers and traditionally licensed teachers. This research project identified differences in the teacher effectiveness and pedagogical management techniques when comparing the two groups of teachers. This chapter focuses on three major aspects that support the research questions of this project. It begins by summarizing the research findings comparing the effectiveness of alternatively licensed teachers with traditionally licensed teachers. The next aspect critical to this study is the time on task of students. Time on task refers to the amount of time students are engaged in the lesson plan as directed by the teacher. The amount of time the students are engaged, or time on task, will be shown to be a key component of student achievement and is the focus of defining teacher effectiveness in this research project. The last component discussed in this chapter is how principals perceive the preparation, performance, and professional development needs of alternatively licensed compared to traditionally licensed technology education teachers in North Carolina.

The literature review summarizes research in the areas necessary to build a justification for this research project and the instrument was used to collect data. The main research topic compares the effectiveness of alternatively licensed technology education teachers to traditionally licensed technology education teachers and their ability to engage students to increase the time on task. There is little research in this area specific to technology education and particularly in North Carolina (Foster, 1996; Haynie, 1998; Hoepfl, 1997, 2001; Merril, 2004; Pavlova, 2005). Since there is little research in this particular area
specific to technology education, most of the literature review summarizes the findings in
different areas of general education. By summarizing previous research that discusses the
results of research in different areas of general education, these same principles can be used
to justify the methodology when studying technology education (Raizen, 1997). Since
technology education has been developed to contain a general education component, when
looking at the entire educational system, it is reasonable to assume the same trends found in
general education can be translated into technology education (Raizen, 1997). Therefore, the
literature review summarizes the research in general education as well as technology
education.

**Teacher Effectiveness**

In order for students to achieve, they must be part of an effective school environment.
When a school is considered effective, there are some characteristics of this school that are
noticeably different than schools classified as ineffective (Christle, Jolivette, & Nelson, 2007;
Clauset & Gaynor, 1982; Jamieson & Wikeley, 2000; Murphy & Hallinger, 1988;
Opdenakker & Damme, 2006). Within effective schools, there are typically similar
characteristics. Even though researchers may debate which characteristics most correlate to a
school’s success, there is a consensus that effective schools have some common qualities
(Brandt, 1982; Christle et al., 2007; Jamieson & Wikeley, 2000; Murphy & Hallinger, 1988;

One of the characteristics of an effective school is the ability to integrate a program to
employee and support effective teachers (Carroll, 1989; Christle et al., 2007; Edmonds,
1982). Effective teachers are the critical link between the content being taught and the
academic achievement of the student. Research supports a positive correlation between teacher effectiveness and student achievement (Boyd et al., 2009; Christle et al., 2007; Edmonds, 1982; Gaines, 1973; Heck, 2009). Therefore, it is important to identify the characteristics of an effective teacher. One method that has historically been used to measure teacher effectiveness is the end of course exam scores (Clotfelter, Ladd, & Vigdor, 2006; D’Agostino & Powers, 2009; Sawyer, 2007). These exams are easily graded and relate to student achievement in a particular course. However, there is much debate about using standardized exam scores as a definitive measure of teacher effectiveness. Although teacher effectiveness is highly correlated to student success, it does not account for all of it. There are many variables that determine a student’s success in the classroom. The teacher-student interaction is only one of many variables within the educational environment that influences a student’s achievement. Within the variable of the teacher, there are also many characteristics of an effective teacher that correlate to student success. As a general consensus of educational research, there are too many variables to consider when measuring teacher effectiveness and student achievement to be included in one research study. Therefore, this research project will only be looking at two variables within the vast number of variables that could affect student achievement. One of these, pedagogical management, as measured by a student’s time on task, was defined as being one of the most critical components of teacher effectiveness (Biderman et al., 2008; Carroll, 1989; Edmonds, 1982; Gaines, 1973; Hines, Kromrey, Swarzman, Mann, & Homan, 1986; Prater, 1992; Seifert & Beck, 1984). The other variable is the type of licensure, alternative or traditional, received by the technology education teacher. One characteristic of an effective teacher is the ability to
effectively manage the classroom (Balistreri, 1991; Clauset & Gaynor, 1982). The type of pedagogical management techniques used by the teacher has a positive correlation to student achievement (Southworth, 2010; Stichter, Lewis, Whittaker, Richter, Johnson, & Trussell, 2009; Lomax & Cooley, 1979). If the teacher’s time is being consumed by only a few students, or the students in the classroom are not focused on the content of the lesson plan, then the teacher is not making the most effective use of class time. By using proper pedagogical management techniques, the teacher will increase the time the students are actually engaged in the content of the lesson plan. This project did not measure all of the proven pedagogical management techniques, but used time on task as a measure of how well the teacher can manage the classroom in a general sense. This research project used the time on task of students as a measure of comparing the effectiveness of alternatively licensed and traditionally licensed technology education teachers.

**Time on Task**

Instructional time has historically been one of the factors considered when planning for student achievement. One of the landmark studies to show the relationship between instructional time and learning gains was the Beginning Teacher Evaluation Study (BTES) in 1976 (Berliner, 1990; Clauset & Gaynor, 1982; Lomax & Cooley, 1979; Seifert & Beck, 1984). Sponsored by the National Institute of Education, this study suggested benchmarks for identifying skills a teacher needs to teach effectively. This California study was performed on elementary school children and evaluated student achievement based on engaged learning time measured through classroom observations. One outcome of this study was the distinction between allocated learning time and engaged learning time (American
Association of School Administrators, 1982). The study helped define the difference between the time students are supposed to be learning and the time they actually spent learning from being engaged in the lesson plan. The results for this study were not conclusive in determining how much engaged learning time increased student achievement, but it did show the possibility of this relationship and raised considerable concern that more research needs to be performed on this topic (American Association of School Administrators, 1982; Berliner, 1990; Clauset & Gaynor, 1982; Lomax & Cooley, 1979; Seifert & Beck, 1984).

Research has shown that to a certain extent, the more instructional time a student has, the more the student will achieve (Berliner, 1990; Lomax & Cooley, 1979; Seifert & Beck, 1984). The research in this area shows instructional time is highly correlated to student achievement. There is little dispute that instructional time is critical, however many researchers will disagree on how to measure the influence of instructional time as a variable (Seifert & Beck, 1984). Simply increasing the amount of instructional time does not necessarily mean higher achievement (Berliner, 1990; Clauset & Gaynor, 1982; Lomax & Cooley, 1979; Seifert & Beck, 1984). But how that time is actually used by the student makes a significant difference in their achievement.

One of the key researchers in the area of time on task is John Carroll (American Association of School Administrators, 1982). After many years of studying learning as a function of time, he developed what became known as The Carroll Model (American Association of School Administrators, 1982; Gaines, 1973). The Carroll model is as follows (American Association of School Administrators, 1982):
Degree of Learning = \frac{\text{Amount of time actually spent learning}}{\text{Amount of time needed to learn}}

Carroll suggested that, due to student diversity, each pupil requires a different amount of time to master a particular task or gain knowledge (American Association of School Administrators, 1982; Gaines, 1973). This time required for the student to learn became the denominator in The Carroll Model. So the formula is the ratio of engaged time to time needed to learn the knowledge (American Association of School Administrators, 1982).

David Berliner (1990), who was the director of the California BTES, mentions six teacher behaviors that are characteristics of an effective teacher (Brandt, 1982; Seifert & Beck, 1984):

1. Time allocation
2. Engagement rates
3. Time management
4. Match of instructional materials to goals of the school
5. Classroom management and discipline
6. Politeness and kindness

Of the six effective teacher skills mentioned by Berliner, the first three are related to time. And number five, classroom management and discipline, could arguably relate to effective use of time as well. Murphy, Weil, Hallinger, and Mitman (1982) reported five characteristics of effective classroom practices, two of which are conducting a well-managed classroom and implementing instructional practices that promote student achievement (Seifert & Beck, 1984). They go on to mention that a key component of effective classrooms
involves devoting a large percentage of class time to learning tasks with a strong academic focus (American Association of School Administrators, 1982; Berliner, 1990; Christie et al., 2007; Murphy et al., 1982). Part of increasing the academic focus of students involves creating a well-managed classroom. A class with minimal behavior problems and disruptions will lend itself to a more learner-friendly environment. This can be accomplished by setting clear rules and expectations for the students, clearly identifying the learning objectives, and delivering a well-prepared organized lesson plan. By establishing a more well-managed classroom, an environment can be created that will be more receptive to increased time on task (Balistreri, 1991; Murphy et al, 1982). Lomax and Cooley (1979) published an article summarizing the findings of ten studies performed investigating the relationship between instructional time and student achievement when teaching reading and mathematics in an elementary school classroom. The findings from this review concluded that increased instructional time could improve student achievement, as long as the time was spent engaged in the lesson plan. Lomax and Cooley (1979) recommended that engaged time, or time on task, would be the stronger indicator of student achievement when discussing the use of instructional time (American Association of School Administrators, 1982; Berliner, 1990; Biderman et al., 2008; Hines et al., 1986; Prater, 1992).

Similar to a research study performed by Colvin, Flannery, Sugai, and Monegan (2009), the researcher collected data for this study by conducting observations at incremental times throughout the class period. This method provided an opportunity for the teacher to transition among different teaching techniques and lesson plan activities. When taking measurements at different increments, the observer records a better overall summary of
different classroom settings and teacher behaviors, and the results of time on task measurements can be more generalized for that class period (Colvin et al., 2009; Hines et al., 1986). The observation instrument used in the current study was developed specifically for the research study conducted by Colvin et al. (2009). These researchers measured the classroom setting and teacher behaviors that contributed to the time on task of students. The study conducted by Colvin et al. (2009) included one teacher and provided feedback concerning ways to improve the classroom management techniques to increase the time on task of students. The current study used the same observation instrument, but will use the data to compare the results collected from alternatively licensed teachers and traditionally licensed teachers. The observation instrument used in the current study was tested to a reliability of 93%.

Berliner explained that most of the research relating time on task to student achievement has been performed in elementary education (Brandt, 1982; Mortenson & Witt, 1998). This is due to the ease of measuring when elementary school children are on task. As students get older, it is less obvious to determine whether or not the student is focused on the content of the lesson plan. Therefore it is more difficult to get accurate measurements with secondary school-aged students using time on task instruments. However, Berliner goes on justify the findings of his research in secondary education by clarifying that, although individual data may be inaccurate, the mean for classes or groups are still valid, with a reliability of approximately 0.95 (Brandt, 1982). This lack of research relating time on task and student achievement in secondary school aged students is one of the motivations behind the current research project.
Alternative Licensure versus Traditional Licensure

Comparing the effectiveness of alternatively licensed teachers and traditionally licensed teachers has been a topic of research for a long time. This section compares the differences research has shown about the characteristics and effectiveness of these two groups of teachers. It also reviews some of the routes available for alternative licensure in North Carolina.

Traditional licensure programs are defined in this project as university-based programs that assume pedagogical content knowledge needs to be developed in a professional atmosphere before allowing a teacher to take control of the classroom (Stoddart & Floden, 1995). Historically, universities were given the authority to educate and provide credentials to teachers based on meeting state licensing requirements, and this has been the primary source for licensing teachers (Stoddart & Floden, 1995).

Alternative licensure is defined as a process of teacher preparation that trains non-licensed individuals with at least a bachelor’s degree programs to the level required by the state to earn standard teaching credentials (Bradshaw & Hawk, 1996). Alternative licensure programs were first developed as an emergency licensure process. Due to teacher shortages, this process allowed school districts to hire unlicensed individuals without a traditional education degree to fill a teaching position if it could be shown that a licensed teacher was not available (Stoddart & Floden, 1995). Over the years, alternative licensure has transitioned from an emergency situation to fill positions to an institutionalized alternative to university-based programs (Stoddart & Floden, 1995). From 1986-1996, there was a 12% increase in the number of alternatively licensed teachers in North Carolina (Bradshaw & Hawk, 1996).
This shows an increased interest in the concept of becoming a classroom teacher without having a traditional education degree.

There is a debate on the quality and effectiveness of an alternatively licensed teacher. According to Stoddart and Floden (1995), alternative licensure has been a part of vocational education since 1917. But research in the field of vocational education has been inconclusive about teacher effectiveness when comparing alternatively licensed and traditionally licensed teachers (Bradshaw & Hawk, 1996; Darling-Hammond et al., 2005; Feiman-Nemser, 1989; Reese, 2010; Sindelar, Daunic, & Rennells, 2004; Stoddart & Floden, 1995). The debate currently continues on the how teachers should be licensed. Many researchers feel that a traditional education program is the only method of obtaining the content and pedagogical knowledge required to be an effective classroom teacher. Becoming a classroom teacher requires several years of professional training and supervised practical experience (Lasley, Siedentop, & Yinger, 2006; Stoddart & Floden, 1995). Others feel that alternatively licensed teachers offer an aspect of relevant experience that would make them effective in the classroom. This has been particularly supported in the field of vocational education. Alternative routes allow individuals with specialized work experience to teach a vocational curriculum and make the content more relevant for the students (Bradshaw & Hawk, 1996). The teacher can then learn the necessary pedagogical skills as they gain teaching experience and through professional development opportunities (Stoddart & Floden, 1995). However, Stoddart and Floden (1995) believe this type of “on the job” learning is only effective if the alternatively licensed teacher is given training and support. General classroom data shows mixed results about the effectiveness of the teacher when comparing alternatively licensed
and traditionally licensed teachers (Bradshaw & Hawk, 1996; Hawley, 1992; Lasley et al., 2006). According to Bradshaw and Hawk (1996), an extensive literature review concluded that alternatively licensed teachers have above average content knowledge determined by college grade point averages and standardized exam scores. Even though content knowledge does not directly translate to an effective teacher, it does dispute the issue of alternatively licensed teachers not having sufficient knowledge of the content contained in the curriculum. In this same literature review, Bradshaw and Hawk (1996) summarized findings that showed alternatively licensed teachers encountered more difficulty than traditionally licensed teachers concerning general pedagogy and classroom management. Alternatively licensed teachers tend to have more difficulty than traditionally licensed teachers when developing and delivering effective lesson plans, understanding differentiated instruction, and preventing disruption and behavioral issues in the classroom (Bradshaw and Hawk, 1996). This translated to alternatively licensed teachers having more difficulty keeping students on task when delivering a lesson plan (Bradshaw and Hawk, 1996). In a study by Sindelar et al. (2004), traditionally licensed teachers outperformed alternatively licensed teachers in a special education class on most of the observational measures taken based on the Praxis III domains. The traditionally licensed teachers scored significantly higher on three of the five Domain 3 criteria, which are based on classroom management and the application of pedagogical skills. Domain C5, which is using class time effectively, was not significantly different (Sindelar et al., 2004). Although there were slight differences between alternatively licensed teachers and traditionally licensed teachers on the 19 individual components of the Praxis III criteria, all teachers, regardless of their licensure type, showed basic competency
on almost of the criteria (Sindelar et al., 2004). In terms of student achievement, the data from researches continues to show mixed results when comparing alternatively licensed teachers and traditionally licensed teachers (Bradshaw and Hawk, 1996; Hawley, 1992).

This literature review demonstrated how the research concerning teacher effectiveness when comparing alternatively licensed teachers and traditionally licensed teachers is inconclusive. The research shows there are characteristics of teachers from both types of licensure that would allow them to be effective in the classroom. Supporters of both types of licensure programs argue they both produce competent teachers and having two different routes are likely to produce teachers with different expertise and skill sets (Feiman-Nemser, 1989; Stoddart and Flodon, 1995). The need for more research in this area was part of the motivation behind this research project.

**Alternative Licensure in North Carolina**

According to the North Carolina Department of Public Instruction (NCDPI), the primary route to alternative licensure is called lateral entry (North Carolina Department of Public Instruction, 2009a). Since this is the primary means of alternative licensure in North Carolina, this will be the only route discussed. Lateral entry is intended for qualified individuals outside of the public education system to immediately obtain a teaching position. To qualify for the lateral entry program, a candidate must (North Carolina Department of Public Instruction, 2009b):

1. Have a bachelor’s degree from an accredited college or university; AND
2. Have one of the following:
   a. A bachelor’s degree or higher that is relevant to the subject area being taught; or
b. 24 semester hours of course work in core area with the following exceptions:
   i. Elementary Education or Exceptional Children (special requirements)
   ii. English as a Second Language (special requirements); or

c. Have one of the following:
   i. Passing score on the Praxis II subject assessment; or
   ii. Passing score on the American Council on the Teaching of Foreign Languages (ACTFL); AND

3. Have one of the following:
   a. 2.5 GPA or above; or
   b. At least five years of relevant experience; or
   c. Passing score on Praxis I, total SAT score of 1100, or a total ACT score of 24; AND
      i. Have one of the following:
         1. 3.0 GPA or above in the field of study
         2. 3.0 GPA or above in all courses senior year
         3. 3.0 GPA or above on a minimum of 15 hours of courses completed within the last five years after the bachelor’s degree or higher.

After a candidate has met these requirements, they can be hired by a North Carolina school system. Once the candidate is hired as a teacher, they are issued a provisional lateral entry license. Once the provisional lateral entry license is issued, the candidate must develop a plan of study. The plan of study is a list of courses the lateral entry teacher must complete to satisfy the requirements of a clear license set by the North Carolina Department of Public
Instruction (North Carolina Department of Public Instruction, 2009a). A clear license is the full license a teacher receives once they have met all the teacher licensure requirements.

There are several organizations that help teachers develop a plan of study. The plan of study can be developed by the NCDPI, a Regional Alternative Licensing Center (RALC), or an approved teacher education program at a college or university, such as NC TEACH. There are four regional offices for the RALC, and the teacher chooses the office that supported the county in which they were employed. NC TEACH is a program based out of the University of North Carolina Center for School Leadership Development in Chapel Hill, NC, and specializes in giving future teachers more pre-service programs to prepare them for the classroom. All of these organizations approach the process in the same manner. Transcripts from the university where the teacher received their degree are reviewed and compared to the courses required for a license. Then a list of courses that still need to be taken is called the plan of study. Once a plan of study is established, the teacher has three years to complete all of the required courses and must take at least six credits a year (North Carolina Department of Public Instruction, 2009b). During this time it is the responsibility of the teacher to find an institution where the courses can be taken. The NC TEACH program is offered at 12 host universities in North Carolina (NC TEACH, 2007). However, the teacher is not required to take the courses on the plan of study at a university in North Carolina, as long as the institution they choose is accredited.

Regardless of the route chosen for developing a plan of study, The State Board of Education has outlined the courses required for technology education. The RALC and NC TEACH do not have licensure areas specifically for technology education. An institution of
higher learning, such as a university, may also be qualified to supply a plan of study. To earn a clear license in technology education, the lateral entry teacher would have to affiliate with a university once the NCDPI has approved the plan of study.

The North Carolina Board of Education lists the following courses for the plan of study for lateral entry teachers in technology education. The teacher must complete the following six courses, or 18 credit hours, and take six credit hours per year (North Carolina State Board of Education, 2009b):

- Curriculum, Instructional Planning, and Assessment in Technology Education
- Instructional Methods in Technology Education (this requirement can be met by the 80 hour induction program)
- Reading in the Content Area Methods
- Meeting Special Learning Needs; Exceptionalities; Diversity
- Classroom Management OR Learning Theory; Learning Styles; Motivation; How Adolescents Learn
- Lab Management and Safety

In addition to the above courses, the teacher must pass the Praxis II Specialty Area exam as well as attend an 80 hour Technology Education Teacher Induction Program sponsored by the Career and Technical Education Department and the State Department of Public Instruction (North Carolina State Board of Education, 2009b). The teacher may not have to take all 18 hours if the NCDPI reviews the transcripts and decides a previous course satisfies the requirements of a course on the plan of study.
To receive a clear license, the teacher must complete the course of study, teach a year in North Carolina, pass the Praxis II for their content area, and receive at or above standard on all criteria on the Teacher Performance Appraisal Instrument (TPIA), the end of year teacher evaluation (Regional Alternative Licensing Center, 2009).

**Principals’ Perceptions**

An administrator’s opinions are very important since their decisions can drastically change the direction of a technology education program (Jewell, 1995). Technology Education programs can vary drastically from school to school. Therefore, it is important for principals to not only understand the current program at their school, but to understand the different skills of the technology teacher. In a study conducted by Jewell (1995), North Carolina principals generally supported the need for technology education courses in all high schools. Most of them agreed that all high school students should take at least one technology education course during their high school career (Jewell, 1995). This same study also points out principals were found to have a high regard for the effectiveness of technology education teachers in general classroom management and content delivery (Jewell, 1995). The current research study builds on these findings and compared the principals’ perspective on teacher effectiveness when comparing alternatively licensed and traditionally licensed technology education teachers.

Being an effective teacher means having the support of the administration. The effectiveness of the teacher can be largely contributed to how they feel about their principal’s support (Edmond, 1982). David Fraser (1999), a coordinator of technology education for the Burnaby School District in British Columbia, Canada, says the reason the technology
education program in his district has been so successful is because of the focus on the administrative support to the teachers. Part of this can be established during a pre-employment interview, or during the time shortly after a new technology education teacher is employed. Balistreri (1991) mentions the importance of the principal establishing a relationship with the new teacher to show the support of the administration. Balistreri (1991) even offers particular interview questions for principals to ask which were developed specifically for interviewing technology education teachers.

In the previously mentioned study by Sindelar et al. (2004), there was a component in the research design for measuring the principal’s perspective of the teacher’s effectiveness. Principal’s rated all participants in the study as above average, but rated the alternatively licensed teachers as having a slightly higher effectiveness than the traditionally licensed teachers based on the same criteria contained in the Praxis III.

**Justification for Research**

From this literature review, it has been shown that, although there is significant research on teacher effectiveness in general education, there is little empirical data relating to technology education in North Carolina. More empirical data needs to be provided for comparing alternatively licensed and traditionally licensed technology education teachers when measuring student achievement in North Carolina.
Chapter 3

Research Questions

The research questions for this project are based on determining the significant differences in teacher effectiveness when comparing alternatively licensed and traditionally licensed technology education teachers in North Carolina. The research questions are as follows:

1. Are there significant differences in achievement, as measured by percent proficiency on the end of course exam, of students taught by alternatively licensed technology education teachers versus those taught by traditionally licensed technology education teachers in North Carolina?

2. Are there significant differences in the pedagogical management practices, as measured by time on task, of alternatively licensed technology education teachers versus traditionally licensed technology education teachers in North Carolina?

3. Are there significant differences in the preparation, performance, and professional development needs, as measured by the principal’s perception, of alternatively licensed technology education teachers versus traditionally licensed technology education teachers in North Carolina?

Methodology

The methodology used to answer the research questions involved both a quantitative and qualitative approach to the statistical analysis. Mixed methodology allowed for a triangulation approach for analyzing the results of the research questions. Triangulation is the
process of examining the same problem from different perspectives (Golafshani, 2003; Hoepfl, 1997; Jick, 1979). From using this approach, the researcher was able to validate the overall findings of the study by comparing the results from each of the three research questions. Before data collection began, the researcher obtained approval from the North Carolina State University Institutional Review Board. A copy of the IRB approval letter and application is shown in Appendix D.

**Research Question 1**

Research question 1 used exam scores to compare student achievement of alternatively and traditionally licensed high school technology education teachers in North Carolina. To answer research question 1, a quantitative analysis was performed to measure any statistically significant differences in the percent of students achieving proficiency between the two groups of teachers on end of the course VoCATS exam for the 2009-2010 school year. The five courses analyzed were Fundamentals of Technology, Communication Systems, Manufacturing Systems, Structural Systems, and Transportation Systems. The 2010 VoCATS exam results for these five courses were obtained from the North Carolina Department of Public Instruction (NCDPI). The focus of research question 1 only included these five courses because these are the five courses that can be taught with a basic technology education license and have a standardized end of course exam. Principles of Technology and Scientific Visualization were not included in the analysis because they require an add-on certification and cannot be taught by a regularly licensed teacher. Courses designed by Project Lead The Way (PLTW) were also not included because they require
additional teacher training (Project Lead The Way, 2011). Having an add-on certification means that teacher attended a workshop in which specific content knowledge was gained. The purpose of only using courses that do not require additional certifications is to limit, as much as possible, the contributors to content knowledge which would affect the percent proficiency of students on the end of course exam. This would skew the data for those exam results because that teacher would have additional knowledge gained other than the knowledge received through the traditional technology education program. The researcher is aware that some teachers may have add-on certifications, but the researcher did not include the courses that require these certifications in this study. In addition to exam results, the NCDPI also provided data as to which technology education teachers in North Carolina are alternatively licensed and which teachers are traditionally licensed.

**Data Cleaning Process**

Two separate spreadsheets were received from the NCDPI. One spreadsheet contained a list of all the high school technology education teachers in North Carolina for the school year ending in 2010. The other spreadsheet contained all the 2010 results for the percent of students proficient on the VoCATS exam for each teacher the NCDPI had on file for Fundamentals of Technology and the four systems courses. The exam results provided by the NCDPI are reported in terms of the percent of students obtaining proficiency for each course taught at a particular school. It was not reported as an actual exam score. It was reported as the number of students obtaining proficiency. Each student is allowed to take the test one time, therefore protecting the integrity of the data. This means an accurate measure
of the proficiency of the students was recorded. Test results are provided for each technology education course taught at the school. If more than one teacher from the same school taught the same course, it could not be determined from the data which exam results were achieved by which teacher.

Before the one-way ANOVA could be performed on the end of course exam data, this information was cleaned to meet the requirements of the study. This process involved two major components. The first part was to clean the list of teachers in order to obtain two statistically independent data sets. The second part was to enter the valid end of course exam data the NCDPI had on file.

The spreadsheet from the NCDPI containing teacher information was cleaned so only the following columns were visible; first name, middle name, last name, alternatively licensed (yes, no, or both), traditionally licensed (yes, no, or both), state subject codes (to verify the name of the course taught), subject (or course) title, array of grade levels taught in that course, and the teachers’ 2009-2010 school assignments. Columns containing information about gender, race, and National Board Certification were removed because they had no relevance in verifying the eligibility of teachers in the study. From this list, the data was then sorted by course, and all but the five courses analyzed in this study were removed. This eliminated schools that did not offer high school level courses, courses that did not have an end of course VoCATS exam, and courses that required a separate add-on certification. From this list, the teachers whose teaching assignment could not positively be identified were removed from the list. According to the spreadsheet provided by the NCDPI, some teachers
were designated by the state as being both alternatively and traditionally licensed. It was apparent that additional criteria was used to determined licensure type. Since the actual licensure type for these teachers could not be positively identified, these teachers were removed from the list. Teachers who had more than one teaching assignment were left in the data pool if one of their assignments was teaching at least one of the five courses analyzed in the study. Each teacher in the list was then assigned a number that will now be their unique identifier. This data cleaning process resulted in a main workbook containing 157 high school technology education teachers meeting the requirements of the study. This included 76 alternatively licensed teachers, 34 traditionally licensed teachers and 47 teachers that the NCDPI designated as both alternatively licensed and traditionally licensed. Once this filtration process was complete, this spreadsheet became the main workbook used for the teacher selection process for the observational portion of the study. However, additional filtration was necessary to analyze the exam data for research question 1.

For research question 1, the data was cleaned further in order to produce two clearly identified independent data sets. The teachers designated as having both types of licensure were eliminated from this portion of the study since their actual licensure type could not be determined from the data. The following columns were then added to the spreadsheet; number of students proficient, total number of students that took the exam, percent proficiency calculated, and percent proficiency from the NCDPI. The last two columns added gave the same information, but were put in as a check to make sure the exam data entry process was accurate. The data was then sorted by course and school code. This made it
easier to input the exam data into this spreadsheet since the exam information spreadsheet provided by the NCDPI was organized by course and numerical order by school code. The exam result information was then entered into the spreadsheet. If an exam result was not provided by the NCDPI for a particular school, this school was eliminated. There were three circumstances where the same teacher had exam data from two schools for the same course. The exam results for this teacher were combined since that teacher is the only teacher responsible for those exam results. The label for the other school was deleted. If two teachers taught the same course from the same school, this school’s exam results were deleted since the exam results for the individual teachers cannot be determined from the data.

At this point, the exam results were analyzed in two different ways. The first was to test if there are any statistically significant differences in the overall percent proficiency of students when comparing alternatively licensed teachers and traditionally licensed teachers. The second was to test if there are any statistically significant differences in the percent proficiency of students when comparing alternatively licensed teachers and traditionally licensed teachers for each of the five courses.

To compare the overall effectiveness, the data was further cleaned to meet the requirements of this analysis. If a teacher taught more than one course, the percent of students proficient from the different courses were combined for this teacher. Since the objective was to compare overall teacher effectiveness, combining these exam results maintains the integrity of the samples. From this list, all of the columns were deleted except the following; alternatively licensed (yes or no), traditionally licensed (yes or no), number
students proficient, number total exams taken, and percent proficiency calculated. The percent proficient column provided by the NCDPI was deleted since this information had been verified as correct and showed redundant information. The list was then sorted by licensure type to group the two sets of teachers. This resulted in 81 total teachers eligible to be analyzed in this portion of the study; 55 alternatively licensed and 26 traditionally licensed. Table 3.1 summarizes these results. This became the final list of teachers to be analyzed. From the data set, a one-way ANOVA was conducted using the statistical software SPSS. This allowed the researcher to determine if there are any statistically significant differences in the overall percent of students proficient on the end of course VoCATS exam of students taught by alternatively licensed teachers compared to those taught by traditionally licensed alternatively licensed teachers.

The other aspect of research question 1 compared teacher effectiveness for each of the five courses included in the study; Fundamentals of Technology and the four systems courses. The primary course for analysis was Fundamentals of Technology, which is the introductory course in the sequence of technology education courses taught in North Carolina (North Carolina Department of Public Instruction, 2009d). Since this course is a prerequisite for the other four systems courses, its curriculum content involves less industry specific information and more general technological knowledge (North Carolina Department of Public Instruction, 2009d). There was also a larger sample size in this data set than for the other courses and therefore created a more powerful statistical analysis. By analyzing the Fundamentals of Technology course, an overall description of how alternatively licensed
teachers and traditionally licensed teachers compare in terms of their ability to educate students about general technological knowledge was attained. The curriculum of the four systems courses contains information that is more industry specific than Fundamentals of Technology. They each contain curriculum content considered to be skill-oriented, and therefore industry experience could contribute to better applications of course material. The researcher wanted to determine if corporate work experience obtained by the alternatively licensed teachers may have contributed to a better understanding of the systems courses. If a better understanding of curricula content exists, this may result in the alternatively licensed teachers having more students obtain proficiency on the VoCATS exam for the systems courses.

**Data Cleaning Results**

Before performing the statistical analysis, the data needed to be formatted to meet the requirements of this portion of the study. Using the main spreadsheet previously mentioned in this chapter, the teachers were sorted by course, and then separated into each individual course they taught. Once the teachers were separated into the individual courses, the list was then sorted by licensure type. The total number of teachers for each course is listed in Table 3.1.
Table 3.1

*Total Number of Teachers*

<table>
<thead>
<tr>
<th>Course</th>
<th>Alternative License</th>
<th>Traditional License</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Five Courses Combined</td>
<td>55</td>
<td>26</td>
<td>81</td>
</tr>
<tr>
<td>Fundamentals of Technology</td>
<td>44</td>
<td>18</td>
<td>62</td>
</tr>
<tr>
<td>Communication Systems</td>
<td>13</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>Manufacturing Systems</td>
<td>7</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Structural Systems</td>
<td>10</td>
<td>11</td>
<td>21</td>
</tr>
<tr>
<td>Transportation Systems</td>
<td>11</td>
<td>8</td>
<td>19</td>
</tr>
</tbody>
</table>

A one-way ANOVA was performed on the data set of the five courses combined, Fundamentals of Technology, and the four systems courses to determine if the type of licensure is a main effect in determining the percent of students proficient on the end of course VoCATS exam.

**Research Question 2**

Research question 2 involved determining the pedagogical management of the teachers as measured by the time on task of their students. This approach involved both a qualitative and quantitative component. A random sample of five teachers was selected from each licensure type from the complete list of technology education teachers in North Carolina. This smaller sample size allowed the researcher to conduct observations and collect
demographical information to allow for a more in-depth quasi-case study analysis of the sample.

**Data Cleaning Process**

This section outlines the process used to select the teachers for the observational portion of the study. As previously mentioned, the main workbook resulted in 157 high school technology education teachers that teach either Fundamentals of Technology or one of the four systems courses. For this portion of the study, the teachers that were shown to have both an alternative license and a traditional license were kept on the list. When one of these teachers was chosen to participate in this portion of the study, their answers on the teacher survey verified which type of licensure they obtained. If their licensure type could not be determined, they became ineligible for the study.

Each one of these teachers had been assigned a number as their unique identifier. At this point, the researcher used a random number generator to produce the list from which the participants were selected. Starting from the first number in the random list, the researcher found the participant whose unique identifier matched the random number. The researcher initially contacted the potential subject by emailing the narrative approved by the North Carolina State University IRB. A copy of this email script is shown in Appendix C. This email described the purpose of the study and the general actions the participant would be required to perform. If the participant responded with an interest in participating, the researcher sent them the teacher consent form, the teacher survey, principal survey, and the student consent forms so the teacher could make an informed decision about whether or not
they would be willing to participate in the study. A copy of the teacher and principal surveys are shown in Appendix B. A copy of the teacher consent form and student video release forms are shown in Appendix C. If the teacher agreed to be in the study, the researcher then contacted the principal of that teacher by emailing them the script approved by the North Carolina State University IRB. A copy of this email script is shown in Appendix C. If the principal showed interest in the study, they were sent a principal consent form in order to be considered for research question 3. A copy of the principal consent form is shown in Appendix C. If both the teacher and the principal signed their consent form, this teacher and principal became subjects of the study. If either the teacher or principal did not agree to participate, this teacher was no longer considered eligible for the study and the next teacher on the list was contacted. When both the teacher and principal agreed to be in the study, the researcher verified from the teacher survey whether or not the teacher had an alternative or traditional license. This process was continued until there were five pairs of teachers and principals from each group of teacher licensure type. Once five teachers and their principals from one licensure type had agreed to be in the study, the researcher then only contacted teachers labeled as the other licensure type or designated as having both. This process continued until five subject pairs from each licensure type had agreed to participate in the study. If a teacher or principal did not respond to the initial email, a second email was sent. If there was still no response, the researcher called the school by telephone. If the potential subject did not respond after two emails and a telephone call, the next teacher on the list was contacted.
Observations

In this portion of the study, the researcher viewed videos recorded by each teacher. Each of the teachers recorded at least 45 minutes of one class period of a typical lesson. The teacher was responsible for choosing the date and class period they videotaped. However, each teacher was asked to video a typical lesson plan in one of the five courses included in the research study. Each video showed a wide angle view of the classroom so the researcher could see all the students during the entirety of the lesson. These videos were mailed to the researcher along with the student consent forms. To record the observational data for this research question, the researcher used an observation tool similar to the one used by Colvin et al. (2009). The observation tool used by Colvin et al. (2009) was field tested to a reliability of 93%. This observation tool allowed the researcher to observe and record pedagogical management of the classroom such as classroom setting, teacher behavior, and the time on task of students. The observation instrument as well as the definitions of the classroom settings, teacher behaviors, and time on task is shown in Appendix A. Data was collected on how many students are on task during a 45 minute segment of the class period. The accepted method of collecting data in this manner is to divide the class time into increments and collect data at specific points in time designated as the interval time (Allday, Duhon, Blackburn-Ellis, & Van Dycke, 2011; Colvin et al., 2009; Sindelar et al., 2004). Interval times are used through the entirety of the class period which allows the teacher to transition through different teaching styles and techniques through the class period. This gives a more accurate interpretation of how the class time is being managed than if observations were only
taken at one point during the class period. Given the nature of the technology education curriculum, project work is a vital component of the lesson plans. The students typically transition through different types of learning activities during the class period. Observing at systematic intervals allowed the researcher to record a more accurate representation of the overall pedagogical management techniques used by the teacher and to better analyze the students’ time on task.

The first observation point occurred five minutes after class had begun. This allowed time for the students to engage in the lesson once the class period had begun. An observation was then recorded every three minutes until 14 observations had been recorded. This allowed the researcher to use this instrument during a class on the traditional bell schedule that has approximately 45 minute classes as well as a block bell schedule that has approximately 90 minute classes. At each interval, the observer recorded the results on the observation instrument. The researcher marked which classroom setting and teacher behavior was being demonstrated at that point in time as well as how many students are on task. Time on task measurements were taken as the number of students performing the appropriate task as directed by the teacher at the specific observation point. Once the observations were completed, there were 14 observation intervals. The results for the students on task were then divided by the total number of students in the class to obtain a ratio of the students on task during each observation interval. An average of these 14 values was calculated to determine the ratio for the students on task for that particular teacher.
**Statistical Analysis**

A one-way ANOVA was performed to determine if there are any statistically significant differences between the time on task of students for the two groups of teachers. The researcher also performed a repeated measures analysis to determine if there are any statistically significant differences in the time on task of students within each classroom setting and teacher behavior. A repeated measures analysis is appropriate when the same main effect is being tested from exposure to different conditions (Field, 2008; Lix & Sajobi, 2010). Time on task was the dependent variable in both groups, but was measured under different conditions at constant intervals. These different conditions are the classroom setting and teacher behavior. This explained if certain classroom settings or teacher behaviors have the ability to maintain a higher on-task rate of students when comparing alternatively licensed and traditionally licensed teachers in technology education.

**Teacher Surveys**

In addition to the observations, demographic data was collected on the teachers participating in this portion of the study. This data was obtained through the use of a teacher survey. A copy of the teacher survey is shown in Appendix B. This survey was sent to the teachers and returned to the researcher once completed. The surveys collected information from the teachers such as years of teaching experience, type of bachelor’s degree, type of teaching license, and years and type of work experience prior to teaching. Even though their demographic situations are much different, both groups of teachers were given the same questions to reduce any bias towards one group. Once the data was collected, it was reviewed
by qualitative analysis. The researcher reported the results of the survey in chapter 4, listing the common terms and phrases used in the survey results. The findings were presented as a discussion using teacher background information to explain any differences in the time on task of students between the two groups of teachers. The researcher then identified survey findings that may have contributed to a higher student time on task between alternatively licensed and traditionally licensed technology education teachers.

**Research Question 3**

Research question 3 measured the principal's' perception of the teacher's preparation, performance, and professional development needs. A telephone survey was conducted with the principals of the teachers selected for the observational component of this project. A copy of the principal survey is shown in Appendix B. As outlined in the consent form, these telephone conversations were audio recorded. The recordings were then transcribed by the researcher. This allowed the responses to be qualitatively analyzed for a more accurate reporting of the results. The researcher reported the results of the survey in chapter 4, listing the common ideas, phrases, and trends found in the survey results. The findings were presented as a discussion using the responses to explain any differences in the principals’ interpretation of the teacher’s effectiveness. The data collected from this survey was used to determine if there are significant differences in the principal’s perception of the preparation, performance, and professional development needs of the technology teacher in their school.
Data Interpretation

Research Questions

Once all of the data was collected, the results of the quantitative and qualitative analyses were examined to answer the research questions. For research question 1, the statistical significance was reported in terms of a p-value, using \( \alpha = 0.05 \), to determine if there are any statistically significant differences in the means between the two groups of teachers. This led to an understanding as to whether or not there are any statistically significant differences in the percent of students proficient on the end of the course VoCATS exam for alternatively licensed teachers compared to traditionally licensed teachers for all five courses combined as well as Fundamentals of Technology and the four systems courses. The observational data collected, along with teacher demographic information, was examined to answer research question 2. This was accomplished by reporting characteristics of technology education teachers concerning pedagogical management as it relates to time on task. A repeated measures analysis showed any statistically significant differences in the time of task of students exposed to different classroom settings and teacher behaviors. The survey results from the principals were used to answer research question 3.

Conclusion

From the quantitative analyses used to answer research questions 1 and 2, the researcher was able to determine if there are any statistically significant differences in teacher effectiveness as measured by the end of course VoCATS exam and the time on task of students when comparing alternatively licensed and traditionally licensed technology
education teachers in North Carolina. From the qualitative analyses used to answer research questions 2 and 3, the researcher was able to determine if there are any qualitative differences in teacher demographics and principals’ perceptions of teacher preparation, performance, and professional development needs which contributed to their pedagogical management when comparing alternatively licensed and traditionally licensed technology education teachers in North Carolina. Using these three questions in combination will provide evidence as to teacher effectiveness when comparing alternatively licensed to traditionally licensed technology education teachers in North Carolina.
Chapter 4

Research Question 1

The results for research question 1, concerning student achievement, showed if there are any statistically significant differences between the percent of students proficient on the end of course VoCATS exam of alternatively licensed compared to traditionally licensed technology education teachers in North Carolina. This was first performed on a data set which included all the technology teachers in North Carolina that met the data filtration requirements explained in chapter 3. The first part of this research question was to determine if there are any statistically significant differences in the percent of student proficiency for the five courses combined. This means if a teacher taught more than one of the five courses, the exam results for these courses were combined, resulting in the total percentage of proficient students for that teacher. The second part of research question 1 showed if there are any statistically significant differences in the students’ proficiency for Fundamentals of Technology and each of the four systems courses. An analysis was conducted on the data set on each course for the teachers that met the data filtration requirements explained in chapter 3.

Five Courses Combined

The first test was to determine if there are any statistically significant differences in the percent of students obtaining proficiency between all the alternatively and traditionally licensed teachers. The five courses included in this data set are Fundamentals of Technology, Communication Systems, Manufacturing Systems, Structural Systems, and Transportation
Systems. For this analysis, a one-way ANOVA was performed on the data set. Table 4.1 shows the descriptive results of the test and Table 4.2 shows the results of the statistical analysis. The test for homogeneity of variances resulted in $p = 0.309$. Using $\alpha = 0.05$, this is not significant, which means the variances of the two samples are not significantly different. This is one of the criteria for justifying the results of the one-way ANOVA.

Table 4.1

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Std. Error</th>
<th>Min.</th>
<th>Max.</th>
<th>95 % C.I. Lower Bound</th>
<th>95 % C.I. Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative</td>
<td>55</td>
<td>76.6085</td>
<td>14.79044</td>
<td>1.99434</td>
<td>38.28</td>
<td>100.00</td>
<td>72.6101</td>
<td>80.6070</td>
</tr>
<tr>
<td>Traditional</td>
<td>26</td>
<td>78.3546</td>
<td>17.47755</td>
<td>3.42763</td>
<td>30.77</td>
<td>100.00</td>
<td>71.2953</td>
<td>85.4140</td>
</tr>
<tr>
<td>Total</td>
<td>81</td>
<td>77.1690</td>
<td>15.61383</td>
<td>1.73487</td>
<td>30.77</td>
<td>100.00</td>
<td>73.7165</td>
<td>80.6215</td>
</tr>
</tbody>
</table>

Table 4.2

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>53.824</td>
<td>1</td>
<td>53.824</td>
<td>.219</td>
<td>.641</td>
</tr>
<tr>
<td>Within Groups</td>
<td>19449.510</td>
<td>79</td>
<td>246.196</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>19503.334</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹. $\alpha = 0.05$
It was determined there are no statistically significant differences between the two groups of teachers when comparing the mean exam scores of the students for all five courses combined. Although these results were not significant, the researcher continued with the study to compare the individual courses. Although there is a small chance of finding significance, the researcher wanted to determine if work experience by alternatively licensed teachers may contribute to increased content knowledge in a trade-based curriculum.

**Five Courses Separately**

The next part of the analysis was to compare the percent of students obtaining proficiency on the VoCATS exam between the two types of licensure for each course separately. A one-way ANOVA was performed on the data sets for each of the five courses included in this study. These courses are Fundamentals of Technology, Communication Systems, Manufacturing Systems, Structural Systems, and Transportation Systems. The objective was to determine if outside work experience obtained by alternatively licensed teachers may contribute to significant differences in the percent of students proficient on the VoCATS exam for that course.

**Fundamentals of Technology**

For the Fundamentals of Technology course, a one-way ANOVA was performed on the data set to determine if there is a significant difference in the percent of students obtaining proficiency on the VoCATS exam for alternatively licensed compared to traditionally licensed teachers. The descriptive statistics are shown in Table 4.3 and the statistical results are shown in Table 4.4. The test for homogeneity of variances resulted in p
\( = 0.445 \). Using \( \alpha = 0.05 \), this is not significant, which means the variances of the two samples are not significantly different. This is one of the criteria for justifying the results of the one-way ANOVA.

Table 4.3

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Std. Error</th>
<th>Min.</th>
<th>Max.</th>
<th>95 % C.I. Lower Bound</th>
<th>95 % C.I. Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative</td>
<td>44</td>
<td>75.5466</td>
<td>15.01185</td>
<td>2.26312</td>
<td>33.33</td>
<td>97.80</td>
<td>70.9826</td>
<td>80.1106</td>
</tr>
<tr>
<td>Traditional</td>
<td>18</td>
<td>77.7378</td>
<td>18.14036</td>
<td>4.27572</td>
<td>30.77</td>
<td>97.22</td>
<td>68.7168</td>
<td>86.7588</td>
</tr>
<tr>
<td>Total</td>
<td>62</td>
<td>76.1827</td>
<td>15.86101</td>
<td>2.01435</td>
<td>30.77</td>
<td>97.80</td>
<td>72.1548</td>
<td>80.2107</td>
</tr>
</tbody>
</table>

Table 4.4

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>61.333</td>
<td>1</td>
<td>61.333</td>
<td>0.241</td>
<td>0.625</td>
</tr>
<tr>
<td>Within Groups</td>
<td>15284.528</td>
<td>60</td>
<td>254.742</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>15345.861</td>
<td>61</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. \( \alpha = 0.05 \)
This analysis resulted in no statistically significant difference in student achievement in the Fundamentals of Technology course.

**Communication Systems**

For the Communication Systems course, a one-way ANOVA was performed to determine if there is a statistically significant difference in the percent of students obtaining proficiency on the VoCATS exam for alternatively licensed compared to traditionally licensed teachers. The descriptive statistics are shown in Table 4.5 and the statistical results are shown in Table 4.6. The test for homogeneity of variances resulted in \( p = 0.154 \). Using \( \alpha = 0.05 \), this is not significant, which means the variances of the two samples are not significantly different. This is one of the criteria for justifying the results of the one-way ANOVA.

Table 4.5

*Descriptive Statistics for Student Achievement in Communication Systems*

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Std. Error</th>
<th>Min.</th>
<th>Max.</th>
<th>95 % C.I. Lower Bound</th>
<th>95 % C.I. Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative</td>
<td>13</td>
<td>81.2354</td>
<td>17.70474</td>
<td>4.91041</td>
<td>30.30</td>
<td>100.00</td>
<td>70.5365</td>
<td>91.9343</td>
</tr>
<tr>
<td>Traditional</td>
<td>7</td>
<td>74.6543</td>
<td>21.68594</td>
<td>8.19652</td>
<td>50.00</td>
<td>100.00</td>
<td>54.5981</td>
<td>94.7104</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>78.9320</td>
<td>18.89060</td>
<td>4.22407</td>
<td>30.30</td>
<td>100.00</td>
<td>70.0909</td>
<td>87.7731</td>
</tr>
</tbody>
</table>
The result of this analysis showed there was no statistically significant difference when comparing the proficiency of students on the end of course exam for Communication Systems.

**Manufacturing Systems**

For the Manufacturing Systems course, a one-way ANOVA was performed on the data set to determine if there is a statistically significant difference in the percent of students obtaining proficiency on the VoCATS exam for alternatively licensed compared to traditionally licensed teachers. The descriptive statistics are shown in Table 4.7 and the statistical results are shown in Table 4.8. The test for homogeneity of variances resulted in $p = 0.085$. Using $\alpha = 0.05$, this is not significant, which means the variances of the two samples are not significantly different. This is one of the criteria for justifying the results of the one-way ANOVA.

### Table 4.6

<table>
<thead>
<tr>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig. $^1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>197.064</td>
<td>1</td>
<td>197.064</td>
<td>0.539</td>
</tr>
<tr>
<td>Within Groups</td>
<td>6583.175</td>
<td>18</td>
<td>365.732</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>6780.239</td>
<td>19</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. $\alpha = 0.05$
Table 4.7

*Descriptive Statistics for Student Achievement in Manufacturing Systems*

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Std. Error</th>
<th>Min.</th>
<th>Max.</th>
<th>95 % C.I. Lower Bound</th>
<th>95 % C.I. Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative</td>
<td>7</td>
<td>76.3157</td>
<td>21.41237</td>
<td>8.09312</td>
<td>47.73</td>
<td>100.00</td>
<td>56.5126</td>
<td>96.1189</td>
</tr>
<tr>
<td>Traditional</td>
<td>5</td>
<td>84.2500</td>
<td>9.64679</td>
<td>4.31418</td>
<td>75.00</td>
<td>100.00</td>
<td>72.2719</td>
<td>96.2281</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>79.6217</td>
<td>17.33833</td>
<td>5.00514</td>
<td>47.73</td>
<td>100.00</td>
<td>68.6054</td>
<td>90.6379</td>
</tr>
</tbody>
</table>

Table 4.8

*One-Way ANOVA for Student Achievement in Manufacturing Systems*

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>183.613</td>
<td>1</td>
<td>183.613</td>
<td>0.588</td>
<td>0.461</td>
</tr>
<tr>
<td>Within Groups</td>
<td>3123.181</td>
<td>10</td>
<td>312.318</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3306.793</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. α = 0.05

This analysis showed no statistically significant difference in the proficiency of students when comparing end of course exams between the two groups of teachers.
Structural Systems

For the Structural Systems course, a one-way ANOVA was performed on the data set to determine if there is a statistically significant difference in the percent of students obtaining proficiency on the VoCATS exam for alternatively licensed compared to traditionally licensed teachers. The descriptive statistics are shown in Table 4.9 and the statistical results are shown in Table 4.10. The test for homogeneity of variances resulted in $p = 0.501$. Using $\alpha = 0.05$, this is not significant, which means the variances of the two samples are not significantly different. This is one of the criteria for justifying the results of the one-way ANOVA.

Table 4.9

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Std. Error</th>
<th>Min.</th>
<th>Max.</th>
<th>95 % C.I. Lower Bound</th>
<th>95 % C.I. Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative</td>
<td>10</td>
<td>80.1850</td>
<td>19.23412</td>
<td>6.08236</td>
<td>45.83</td>
<td>100.00</td>
<td>66.4257</td>
<td>93.9443</td>
</tr>
<tr>
<td>Traditional</td>
<td>11</td>
<td>76.9927</td>
<td>23.15090</td>
<td>6.98026</td>
<td>33.33</td>
<td>100.00</td>
<td>61.4397</td>
<td>92.5457</td>
</tr>
<tr>
<td>Total</td>
<td>21</td>
<td>78.5129</td>
<td>20.90763</td>
<td>4.56242</td>
<td>33.33</td>
<td>100.00</td>
<td>68.9958</td>
<td>88.0299</td>
</tr>
</tbody>
</table>
Table 4.10

*One-Way ANOVA for Student Achievement in Structural Systems*

<table>
<thead>
<tr>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig. ¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>53.379</td>
<td>1</td>
<td>53.379</td>
<td>0.117</td>
</tr>
<tr>
<td>Within Groups</td>
<td>8689.203</td>
<td>19</td>
<td>457.326</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8742.583</td>
<td>20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹. \( \alpha = 0.05 \)

As a result of this analysis, there was no statistically significant difference in student achievement as measured by the proficiency of students when comparing the two groups of teachers.

**Transportation Systems**

For the Structural Systems course, a one-way ANOVA was performed on the data set to determine if there is a statistically significant difference in the percent of students obtaining proficiency on the VoCATS exam for alternatively licensed compared to traditionally licensed teachers. The descriptive statistics are shown in Table 4.11 and the statistical results are shown in Table 4.12. The test for homogeneity of variances resulted in \( p = 0.829 \). Using \( \alpha = 0.05 \), this is not significant, which means the variances of the two samples are not significantly different. This is one of the criteria for justifying the results of the one-way ANOVA.
Table 4.11

**Descriptive Statistics for Student Achievement in Transportation Systems**

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Std. Error</th>
<th>Min.</th>
<th>Max.</th>
<th>95 % Lower Bound</th>
<th>95 % Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative</td>
<td>11</td>
<td>78.2564</td>
<td>17.27377</td>
<td>5.20824</td>
<td>52.63</td>
<td>100.00</td>
<td>66.6517</td>
<td>89.8610</td>
</tr>
<tr>
<td>Traditional</td>
<td>8</td>
<td>84.8675</td>
<td>18.40327</td>
<td>6.50654</td>
<td>47.37</td>
<td>100.00</td>
<td>69.4820</td>
<td>100.253</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>81.0400</td>
<td>17.57053</td>
<td>4.03096</td>
<td>47.37</td>
<td>100.00</td>
<td>72.5713</td>
<td>89.5087</td>
</tr>
</tbody>
</table>

Table 4.12

**One-Way ANOVA for Student Achievement in Transportation Systems**

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>202.433</td>
<td>1</td>
<td>202.433</td>
<td>0.643</td>
<td>0.434</td>
</tr>
<tr>
<td>Within Groups</td>
<td>5354.593</td>
<td>17</td>
<td>314.976</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5557.026</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) \alpha = 0.05

This analysis showed no statistically significant difference in the proficiency of students when comparing end of course exams between the two groups of teachers in Transportation Systems.
Although no statistically significant differences were found for any of the analyses, some trends were discovered that warrant further research projects that are more targeted at some individual components of the current study. A summary of the research findings are shown in Table 4.13.

Table 4.13

*Summary of Results for Student Achievement*

<table>
<thead>
<tr>
<th>Course</th>
<th>N</th>
<th>Mean</th>
<th>Δ</th>
<th>p (α = 0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alt</td>
<td>Trad</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All 5 Courses</td>
<td>55</td>
<td>26</td>
<td>76.6</td>
<td>78.4</td>
</tr>
<tr>
<td>Fund Of Tech</td>
<td>44</td>
<td>18</td>
<td>75.5</td>
<td>77.7</td>
</tr>
<tr>
<td>Communication</td>
<td>13</td>
<td>7</td>
<td>81.2</td>
<td>74.7</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>7</td>
<td>5</td>
<td>76.3</td>
<td>84.3</td>
</tr>
<tr>
<td>Structural</td>
<td>10</td>
<td>11</td>
<td>80.2</td>
<td>77.0</td>
</tr>
<tr>
<td>Transportation</td>
<td>11</td>
<td>8</td>
<td>78.3</td>
<td>84.9</td>
</tr>
</tbody>
</table>

*Research Question 2*

**Time on Task**

This part of the study compared the time on task of students of alternatively licensed teachers compared to traditionally licensed technology education teachers in North Carolina.
Five teachers were chosen from each group. The number of students on task for each teacher was recorded at each interval and the average percentage of students on task for each teacher was calculated per the methodology described in chapter 3. A one-way ANOVA was used to compare the average number of students on task between the two groups of teachers. The descriptive statistics of the results are shown in Table 4.14 and the results for significance are shown in Table 4.15. The test for homogeneity of variances resulted in $p = 0.141$. Using $\alpha = 0.05$, this is not significant, which means the variances of the two samples are not significantly different. This is one of the criteria for justifying the results of the one-way ANOVA.

Table 4.14

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Std. Error</th>
<th>Min.</th>
<th>Max.</th>
<th>95 % C.I. Lower Bound</th>
<th>95 % C.I. Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative</td>
<td>5</td>
<td>.75800</td>
<td>.103795</td>
<td>.046419</td>
<td>.612</td>
<td>.857</td>
<td>.62912</td>
<td>.88688</td>
</tr>
<tr>
<td>Traditional</td>
<td>5</td>
<td>.77460</td>
<td>.049470</td>
<td>.022124</td>
<td>.693</td>
<td>.817</td>
<td>.71317</td>
<td>.83603</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>.76630</td>
<td>.077152</td>
<td>.024398</td>
<td>.612</td>
<td>.857</td>
<td>.71111</td>
<td>.82149</td>
</tr>
</tbody>
</table>
Table 4.1

**One-Way ANOVA for Time on Task**

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig. 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>.001</td>
<td>1</td>
<td>.001</td>
<td>.104</td>
<td>.755</td>
</tr>
<tr>
<td>Within Groups</td>
<td>.053</td>
<td>8</td>
<td>.007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>.054</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. \( \alpha = 0.05 \)

**Classroom Settings and Teacher Behaviors**

The following information is being shared because it represents some of the qualitative aspects found during the data analysis process. As seen from the results above, none of the comparisons between the time on task of students when comparing alternatively licensed traditionally licensed teachers was found to be significant for the five courses combined as well as each systems course. A discussion of these non-significant findings will be discussed further in chapter 5. However, although they did not yield any statistically significant differences, there are some qualitative differences between the two groups that are of interest to the researcher. Qualitative data was collected to show how the teachers chose to use their instructional time. As described earlier, the observation instrument listed the classroom setting as either large group (L), small group (S), individual (I), or the class was transitioning between these settings (T). The teacher behavior was identified as either lecture (L), activity (A), project (P), or the teacher was giving either a formal or informal assessment.
Table 4.16 shows the raw data for the frequency of classroom settings and teacher behaviors used by each group of teachers. This data would have been used to help explain any statistically significant differences in the time on task of students between the two groups if one had existed. However, since there were no significant differences, this data can be used to show there are some qualitative differences in the teaching styles of alternatively licensed and traditionally licensed technology education teachers.

Table 4.16

*Frequency of Classroom Settings and Teacher Behaviors*

<table>
<thead>
<tr>
<th>Setting</th>
<th>Alternative</th>
<th>Traditional</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Average</td>
</tr>
<tr>
<td></td>
<td>Occurrences</td>
<td></td>
</tr>
<tr>
<td>Large Group</td>
<td>26</td>
<td>5.2</td>
</tr>
<tr>
<td>Small Group</td>
<td>12</td>
<td>2.4</td>
</tr>
<tr>
<td>Individual</td>
<td>31</td>
<td>6.2</td>
</tr>
<tr>
<td>Transition</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>Behavior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lecture</td>
<td>14</td>
<td>2.8</td>
</tr>
<tr>
<td>Activity</td>
<td>12</td>
<td>2.4</td>
</tr>
<tr>
<td>Project</td>
<td>33</td>
<td>6.6</td>
</tr>
<tr>
<td>Assessment</td>
<td>11</td>
<td>2.2</td>
</tr>
</tbody>
</table>
The qualitative analysis shows the traditionally licensed teachers used more large and small group settings while the alternatively licensed teachers used more individual work. It also shows the traditionally licensed teachers used more lecture style lessons while the alternative licensed teachers used more activities, projects, and assessments during their instructional time. Possible reasons for these differences will be discussed in chapter 5.

The researcher also ran a repeated measures test to determine if there were any statistically significant differences between the time on task of students for both teacher licensure types for the different classroom settings and teacher behaviors. However, there were not enough different types of classroom settings and behaviors being used by each teacher within the observation period to yield any type of significant or practical results. Not all of the teachers exhibited all the different types of classroom settings and behaviors during their instructional time. Therefore, there were not enough data points to make this type of analysis worthwhile.

Teacher Survey

Another component of research question 2 was analyzing the qualitative data obtained from a teacher survey. Teacher surveys were used to obtain background information on the ten teachers participating in the observation portion of the study. The purpose of the teacher survey was to describe qualitative characteristics of each group of licensed teachers. The survey questions for the teachers are shown in Appendix B. Table 4.17 shows the results of the teacher survey for alternatively licensed teachers and Table 4.18 shows the teacher survey results for traditionally licensed teachers. The participants’ answers have been
condensed into general categories and terms in order to compare similar responses. This information will be discussed in chapter 5 to explain why there may or may not be differences in the observations of the teachers’ instructional time.
<table>
<thead>
<tr>
<th>Question</th>
<th>Participant 1</th>
<th>Participant 2</th>
<th>Participant 3</th>
<th>Participant 4</th>
<th>Participant 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years Teaching</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Years Teaching HS</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Licensure</td>
<td>Alternative</td>
<td>Alternative</td>
<td>Alternative</td>
<td>Alternative</td>
<td>Alternative</td>
</tr>
<tr>
<td>Other Certifications</td>
<td>No</td>
<td>Elementary Ed; Trade &amp; Industrial</td>
<td>No</td>
<td>Business Ed; Trade &amp; Industrial</td>
<td>Trade &amp; Industrial</td>
</tr>
<tr>
<td>Other Teaching Experience</td>
<td>3 years exceptional children</td>
<td>No</td>
<td>4 years Univ. micro-computer applications.</td>
<td>10 years Business Ed &amp; Tech Ed</td>
<td>26 years Trade &amp; Industrial</td>
</tr>
<tr>
<td>Degrees Earned</td>
<td>BS Science</td>
<td>BS Science</td>
<td>BS Eng.; MS Manuf. Technology</td>
<td>BS Math; BS Computer Science; MS Eng.</td>
<td>BS Science</td>
</tr>
<tr>
<td>Degree Earned Tech Ed License</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>License Other Than Tech Ed</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Courses In Pedagogical Management</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Other Work Experience</td>
<td>3 years residential construction</td>
<td>10 years residential construction</td>
<td>4 years furniture product development and cost analysis</td>
<td>5 years systems analyst</td>
<td>No</td>
</tr>
</tbody>
</table>
Table 4.18

*Survey Results for Traditionally Licensed Teachers*

<table>
<thead>
<tr>
<th>Question</th>
<th>Participant</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years Teaching</td>
<td></td>
<td>26</td>
<td>15</td>
<td>18</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>Years Teaching HS</td>
<td></td>
<td>26</td>
<td>15</td>
<td>18</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>Licensure</td>
<td></td>
<td>Traditional</td>
<td>Traditional</td>
<td>Traditional</td>
<td>Traditional</td>
<td></td>
</tr>
<tr>
<td>Other Certifications</td>
<td></td>
<td>Trade &amp; Industrial</td>
<td>Electronics ; Metals</td>
<td>No</td>
<td>Trade &amp; Industrial</td>
<td>No</td>
</tr>
<tr>
<td>Other Teaching Experience</td>
<td></td>
<td>15 years Trade &amp; Industrial</td>
<td>5 years online Industrial courses at Univ.</td>
<td>No</td>
<td>12 years Trade &amp; Industrial</td>
<td>No</td>
</tr>
<tr>
<td>Degrees Earned</td>
<td></td>
<td>BS Tech Ed</td>
<td>BS Tech Ed</td>
<td>BS Tech Ed</td>
<td>BS Tech Ed</td>
<td>BS Tech Ed</td>
</tr>
<tr>
<td>Degree Earned Tech Ed License</td>
<td></td>
<td>BS Tech Ed</td>
<td>BS Tech Ed</td>
<td>BS Tech Ed</td>
<td>BS Tech Ed</td>
<td>BS Tech Ed</td>
</tr>
<tr>
<td>License Other Than Tech Ed</td>
<td></td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Courses In Pedagogical Management</td>
<td></td>
<td>BS Tech Ed</td>
<td>BS Tech Ed</td>
<td>BS Tech Ed</td>
<td>BS Tech Ed</td>
<td>BS Tech Ed</td>
</tr>
<tr>
<td>Other Work Experience</td>
<td></td>
<td>No</td>
<td>Metals Specialist; Electronic Technician</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
Research Question 3

Research question 3 was designed to determine if the principals of the participants in research question 2 have a different perception of the preparation, performance, and professional development needs when comparing alternatively licensed and traditionally licensed technology education teachers. The principal survey questions are shown in Appendix B. The results of the survey for the principals of the alternatively licensed teachers are shown in Table 4.1 and the results of the survey for the principals of the traditionally licensed teachers are shown in Table 4.20. Even though this survey contained open-ended questions, the researcher was pleased with the similarity in language the principals used in their responses. This allowed the researcher to perform an accurate comparison of the principals’ responses. The responses to the survey questions have been categorized and grouped together based on similar responses by the principals. The researcher found that although the principals used different terms, many of the responses had the same meaning. By doing this, a more standardized interpretation of the responses was reported.
Table 4.19

Survey Results for Principals of Alternatively Licensed Teachers

<table>
<thead>
<tr>
<th>Question</th>
<th>Participant Principal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Total Years Admin</td>
<td>7</td>
</tr>
<tr>
<td>Total Years Principal</td>
<td>3</td>
</tr>
<tr>
<td>Years At Current School</td>
<td>3</td>
</tr>
<tr>
<td>Tech Ed Teachers Principal For</td>
<td>2</td>
</tr>
<tr>
<td>Teacher’s Content Knowledge</td>
<td>Good</td>
</tr>
<tr>
<td>Teacher’s Pedagogical Knowledge</td>
<td>Good</td>
</tr>
<tr>
<td>Varied Instructional Strategies</td>
<td>Below Average</td>
</tr>
<tr>
<td>Exam Scores</td>
<td>Below Average</td>
</tr>
<tr>
<td>Professional Development Needs</td>
<td>Pedagogical knowledge; delivery methods; behavior management</td>
</tr>
<tr>
<td>Overall Teacher Effectiveness</td>
<td>Satisfactory; room for improvement</td>
</tr>
</tbody>
</table>
Table 4.20

*Survey Results for Principals of Traditionally Licensed Teachers*

<table>
<thead>
<tr>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Years Admin</strong></td>
<td>14</td>
<td>7</td>
<td>11</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total Years Principal</strong></td>
<td>8</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td><strong>Years At Current School</strong></td>
<td>6</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Tech Ed Teachers Principal For</strong></td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td><strong>Teacher's Content Knowledge</strong></td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td><strong>Teacher's Pedagogical Knowledge</strong></td>
<td>Good</td>
<td>Average</td>
<td>Average</td>
<td>Average</td>
<td>Excellent</td>
</tr>
<tr>
<td><strong>Varied Instructional Strategies</strong></td>
<td>Needs improvement</td>
<td>Needs improvement</td>
<td>Average</td>
<td>Good</td>
<td>Very good</td>
</tr>
<tr>
<td><strong>Exam Scores</strong></td>
<td>Needs improvement</td>
<td>Average</td>
<td>Average</td>
<td>Good</td>
<td>Very good</td>
</tr>
<tr>
<td><strong>Professional Development Needs</strong></td>
<td>Differentiated instruction; varied delivery methods</td>
<td>Differentiated instruction; varied delivery methods; knowledge of different learning styles</td>
<td>Differentiated instruction; varied delivery methods; behavior management</td>
<td>Formative assessing to drive teaching methods; project-based unit development</td>
<td>Behavior management</td>
</tr>
<tr>
<td><strong>Overall Teacher Effectiveness</strong></td>
<td>Satisfactory; wants greater desire for improving teaching methods</td>
<td>Satisfactory; improve diversified instruction and varied use of technology</td>
<td>Satisfactory; varied use of technology; behavior management</td>
<td>Satisfactory</td>
<td>Excellent</td>
</tr>
</tbody>
</table>
For the principals of alternatively licensed teachers, the average number of total years as an administrator is 7.8, the average number of total years as a principal is 3.8 years, and the average number of years as the principal of the current school is 3.4 years. For the principals of traditionally licensed teachers, the average number of total years as an administrator is 10.6, the average number of total years as a principal is 4.0 years, and the average number of years as the principal of the current school is 3.2 years. The average number of technology education teachers for whom the principals have been the administrator is 4.0 for the principals of alternatively licensed teachers and 4.4 for principals of traditionally licensed teachers.

The results for all three research questions are discussed in chapter 5.
Chapter 5

Introduction

This chapter discusses the results shown in chapter 4. The researcher discussed how the effectiveness of alternatively licensed technology education teachers compares to that of traditionally licensed technology education teachers in North Carolina. Although the quantitative results showed there are no statistically significance differences, there are observational and qualitative differences that are of interest to the researcher and the technology education community. There are also components of this study that would benefit from more in-depth research and the researcher will provide other possible research ideas that should be explored.

Research Question 1

The first research question compared the end of course VoCATS exams taken by students of alternatively licensed teachers and traditionally licensed teachers. This was accomplished by comparing the percent of students proficient on the exam when comparing the two groups of teachers. The main design of research question 1 is composed of several parts. First, a comparison was made between the two groups of teachers when all five courses are combined. This provided a comparison of all the technology education teachers in North Carolina that meet the requirements of the study described in chapter 3. The second part of research question 1 discusses the results concerning the Fundamentals of Technology course. Specific attention was given to this course because it is the introductory technology education course as designated by the North Carolina Department of Public Instruction.
In addition to these comparisons, the research also discusses the four systems courses to determine if there are any statistically significant differences in the percent of students proficient on the VoCATS exam between the two groups of teachers. This component was included in the study because the researcher is interested in determining if work experience obtained by alternatively licensed teachers could be a factor in teacher effectiveness. The four systems courses are more manual skills-based than Fundamentals of Technology, and therefore work experience could play a greater role in teacher effectiveness.

**Five Courses Combined**

When comparing alternatively licensed to traditionally licensed technology education teachers for all five courses combined, the result of the statistical analysis gives a \( p = 0.641 \). Therefore, the statistical analysis shows there was no statistically significant difference in the percent of students proficient on the VoCATS between the two groups of teachers when the five courses are combined. There are several possible reasons why the statistical analysis shows there are no differences. The first is there may not be a significant difference between the two groups of teachers when comparing the percent of students proficient on the VoCATS. This would support the literature that says there are no statistically significant differences in teacher effectiveness when comparing alternatively licensed teachers and traditionally licensed teachers (Bradshaw & Hawk, 1996; Darling-Hammond et al., 2005; Feiman-Nemser, 1989; Hoepfl, 2001; Litowitz, 1998; Reese, 2010; Sindelar et al., 2004; Stoddart & Floden, 1995). Another reason a significant difference may not have been detected is because of the lack of power of the statistical analysis.
process was completed on the two groups of teachers, there were 55 alternatively licensed teachers and 26 traditionally licensed teachers. Although the sample sizes are large enough for a valid analysis, there are approximately 2.1 times more alternatively licensed teachers than traditionally licensed teachers. This difference in sample sizes causes a less powerful result and therefore creates less of a chance in discovering a statistically significant difference if one exists than if the sample sizes were equal (Guo & Luh, 2008; Tam & Wisenbaker, 1996; Wilcox, 1989). Even though different formulas are used when conducting a one-way ANOVA depending on the extent of unequal sample sizes, SPSS automatically chooses the correct formula based on the data. Due to these possible reasons, no statistically significant differences were found in the analysis of the five courses combined.

The descriptive statistics show that traditionally licensed teachers had a mean value of percent student proficiency 1.75 higher than alternatively licensed teachers. This means that on average, the percent of students scoring meeting proficiency on the VoCATS exam was 1.75 higher for traditionally licensed teachers than for alternatively licensed teachers. When comparing the maximum percent proficiencies, both groups had a maximum of 100% proficiency. When comparing the minimum percent proficiencies, the alternatively licensed teachers had a minimum of 38.28 while the traditionally licensed teachers had a minimum of 30.77, 7.51 lower than that of alternatively licensed teachers. The standard deviation confirms this difference by the traditionally licensed teachers having a higher standard deviation than the alternatively licensed teachers. This means that although the traditionally licensed teachers had a slightly higher mean, their spread of exam results were greater than
that of alternatively licensed teachers. Even though there were no statistically significant differences in this section of the study, there are some observational differences that would be worth looking into further with additional studies.

**Five Courses Separately**

**Fundamentals of Technology**

When comparing the percent of students proficient on the VoCATS exam, Fundamentals of Technology was chosen because this is the introductory course as identified by the North Carolina Department Public Instruction (North Carolina Department of Public Instruction, 2009d). Therefore, to fulfill the researcher’s interest in analyzing an individual course, the researcher knew this course would have the best opportunity for fulfilling the requirements to have a valid statistical analysis. After the data filtration process to determine the qualified participants, there were 44 alternatively licensed teachers and 18 traditionally licensed teachers. The statistical analysis gave a result of p = 0.625, meaning there was no statistically significant difference in the percent of students proficient on the VoCATS exam between the two groups of teachers in the Fundamentals of Technology course. There are several possible reasons why the statistical analysis shows there is no difference. The first is there may not be any statistically significant differences between the two groups of teachers when comparing the percent of students proficient on the VoCATS for the Fundamentals of Technology course. This would support the literature that says there are no significant differences when comparing the performance of alternatively licensed teachers and traditionally licensed teachers (Bradshaw & Hawk, 1996; Darling-Hammond et al., 2005;
Feiman-Nemser, 1989; Hoepfl, 2001; Litowitz, 1998; Reese, 2010; Sindelar et al., 2004; Stoddart & Floden, 1995). Another reason a difference may not have been detected is because of the lack of power of the statistical analysis. Once the data filtration process was completed on the two groups of teachers, there were 44 alternatively licensed teachers and 18 traditionally licensed teachers. Although the sample size is large enough for a valid analysis, there were over 2.4 times more alternatively licensed teachers than traditionally licensed teachers. This difference in sample sizes caused a less powerful result and therefore creates less of a chance in discovering a statistically significant difference if one exists than if the sample sizes were equal (Guo & Luh, 2008; Tam & Wisenbaker, 1996; Wilcox, 1989). Even though different formulas are used when conducting a one-way ANOVA depending on the extent of unequal sample sizes, SPSS automatically chooses the correct formula based on the data. Due to these possible reasons, no statistically significant difference was found in the analysis of the Fundamentals of Technology course.

The descriptive statistics show that for Fundamentals of Technology, the traditionally licensed teachers had a mean value of 2.19 higher than that of alternatively licensed teachers. This means that on average, the percent of students meeting proficiency on the VoCATS exam was 2.19 higher for traditionally licensed teachers than for alternatively licensed teachers. When comparing the maximum values, the alternatively licensed teachers had a maximum percent proficiency of 97.80 while the traditionally licensed teachers had a maximum percent proficiency of 97.22, 0.58 lower than that of alternatively licensed teachers. When comparing the minimum values, the alternatively licensed teachers had a
minimum value of 33.33 while traditionally licensed teachers had a minimum value of 30.77, 2.56 lower than that of alternatively licensed teachers. The standard deviation also confirms this difference by the traditionally licensed teachers having a higher standard deviation than the alternatively licensed teachers. This means that although the traditionally licensed teachers had a slightly higher mean, their spread of exam results were greater than that of alternatively licensed teachers, while having a lower maximum and minimum value. Even though there were no statistically significant differences in this section of the study, there are some observational differences that would be worth looking into further with additional studies.

The main focus of research question 1 was to compare the percent proficiency of students for all five courses combined and the Fundamentals of Technology course. However, comparing the four systems courses is also of interest to the researcher. Since the systems courses contain content that is more industry related and skill-based, the researcher knew it would be valuable to determine if industry experience could be a factor when analyzing the percent proficiency of students on the VoCATS exam when comparing the two groups of teachers. The four systems courses all had similar results. The statistical analysis for each of the four systems courses resulted in no statistically significant difference in the percent of students proficient on the end of course exam when comparing the two groups of teachers. There are several possible reasons why the statistical analyses showed there is no difference. The first is there may not be any statistically significant differences between the two groups of teachers when comparing the percent of students proficient on the VoCATS
exam. Another reason a difference may not have been detected was because of the lack of power of the statistical analysis. Each systems courses had small sample sizes. A larger sample size would provide a more powerful statistical analysis. In some cases, there were unequal sample sizes, although each systems course passed the test for unequal variances. This difference in sample sizes causes a less powerful result than if the sample sizes were equal and therefore creates less of a chance in discovering a statistically significant difference if one exists (Guo & Luh, 2008; Tam & Wisenbaker, 1996; Wilcox, 1989). Even though different formulas are used when conducting a one-way ANOVA depending on the extent of unequal sample sizes, SPSS automatically chooses the correct formula based on the data. The individual results for each statistical test are explained, but all four courses share similar reasons as to why the statistical test showed no statistical difference. The following sections discuss the results of the four systems courses.

**Communication Systems**

After the data filtration process to determine the qualified participants for Communication Systems, there were 13 alternatively licensed teachers and 7 traditionally licensed teachers. The statistical analysis gave a result of $p = 0.472$, meaning there was no statistically significant difference in the percent of students proficient on the VoCATS exam between the two groups of teachers in the Communication Systems course. Once the data filtration process was completed, there were 13 alternatively licensed teachers and 7 traditionally licensed teachers. The ratio of traditionally licensed teachers to alternatively licensed teachers is approximately 1.9.
In this situation, the researcher felt the descriptive statistics were more valuable to look at than the statistical significance. For Communication Systems, the alternatively licensed teachers had a mean value of 81.24 while the traditionally licensed teachers had a mean value of 74.65. This results in the alternatively licensed teachers having a mean value 6.59 higher than traditionally licensed teachers. This means that on average, the percent of students meeting proficiency on the VoCATS exam was 6.59 higher for alternatively licensed teachers. When comparing the maximum values, both groups of teachers had maximum values of 100. When comparing the minimum values, the alternatively licensed teachers had a minimum value of 30.30 while traditionally licensed teachers had a minimum value of 50.00, 19.70 higher than that of alternatively licensed teachers. Even though the range of exam results is narrower for traditionally licensed teachers, the standard deviation was higher because of some of the outlying data points. When looking at the data for alternatively licensed teachers, the minimum value was 30.30 while the second lowest value was 70.00. This means the 30.30 value skews the data in providing a lower mean value and the lowest minimum value. Even though there were no statistically significant differences in this section of the study, these observational differences are significant to the researcher and would be worth researching further with additional studies.

Manufacturing Systems

Of the five courses, Manufacturing Systems is the most difficult to draw any conclusions because of the small sample sizes. After the data filtration process to determine the qualified participants for Manufacturing Systems, there were 7 alternatively licensed
teachers and 5 traditionally licensed teachers. The statistical analysis gave a result of \( p = 0.461 \), meaning there was no statistically significant difference in the percent of students proficient on the VoCATS exam between the two groups of teachers in the Manufacturing Systems course. Once the data filtration process was completed, there were 7 alternatively licensed teachers and 5 traditionally licensed teachers.

The descriptive statistics show the alternatively licensed teachers had a mean value of percent of students proficient of 76.32 while the traditionally licensed teachers had a mean value of 84.25. This results in the traditionally licensed teachers having a mean value 7.93 higher than alternatively licensed teachers. This means that on average, the percent of students meeting proficiency on the VoCATS exam was 7.93 higher for alternatively licensed teachers. When comparing the maximum values, both groups of teachers had maximum values of 100. However, when comparing the minimum values, the two groups of teachers had very different values. The alternatively licensed teachers had a minimum value of 47.73 while traditionally licensed teachers had a minimum value of 75.00, 27.27 higher than that of alternatively licensed teachers. As expected due to these values, the standard deviation of the alternatively licensed teachers was much higher than the traditionally licensed teachers. When looking at the data for alternatively licensed teachers, this group has three values lower than the lowest value for traditionally licensed teachers. This is important when understanding how the mean for traditionally licensed teachers seems to be much higher than that of alternatively licensed teachers. Even though there were no statistically
significant differences in this section of the study, these observational differences are significant to the researcher and would be worth researching further with additional studies.

**Structural Systems**

After the data filtration process to determine the qualified participants for Structural Systems, there were 10 alternatively licensed teachers and 11 traditionally licensed teachers. The statistical analysis gave a result of \( p = 0.736 \), meaning there was no statistically significant difference in the percent of students proficient on the VoCATS exam between the two groups of teachers in the Communication Systems course. Once the data filtration process was completed on the two groups of teachers, there were 10 alternatively licensed teachers and 11 traditionally licensed teachers.

When looking at the descriptive statistics for Structural Systems, the alternatively licensed teachers had a mean value of 80.19 while the traditionally licensed teachers had a mean value of 77.00. This results in the alternatively licensed teachers having a mean value 3.19 higher than traditionally licensed teachers. This means that on average, the percent of students meeting proficiency on the VoCATS exam was 3.19 higher for alternatively licensed teachers. When comparing the maximum values, both groups of teachers had maximum values of 100. When comparing the minimum values, the alternatively licensed teachers had a minimum value of 45.83 while traditionally licensed teachers had a minimum value of 33.33, 12.50 lower than that of alternatively licensed teachers. The standard deviation was higher for the traditionally licensed teachers which is consistent with the minimum and maximum ranges. Even though there were no statistically significant
differences in this section of the study, these observational differences are significant to the researcher and would be worth researching further with additional studies.

**Transportation Systems**

After the data filtration process to determine the qualified participants for Transportation Systems, there were 11 alternatively licensed teachers and 8 traditionally licensed teachers. The statistical analysis gave a result of $p = 0.434$, meaning there was no statistically significant difference in the percent of students proficient on the VoCATS exam between the two groups of teachers in the Transportation Systems course. The data filtration process resulted in 11 alternatively licensed teachers and 8 traditionally licensed teachers.

The descriptive statistics show the alternatively licensed teachers had a mean value of percent of students proficient of 78.26 while the traditionally licensed teachers had a mean value of 84.87. This results in the traditionally licensed teachers having a mean value 6.61 higher than alternatively licensed teachers. This means that on average, the percent of students meeting proficiency on the VoCATS exam was 6.61 higher for alternatively licensed teachers. When comparing the maximum values, both groups of teachers had maximum values of 100. However, when comparing the minimum values, the alternatively licensed teachers had a minimum value of 52.63 while traditionally licensed teachers had a minimum value of 47.37, 5.26 lower than that of alternatively licensed teachers. As expected due to these ranges of values, the standard deviation of the traditionally licensed teachers is higher than the alternatively licensed teachers. The mean value for traditionally licensed teachers is higher even though the minimum value is lower than that of alternatively licensed
teachers. Looking at the values for traditionally licensed teachers, the minimum value was 47.37 and the next lowest value was 75.00. This outlying data point lowered the mean for the traditionally licensed teachers by a value of 5.35. This is important when understanding how the mean for traditionally licensed teachers is higher than that of alternatively licensed teachers, but had the potential of being much higher without this one outlier. Even though there were no statistically significant differences in this section of the study, these observational differences are significant to the researcher and would be worth researching further with additional studies.

The main focus of research question 1 is to compare the percent proficiency of students on the VoCATS exam of alternatively licensed teachers to traditionally licensed teachers. From the results mentioned above, there were no statistically significant differences in the analysis of all five courses combined, Fundamentals of Technology, or any of the four systems courses. However, it is significant for the researcher when analyzing the qualitative differences and determining there is a need for looking more in-depth at these issues in future research. The two analyses with larger sample sizes are when all five courses are combined and Fundamentals of Technology. In both of these comparisons, the traditionally licensed teachers have slightly higher means. When considering the four systems, Communication Systems and Structural Systems had higher means for alternatively licensed teachers while Manufacturing Systems and Transportation Systems had higher means for traditionally licensed teachers. Each of these means have greater differences than those of all five courses combined and Fundamentals of Technology. These results are summarized in Table 4.13.
This could be due to smaller sample sizes and less powerful results. But it raises the question of why some courses have a higher mean for alternatively licensed teachers and other courses have higher means for traditionally licensed teachers.

**Research Question 2**

Research question 2 was designed to analyze the time on task of students when comparing alternatively licensed and traditionally licensed technology education teachers. This question also incorporated a teacher survey to be used for demonstrating qualitative aspects that contribute to the differences in the statistical analysis.

**Time on Task**

This main focus of this research question analyzes the time on task of students when comparing alternatively licensed to traditionally licensed technology education teachers in North Carolina. This was accomplished by observing the instructional time of five teachers from each group. After performing a one-way ANOVA to compare the time on task of students between the two groups of teachers, this resulted in $p = 0.755$. This level of significance means there was no significant difference in the ratio of students spending their time on task when comparing alternatively licensed teachers and traditionally licensed teachers in technology education. One of the possible factors contributing to this lack of significance is the small sample size. Typically there would be more than five samples per group in order to get a more powerful statistical analysis. However, due to the time constraints and complexity of the analysis process, this was the sample size chosen. Since no
statistically significant difference was found, this research question will be better answered by looking at the descriptive statistics, observational data, and qualitative components.

The maximum ratio of students on task was 0.857 for alternatively licensed teachers and 0.817 for traditionally licensed teachers. This means the most effective alternatively licensed teacher kept an average of 85.7% of students on task during the 14 observational intervals. The most effective traditionally licensed teacher kept an average of 81.7% of students on task during the same observational intervals. The minimum ratio of students on task was 0.612 for alternatively licensed teachers and 0.693 for traditionally licensed teachers. This means the least effective alternatively licensed teacher kept an average of 61.2% of students on task during the 14 observational intervals. The least effective traditionally licensed teacher kept an average of 69.3% of students on task during the same observational intervals.

Even though there are no significant differences between the ratios of students on task of alternatively licensed and traditionally licensed teachers, there are some qualitative observations that are of interest to the researcher. The alternative licensed teachers had both the maximum and the minimum ratio of students on task during the observation intervals. This tells the researcher there are potentially some pedagogical management techniques that alternatively licensed teachers are using that are both more effective and less effective than the techniques used by traditionally licensed teachers. This warrants a more focused research study on how professional development affects the teacher's pedagogical management skills.
These are the kinds of differences the researcher was looking for, and therefore has evidence that more detailed researcher in this area would be beneficial.

**Classroom Settings and Teacher Behaviors**

While the main objective of the teacher observations was to look at the time on task of students, the researcher also collected data on the type of classroom setting and the teacher behaviors used during the instructional time. As mentioned in chapter 4, no formal statistical analysis was performed on the classroom setting and teacher behaviors because the data was not complete enough for the results to have any statistical significance. There were five teachers in each group, and each teacher did not use enough different types of classroom settings and teacher behaviors for the repeated measures analysis to produce any significant results. However, when looking at the data qualitatively, the researcher finds some differences worth noting. In Table 4.15 a summary of the occurrences of the total number of classroom settings and teacher behaviors were listed. When analyzing the average number of classroom settings per teacher, the traditionally licensed teachers tended to use more small and large group settings while the alternatively licensed teachers seem to use individual work to a much greater extent. When comparing teacher behaviors, the traditionally licensed teachers used much more lecture style while the alternatively licensed teachers used more activities and projects during the instructional time. The alternatively licensed teachers also tended to use more assessment behaviors to determine the students’ understanding of course material. Two of the traditionally licensed teachers used two different classroom settings and two different teacher behaviors. The other two traditionally licensed teachers used three
different settings and three different behaviors. One alternatively licensed teacher used individual project work the entire observation period. Three of the alternatively licensed teachers used two different classroom settings and three different teacher behaviors, while one alternatively licensed teacher used three different classroom settings and three different teacher behaviors. When analyzing this observational data, the alternatively licensed teachers tended to use more different classroom settings and teacher behaviors than did the traditionally licensed teachers.

**Teacher Surveys**

Another component of research question 2 is to analyze the results of a teacher survey of the same participants that took part in the observational portion of the study. The purpose of these surveys was to help explain any statistically significant differences between the time on task of students previously analyzed. Since there were no statistically significant differences in the time on task of students, these surveys will be used to look at the general trends of the responses between the two groups of teachers.

For the alternatively licensed teachers, the minimum value of years teaching technology education is 4 while the maximum is 10. For traditionally licensed teachers the minimum value of years teaching technology education is 15 while the maximum is 26. The average number of years teaching technology education for the alternatively licensed teachers was 6.2 years while for traditionally licensed teachers it was 19.0 years. All of these years were spent at the high school level for all ten teachers. The difference in years of teaching is of interest to the researcher. Given this difference, the researcher is interested in
focusing on the early years of a teacher's career to find ways to improve student achievement and time on task.

Both the alternatively licensed teachers and the traditionally licensed teachers had three teachers in the group with certifications in addition to being licensed in technology education. Three of the alternatively licensed teachers had certifications in Trade and Industrial, while one of them also had a certification in Business Education. In addition, one of the three also had an elementary education certification. Two of the three traditionally licensed teachers have certifications in Trade and Industrial while the third teacher had certifications in electronics and metals.

When comparing teaching experience outside of technology education, four alternatively licensed teachers and three traditionally licensed teachers had other teaching experience. The four alternatively licensed teachers had other teaching experience in four different areas; exceptional children, business education, trade and industrial, and microcomputer applications. All three of the traditionally licensed teachers having other teaching experience all had experience with trade and industrial, while one them had university teaching experience in this area. Therefore, the results show that alternatively licensed teachers have a wider range of teaching experiences, which should be expected since most traditionally licensed teachers in technology education come from a traditional technology education degree program.

When comparing the degrees earned between alternatively licensed teachers and traditionally licensed teachers, all five traditionally licensed teachers earned a bachelor’s
degree in technology education. For the alternatively licensed teachers, three of them earned bachelors’ degrees in science related fields, one of them had a bachelor’s degree in engineering and a master’s degrees in manufacturing technology, and one had a bachelor’s degree in math, a bachelor’s degree in computer science, and a master’s degree in engineering. From these results, it is clear that alternatively licensed teachers come from a more varied background than traditionally licensed teachers. These teachers would possess a high level of expertise in specific areas of the curriculum, which would be reflected in their content knowledge of certain components of the different systems courses. Therefore, students may be receiving more specialized and workforce related instruction in certain areas of the curriculum, while receiving a lesser quality of instruction in other areas. This is also supported by the answers to question 10, which asks for information about work experience other than teaching. Four of the five alternatively licensed teachers had industry work experience. This work experience would further support the idea that these teachers would bring into the classroom a high level of expertise in a narrow field. Because of this varied background, these teachers would bring certain specialty areas into the classroom based on their background. Only one traditionally licensed teacher had work experience other than teaching.

Questions 7, 8, and 9 refer to degrees that earned the teachers a technology education teaching license and which degrees offered courses in pedagogical management. This was an important aspect of the survey because one of the criticisms of alternative licensure is the lack of pedagogical knowledge these teachers possess (Bradshaw & Hawk, 1996; Darling-
Hammond et al., 2005; Litowitz, 1998; Reese, 2010; Stoddart & Floden, 1995). As expected, all five of the traditionally licensed teachers received a technology education teaching licensed from their bachelor’s degree. The same teachers also had courses in pedagogical management from this degree. None of the alternatively licensed teachers received a technology education teaching licensed from their degree nor did any of them have any academic courses in pedagogical management while obtaining their degrees. Even though there were no statistically significant differences in the VoCATS exam results and time on task, the value of pedagogical knowledge in regards to the effectiveness of the teacher should be looked into further when comparing alternatively licensed and traditionally licensed technology education teachers.

Research Question 3

The last research question was designed to determine if there are any qualitative differences in the principals’ perceptions of the effectiveness of alternatively licensed teachers compared to traditionally licensed teachers concerning the teachers’ preparation, performance, and professional development needs.

Principals’ Backgrounds

Survey questions 1 through 4 were designed to gather background information about the principals’ experiences as administrators. This will assist in reporting the qualitative results of the survey because it will tells us how much experience each principal has working with technology education teachers. When comparing these results, the average years of experience for the principals of both groups of teachers are similar. Both groups have had
approximately the same number of years of experience as administrators and have also had the opportunity to work with approximately the same number of technology education teachers.

**Teacher Preparation**

Survey questions 5 and 6 were designed to determine if the principals of the two groups of teachers had different perceptions of the teachers’ curriculum content and pedagogical knowledge. When looking at the teachers’ preparation, there were no significant differences in the principals’ perceptions of the curriculum content and pedagogical knowledge between the two groups of teachers. Both groups of principals were pleased with the teachers’ content knowledge in technology education. Some principals give very limited time to the observation of teachers. This lack of difference between the two groups of teachers may be the result of the principals’ lack of opportunity to witness the characteristics of content knowledge or observe the instructional strategies that would be representative of strong pedagogical knowledge.

**Teacher Performance**

Survey questions 7 and 8 are related to the principals’ perceptions of the different types of instructional techniques used in the classroom to deliver the content. One principal of the alternatively licensed teachers rated the teachers as below average and needing improvement. Two principals of traditionally licensed teachers rated the teacher as below average and needing improvement. This is the one difference that is of interest to the researcher. But overall, there was not a noticeable different between the principals’
perceptions of the use of different instructional techniques between the two groups of teachers. Concerning the teachers’ end of course results on the VoCATS exam, one principal from each group of teachers was not satisfied. However, there were not any significant differences between the two groups of principals when commenting on their perception of the teachers’ end of course exam results.

**Teacher Professional Development**

Survey question 9 was designed to get the principals’ perceptions on what they perceived as professional development needs of the teacher. The results show there were no significant differences between the two groups of teachers. However, the researcher would like to point out some of the differences that were mentioned. The only time that pedagogical knowledge was mentioned for a professional development need was for an alternatively licensed teacher. Behavior management was mentioned twice for traditionally licensed teachers and once for an alternatively licensed teacher. The need for increasing the variety of teaching methods was mentioned three times for both groups of teachers. Increasing the differentiation of instruction was mentioned three times for traditionally licensed teachers and only once for alternatively licensed teachers. One interesting comment was the principal of a traditionally licensed teacher wanted to see more project and activity based learning to occur in the classroom. From these results, there were no significant differences among the responses. However, it is significant to the researcher to learn what the principals of these teachers think about the preparation, performance, and professional development needs of technology education teachers. The researcher understands there is a need for all teachers to pursue
professional development opportunities, and these results show that both alternatively licensed teachers and traditionally license teachers in technology education experience some of the same needs.

**Overall Teacher Effectiveness**

The last question gave the principals a chance to comment on how they felt about their teacher’s overall effectiveness. By providing a general open-ended question, this gave the principal’s a chance to add other comments that were not specifically related to the previous questions in the survey. By using generic wording in the question, the principal had the opportunity to decide how they assigned overall value to the teacher’s effectiveness. Given this opportunity, every principal said they were satisfied with the effectiveness of their technology education teacher. In addition, some of the principals made extra comments about how they felt their teacher needed improvement in certain areas. Most of the areas of improvement were the same as mentioned in question 9 regarding professional development. One principal of an alternatively licensed teacher made a positive comment about how they appreciated their teacher’s commitment to after school technology education related clubs and activities. However, there were no distinct differences in the comments made by the principals of both groups of teachers. One of the reasons there were no differences is because there may not be a measurable difference how principals perceive their technology education teacher when comparing alternatively licensed and traditionally licensed technology education teachers. However, if there is a measurable difference, which was not found in this
study, principals may not have the interaction needed with these teachers to detect a difference if one existed.

**Recommendations**

Beyond the research questions in this study, one of the underlying goals of this research study is to determine if there are enough differences in the data of these two groups of teachers to validate the need for researching other aspects of teacher licensure in technology education. As mentioned in the results, the researcher feels that enough qualitative differences were noticed in this study to look further into identifying some more specific differences between alternatively licensed and traditionally licensed teachers in technology education. It is the recommendation of the researcher that further analyses be conducted to compare the effectiveness of alternatively licensed and traditionally licensed teachers in technology education. One recommendation is to develop a methodology to incorporate larger sample sizes. This methodology should also be developed to account for large differences in the number of alternatively licensed and traditionally licensed teachers. The researcher feels there was value in comparing the two groups of teachers within the Fundamentals of Technology course and the individual systems courses. Further research should be conducted in these areas with a methodology that accounts for the small sample sizes. The researcher would also like to see more research comparing the pedagogical management techniques of the two groups of teachers to increase the students’ time on task. From more detailed analyses of how the two groups of teachers use varying classroom settings and teacher behaviors, recommendations could be made on improving alternative
licensure training programs and traditional teacher education programs in technology education. Further studies will also provide documentation as to which areas of professional development these teachers would benefit. It has been documented throughout this study that time on task is a critical component to student achievement. By analyzing the pedagogical management techniques of both alternatively licensed and traditionally licensed teachers, alternative licensure programs and traditional technology education programs can be designed for improved teacher effectiveness resulting in greater student achievement.

**Conclusion**

In this study, three research questions were used to provide a strong methodology for comparing the effectiveness of alternatively licensed and traditionally licensed technology education teachers in North Carolina. As discussed earlier, current research shows there is mixed data when comparing the effectiveness of alternatively licensed teachers compared to traditionally licensed teachers. This study used existing research to design a methodology that would examine how these two groups of teachers compare to each other in technology education in North Carolina. By using the methodology in this study, the researcher was able to provide evidence that there may not be any statistically significant differences between alternatively licensed and traditionally licensed technology education teachers in North Carolina concerning the percent of students proficient on the end of course VoCATS exam, the time on task of students, and the principals’ perceptions of the teachers’ effectiveness.
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APPENDIX A

Observation Recording Instrument
Definitions of Classroom Settings, Teacher Behaviors, and Time on Task
Observation Recording Instrument

Date: 
Teacher Code #: 
Type of Licensure: 
Number of Students: 

Directions
The first observation will be recorded five minutes after class begins. Then record the classroom setting, teacher behavior, and the number of students on task at each 3 minute interval. Continue the observation until 14 observations have been recorded.

<table>
<thead>
<tr>
<th>Interval</th>
<th>Minute</th>
<th>Classroom Setting</th>
<th>Teacher Behavior</th>
<th>No. of Students on Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>L S I T</td>
<td>L A P T</td>
<td></td>
</tr>
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<td>2</td>
<td>8</td>
<td>L S I T</td>
<td>L A P T</td>
<td></td>
</tr>
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<td>11</td>
<td>L S I T</td>
<td>L A P T</td>
<td></td>
</tr>
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<td>4</td>
<td>14</td>
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AVG. ________

Classroom Setting          | Teacher Behavior
L = Large Group       | L = Lecture
S = Small Group       | A = Activity
I = Independent       | P = Project
T = Transition        | T = Test or Assessment
Definitions of Classroom Settings, Teacher Behaviors, and Time on Task

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Item</th>
<th>Definition</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Classroom Setting</strong></td>
</tr>
<tr>
<td>L</td>
<td>Large Group</td>
<td>Whole class is one group for executing teacher behavior</td>
</tr>
<tr>
<td>S</td>
<td>Small Group</td>
<td>Class is dividing into more than one group for executing teacher behavior</td>
</tr>
<tr>
<td>I</td>
<td>Independent</td>
<td>Each student is individually executing the teacher behavior</td>
</tr>
<tr>
<td>T</td>
<td>Transition</td>
<td>Class is between teacher behaviors and students are transitioning to next behavior in an efficient manner as directed by the teacher</td>
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<tr>
<td></td>
<td></td>
<td><strong>Teacher Behavior</strong></td>
</tr>
<tr>
<td>L</td>
<td>Lecture</td>
<td>Teacher is engaged in any behavior that incorporates content delivery of the lesson plan</td>
</tr>
<tr>
<td>A</td>
<td>Activity</td>
<td>Students are working on an activity that supports the lesson plan content</td>
</tr>
<tr>
<td>P</td>
<td>Project</td>
<td>Students are engaged in creating an artifact requiring materials, tools, and processes</td>
</tr>
<tr>
<td>T</td>
<td>Test or Assessment</td>
<td>Teacher is assessing student knowledge through formal or informal, formative or summative assessment</td>
</tr>
</tbody>
</table>

**Student On-Task Behavior**

On-task behavior is defined as the student being in compliance with the directions from the teacher as to which of the above settings or behavior the student should be engaged.
APPENDIX B

Teacher Survey
Principal Survey
Teacher Survey
(To be completed by the teacher)

Thank you for participating in this research study on teacher effectiveness in technology education. This survey contains ten short answer questions and will provide information vital to the conclusions of the study. During the survey, I ask that you answer each question as accurately as possible. This will assist in developing a more valid research study. The proper measures have been taken to protect your confidentiality in accordance with the North Carolina State University Institutional Review Board, and no response published in my dissertation can be traced back to you. I will be the only person to see the results of the survey, and if you have questions any time during the study, please feel free to contact me.

Technology Education Experience

1. How many years, including the current year, have you been a technology education teacher?

2. How many of these years have been teaching at the high school level?

3. Please circle one of the following:
   a. I earned my technology education teaching license through a traditional university education program.
   b. I earned my technology education teaching license through alternative certification, including Lateral Entry.
   c. I am currently working on the requirements for a technology education license through alternative certification, including Lateral Entry.
   d. Other (briefly describe):

Non-Technology Education Experience

4. Are you certified in areas of education other than technology education, including other areas of Career and Technical Education?

   If yes, please list these areas of certification.
5. Have you taught in areas of education other than technology education, including other areas of Career and Technical Education?

If yes, please list the areas and years of teaching experience.

Educational Background

6. Please list all the degrees you have earned, including any area of concentration.

7. Which degree(s) if any, resulted in a technology education teaching license? (If none, write N/A)

8. Which degree(s), if any, resulted in a teaching license other than technology education? (If none, write N/A)

9. Which degree(s), if any, contained courses in pedagogical management? (If none, write N/A)

Non-Teaching Experience

10. Do you have any work experience other than teaching high school technology education?

If yes, please list your previous work experience, number of years of that work experience, and a brief description of the general duties of that work experience.
Principal Survey
(Conducted by phone)

The researcher contacts the principal by phone and begins with the following script:

Hello. My name is Bradley Bowen and I am a doctoral candidate at North Carolina State University in Technology Education. I requested to conduct this survey with you because a technology education teacher at your school has accepted my request for participating in a research study on teacher effectiveness in technology education. It consists of ten short answer questions. During the survey, I ask that you be as open and honest as possible with your responses. This will assist in developing a more accurate and complete research study. The proper measures have been taken to protect your confidentiality in accordance with the North Carolina State University Institutional Review Board, and no response published in my dissertation can be traced back to you. Do you have any questions before we begin?

Introductory Questions

1. How many total years have you been an administrator, either as a principle or assistant principal?

2. How many total years have you been a principal?

3. How many years have you been a principal at your current school?

4. How many other technology education teachers have you been the administrator for?

Preparation

5. What is your perception of the teacher’s content knowledge of the courses being taught?

6. What is your perception of the teacher’s pedagogical knowledge within education?
Performance

7. How well do you feel about the teacher’s use of different instructional techniques for delivering course content?

8. How satisfied are you with the end of year test scores for the teacher?

Professional Development

9. Are there any areas of professional development from which you think the teacher would benefit?

Concluding Question

10. Overall, how do you feel about the teacher’s effectiveness?

Researcher concludes the survey by ending with the following script:

Thank you for participating in this study. If at any point you have questions about the research study, please feel free to contact me.
APPENDIX C

Initial Contact Email Scripts
Teacher Consent Form
Principal Consent Form
Video Release 18 and Over
Video Release Under 18
Email Scripts for Initial Contact

Initial Contact with Teacher

Mr. /Mrs. / Dr. ______________. My name is Bradley Bowen and I am a technology education teacher at Enloe High School in Raleigh, NC. I am also a doctoral candidate at North Carolina State University in Technology Education. I am contacting you because you were selected from a random list of technology education teachers in North Carolina to participate in my dissertation research study. Your participation is completely voluntary. If you are willing to participate, the main tasks would be to video tape one class period during a typical instructional day and filling out a short survey. Your participation will assist in completing my dissertation research and will help to continue improving the field of technology education. If you are willing to consider participating, I would like to send you a consent form that describes the details of study, how the information will be used, the procedures you will follow during the study, and how your confidentiality will be maintained throughout the entire process. If you choose to participate, I would like to offer you a small token of appreciation by sending you a $25 gift card to the store or restaurant of your choice. Would you consider participating in the research study?

Initial Contact with Principal

Mr. /Mrs. / Dr. ______________. My name is Bradley Bowen and I am a technology education teacher at Enloe High School in Raleigh, NC. I am also a doctoral candidate at North Carolina State University in Technology Education. I am contacting you because a technology education teacher in your school has agreed to participate in my dissertation research study. As part of the study, I am asking that you help participate by answering a short phone survey, lasting no more than 15 minutes. Your participation will assist in completing my dissertation research and will help to continue improving the field of technology education. Your participation in the study is completely voluntary. If you are willing to consider participating, I would like to send you a consent form that describes the details of study, how the information in the study will be used, and how your confidentiality will be maintained throughout the entire process. Would you consider participating in the research study?
North Carolina State University

Informed Consent Form For Research
(Teacher Form)

Title of Study: Measuring Teacher Effectiveness And Student Achievement When Comparing Traditionally Certified Teachers To Alternatively Certified Teachers In Technology Education

Principal Investigator: Bradley Bowen
Faculty Sponsor: William DeLuca

You are being asked to take part in a research study. Your participation in this study is voluntary. You have the right to be a part of this study, to choose not to participate, or to stop participating at any time without penalty. The purpose of research studies is to gain a better understanding of a certain topic or issue. You are not guaranteed any personal benefits from being in a study. Research studies also may pose risks to those that participate. In this consent form you will find specific details about the research in which you are being asked to participate. If you do not understand something in this form it is your right to ask the researcher for clarification or more information. A copy of this consent form will be provided to you. If at any time you have questions about your participation, do not hesitate to contact the researcher named above.

What is the purpose of this study?
The purpose of this study is to compare teacher effectiveness and student achievement between traditionally certified and alternatively certified technology education teachers. This will be accomplished by observing how students stay engaged in the lesson plan when reacting to certain teacher actions and characteristics. The data will then be analyzed to measure the students’ time of engagement based on the teacher’s method of delivery and classroom management techniques. The conclusion of the study will be able to offer recommendations for teacher preparation and professional development for both traditional education programs and alternative certification programs. By participating in this study, you will be helping progress the field of technology education. Please consider participating in this study.

What will happen if you take part in the study?
If you agree to participate in this study, you will be asked to sign a dissertation study consent form and return it to the researcher by mail. For the study, you will be asked to distribute and collect video release forms (provided by the researcher) from each student in the class, video tape one class period when delivering a typical lesson plan, fill out a short survey, and send the video file, release forms, and survey to the researcher by mail. To record the video, you will be asked to setup a video camera in the classroom and video one class period of a typical lesson. You will not need to conduct the class in any manner other than how you would normally teach. The video does not need to show the teacher, but it needs to show all of the students during the entire class period. This may be accomplished by setting the camera on a tripod in the corner of the room providing a wide view of the classroom. Students who do not submit a video release can remain in the classroom but out of view of the camera. This will prevent students from missing instructional time while providing the researcher with the necessary data. Once the videotaping is complete, you can either mail the video tape or flash drive with the file, or the researcher will arrange for personal pick-up. The researcher will be the only person to view the video, which will be destroyed at the conclusion of the study. Nothing in the video will be used to critique your teaching performance. The researcher in this study is only interested in the actions of the students, and how their actions relate to your teaching methods. In addition you will be asked to complete a short survey. This survey is designed to gather information about your licensure area, education background, and work experience. The questions do not ask anything related to job performance and are strictly for gathering background information. The questions are short answer and should take about 10-15 minutes to complete.
The total time commitment for participation in this study will include distributing and collecting video release permission forms from each student, setting up and breaking down the video camera, recording 45 minutes of one class period, mailing or emailing the video file, and completing the short survey. It is estimated the total time for these tasks is 1.5 hours, 45 minutes for recording and 45 minutes of additional tasks.

As part of the research study, the principal of your school will be taking part in a phone survey. This survey is meant to gather information critical to the benefits of this study by providing their perspective on your performance, preparedness, and professional development. Any response provided by the principal in their survey will be used for dissertation research only and will not be included in any of the teacher’s personnel records or files. The questions that will be used to conduct the survey for the principal have been included with this form and they may help you decide about your participation in this study.

Risks
Even though, the proper measures will be taken to assure the confidentiality of your identity in this study, there are some possible risks you need to be made aware of. One of the risks involved with this study would be a breach of confidentiality. Your principal will know that you are participating in this study. However, the principal will not have access to the video file, survey questions, or any other document or information about you gathered during the research study. The video tape or file will be kept in a secure location and will be destroyed upon the conclusion of the study. Another risk may be your concern about the how the questions the principal will be asked will be used in relationship to your career. These questions will reflect the principal’s perception if your professional preparation, performance, and professional development. The answers to these questions are for research purposes only and will not be reflected in any personnel records or files. The principal’s responses will be kept in the strictest of confidence and will only be made available to the researcher. In order to maintain the confidentiality of the research, you will not have access the principal’s responses to the questions.

Benefits
As a member of the technology education community, your participation will help to advance the field of technology education with suggestions for teacher preparation and professional development. The results of this study will help the researcher make conclusions that will benefit both tradition education programs and alternative certification programs.

Confidentiality
The information in the study will be kept confidential to the full extent allowed by law. Names or references will not be used in oral or written reports that could link you to the study. All collected documents and information used in this research study will contain only code numbers. These code numbers will be referenced on a master list used only by the researcher to identify the participants in the study. The master list will be stored on a computer that is password protected with the password only known to the researcher. Any video file or document collected during this study will be kept in a locked file cabinet at the researcher’s residence.

Compensation
For participating in this study you will receive a $25 gift card to the store of your choice. Once the video file and survey have been received by the researcher, you will be contacted by the researcher to let you know all the necessary information has been received and is complete. At that time the researcher will thank you for your participation and will ask for which store you would like the gift card. If for any reason you decide to drop out of the study before the researcher receives the video file or survey, you will not be eligible to receive the gift card.

What if you have questions about this study?
If you have questions at any time about the study or the procedures, you may contact the researcher, Bradley Bowen at bbowen@wcpss.net or (919)696-0964.
What if you have questions about your rights as a research participant?
If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Deb Paxton, Regulatory Compliance Administrator, Box 7514, NCSU Campus (919/515-4514).

Consent To Participate
“I have read and understand the above information. I have received a copy of this form. I agree to participate in this study with the understanding that participation is not part of my job and I may choose not to participate or to stop participating at any time without penalty or loss of benefits to which I am otherwise entitled. I also can skip any question on the survey I do not want to answer.”

Subject’s signature_______________________________________ Date _________________
Investigator’s signature____________________________________ Date _________________
North Carolina State University

Informed Consent Form For Research
(Principal Form)

Title of Study: Measuring Teacher Effectiveness And Student Achievement When Comparing Traditionally Certified Teachers To Alternatively Certified Teachers In Technology Education

Principal Investigator: Bradley Bowen
Faculty Sponsor: William DeLuca

You are being asked to take part in a research study because a technology teacher in your school has agreed to participate in a North Carolina State University technology education dissertation research study. Your participation in this study is voluntary. You have the right to be a part of this study, to choose not to participate, or to stop participating at any time without penalty. The purpose of research studies is to gain a better understanding of a certain topic or issue. You are not guaranteed any personal benefits from being in a study. Research studies also may pose risks to those that participate. In this consent form you will find specific details about the research in which you are being asked to participate. If you do not understand something in this form it is your right to ask the researcher for clarification or more information. A copy of this consent form will be provided to you. If at any time you have questions about your participation, do not hesitate to contact the researcher named above.

What is the purpose of this study?
The purpose of this study is to compare teacher effectiveness and student achievement between traditionally certified and alternatively certified technology education teachers. This will be accomplished by observing how students stay engaged in the lesson plan when reacting to certain teacher actions and characteristics. The data will then be analyzed to measure the students’ time of engagement based on the teacher’s method of delivery and classroom management techniques. The conclusion of the study will be able to offer recommendations for teacher preparation and professional development for both traditional education programs and alternative certification programs. By participating in this study, you will be helping progress the field of technology education. Please consider participating in this study.

What will happen if you take part in the study?
If you agree to participate in this study, you will be asked to participate in a phone survey. This survey will be conducted by the researcher and should last between 10-15 minutes. The questions you will be asked are intended to gather information about your perceptions regarding a specific technology education teacher’s preparation, effectiveness, and professional development needs. This technology education teacher has agreed to participate in this study and is aware of the questions that will be asked about them. This phone survey will be audio taped to ensure accuracy in reporting results. The audio file and survey responses will be kept in the strictest confidence and will be destroyed once the study is complete.

Risks
One of the risks involved with this study would a breach of confidentiality of your identity in the study. The teacher will be the only person who knows your identity in this study. Other than this teacher, proper measures will ensure that no other individual knows your identity in this study. Another risk may involve your concern with the teacher learning of the information you provide in the phone survey. You may also have a concern about the teacher learning of your responses. I can assure you that your confidentiality will be maintained in the strictest manner at all times. Your responses will only be available to the researcher. In addition, the teacher will be made aware of the phone survey and the questions you will be asked about the teacher. The teacher has seen the questions and has agreed to continue participating in the study. The audio tape of the responses you provide
will be kept in a secure location and will be destroyed upon the conclusion of the study. Because you are evaluating a teacher in your school, there may be concerns from the teacher about how these responses will be used. Any response you provide is for dissertation research only and will not be included in any of the teacher’s personnel records or files. This will be communicated to the teacher before the study begins.

**Benefits**
Your participation will help to advance the field of technology education with suggestions for teacher preparation and professional development. The results of this study will help the researcher make conclusions that will benefit both tradition education programs and alternative certification programs.

**Confidentiality**
The information in the study will be kept confidential to the full extent allowed by law. Names or references will not be used in oral or written reports that could link you to the study. All collected documents and information used in this research study will contain only code numbers. These code numbers will be referenced on a master list used only by the researcher to identify the participants in the study. The master list will be stored on a computer that is password protected with the password only known to the researcher. Any audio file or document collected during this study will be kept in a locked file cabinet at the researcher’s residence.

**Compensation**
You will not receive any compensation for participating in this study.

**What if you have questions about this study?**
If you have questions at any time about the study or the procedures, you may contact the researcher, Bradley Bowen at bbowen@wcpss.net or (919)696-0964.

**What if you have questions about your rights as a research participant?**
If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Deb Paxton, Regulatory Compliance Administrator, Box 7514, NCSU Campus (919/515-4514).

**Consent To Participate**
“I have read and understand the above information. I have received a copy of this form. I agree to participate in this study with the understanding that participation is not part of my job and I may choose not to participate or to stop participating at any time without penalty or loss of benefits to which I am otherwise entitled. I also can skip any question during the survey I do not want to answer.”

Subject's signature_______________________ Date _______________

Investigator's signature______________________ Date ______________
North Carolina State University

Video Release for Research
(18 and over)

Name of Research Project: Measuring Teacher Effectiveness And Student Achievement When Comparing Traditionally Certified Teachers To Alternatively Certified Teachers In Technology Education

Principal Researcher: Bradley Bowen (doctoral student)
Faculty Sponsor: William DeLuca (committee chair)

Please read the following and sign if you give consent.

Your teacher has agreed to participate in a research study being conducted by a doctoral student at North Carolina State University. The teacher needs to video tape one class period. Your identity will be kept confidential at all times to the fullest extent of the law. A picture, video clip, or your name will not be published in any way. The video will remain in the possession of the teacher or the researcher at all times in a secure location. No one else will have access to the video. Once the research study is complete, the video will be destroyed.

During the taping of this class period, you will not be asked to do anything other than to conduct normal classroom activities. Participation in the taping of this class period is voluntary and you can choose to stop participating at any time without penalty or change in grade.

I have read the above information concerning the research study and give permission for the teacher to video tape me during class.

____________________________________
Student Printed Name

____________________________________
Student Signature

Date
North Carolina State University

Video Release for Research
(under 18)

Name of Research Project: Measuring Teacher Effectiveness And Student Achievement When Comparing Traditionally Certified Teachers To Alternatively Certified Teachers In Technology Education

Principal Researcher: Bradley Bowen (doctoral student)
Faculty Sponsor: William DeLuca (committee chair)

Parent/guardian: please read the following and sign if you give consent.

Your child’s teacher has agreed to participate in a research study being conducted by a doctoral student at North Carolina State University. The teacher needs to video tape one class period. Your child’s identity will be kept confidential at all times to the fullest extent of the law. A picture, video clip, or the name of your child will not be published in any way. The video will remain in the possession of the teacher or the researcher at all times in a secure location. No one else will have access to the video. Once the research study is complete, the video will be destroyed.

During the taping of this class period, your child will not be asked to do anything other than to conduct normal classroom activities. Participation in the taping of this class period is voluntary and your child can choose to stop participating at any time without penalty or change in grade.

I have read the above information concerning the research study and give permission for the teacher to video tape my child during class.

____________________________________
Student Printed Name

____________________________________
Parent/Guardian’s Printed Name

____________________________________
Parent/Guardian’s Signature

____________________________________
Date
APPENDIX D

NCSU IRB Approval Letter
NCSU IRB Application
From: Carol Mickelson, IRB Coordinator  
North Carolina State University  
Institutional Review Board

Date: March 29, 2010

Project Title: Measuring Teacher Effectiveness And Student Achievement When Comparing Traditionally Certified Teachers To Alternatively Certified Teachers In Technology Education

IRB#: 1264-10

Dear Mr. Bowen,

The project listed above has been reviewed by the NC State Institutional Review Board for the Use of Human Subjects in Research, and is approved for one year. This protocol will expire on March 29, 2010 and will need continuing review before that date.

NOTE:

1. You must use the attached consent forms which have the approval and expiration dates of your study.

2. This board complies with requirements found in Title 45 part 46 of The Code of Federal Regulations. For NCSU the Assurance Number is: FWA0003429.

3. Any changes to the protocol and supporting documents must be submitted and approved by the IRB prior to implementation.

4. If any unanticipated problems occur, they must be reported to the IRB office within 5 business days by completing and submitting the unanticipated problem form on the IRB website.

5. Your approval for this study lasts for one year from the review date. If your study extends beyond that time, including data analysis, you must obtain continuing review from the IRB.

Sincerely,

Carol Mickelson  
NC State IRB
North Carolina State University
Institutional Review Board for the Use of Human Subjects in Research
SUBMISSION FOR NEW STUDIES

GENERAL INFORMATION

1. Date Submitted: December 28, 2009
   1a. Revised Date: February 12, 2010
   1b. Revised Date: February 18, 2010
   1c. Revised Date: March 29, 2010

2. Title of Project: Measuring Teacher Effectiveness And Student Achievement When Comparing Traditionally Certified Teachers To Alternatively Certified Teachers In Technology Education

3. Principal Investigator: Bradley Bowen

4. Department: Math, Science, and Technology Education

5. Campus Box Number:

6. Email: bbowen@acps.net

7. Phone Number: (919) 696-0964

8. Fax Number: (919) 856-7917

9. Faculty Sponsor Name and Email Address if Student Submission: William Deluca; william.deluca@ncsu.edu

10. Source of Funding? (required information): Self

11. Is this research receiving federal funding?: No

12. If Externally funded, include sponsor name and university account number: N/A

13. RANK:
   - Faculty
   - Student: □ Undergraduate; □ Masters, or □ PhD
   - Other (specify): EdD

---

As the principal investigator, my signature testifies that I have read and understood the University Policy and Procedures for the Use of Human Subjects in Research. I assure the Committee that all procedures performed under this project will be conducted exactly as outlined in the Proposal Narrative and that any modification to this protocol will be submitted to the Committee in the form of an amendment for its approval prior to implementation.

Principal Investigator:

Bradley Bowen
(typed/printed name)

Bradley Bowen
(signature)

* 03/29/10
(date)

---

As the faculty sponsor, my signature testifies that I have reviewed this application thoroughly and will oversee the research in its entirety. I hereby acknowledge my role as the principal investigator of record.

Faculty Sponsor:

William Deluca
(typed/printed name)

William Deluca
(signature)

* 03/29/10
(date)

*Electronic submissions to the IRB are considered signed via an electronic signature. For student submissions this means that the faculty sponsor has reviewed the proposal prior to it being submitted and is copied on the submission.

Please complete this application and email as an attachment to: debra_paxton@ncsu.edu or send by mail to: Institutional Review Board, Box 7514, NCSU Campus (Administrative Services III). Please include consent forms and other study documents with your application and submit as one document.

******************************************************************************

For SPARCS office use only

Reviewer Decision (Expeditied or Exempt Review)

☐ Exempt
☐ Approved
☐ Approved pending modifications
☐ Table

Expeditied Review Category: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8a ☐ 8b ☐ 8c ☐ 9

Reviewer Name

Signature

Date
A. INTRODUCTION
1. Briefly describe in lay language the purpose of the proposed research and why it is important.

This research study is designed to help advance the field of technology education. This study will measure teacher effectiveness and student achievement when comparing technology education teachers certified by traditional education programs and alternative certification programs. This will be accomplished by observing specific teacher behaviors and classroom management techniques that contribute to students being engaged in the classroom. The data will be analyzed to determine if certification type, educational background, degree type, and work experience play a role if teacher effectiveness and student achievement in technology education. The research also involves recording principals’ perceptions on the teacher’s preparedness, effectiveness, and professional development needs. This is important in the development of teacher education and professional development programs to better prepare technology education teachers for the classroom. By studying the characteristics of the two different types of certified teachers, recommendations can be made to improve traditional and alternative certification programs.

2. If student research, indicate whether for a course, thesis, dissertation, or independent research.

This study is for a dissertation in technology education.

B. SUBJECT POPULATION
1. How many subjects will be involved in the research?

This study will involve a maximum of 16 teachers and their students in one class period, and the principals of these teachers.

2. Describe how subjects will be recruited. Please provide the IRB with any recruitment materials that will be used.

The randomly selected teachers will be the first point of contact for the study. The teachers will be initially contacted by email with a follow-up phone call if necessary. Every effort will be made to recruit the selected teacher. If the teacher cannot be contacted or does not respond after these efforts, the next teacher on the list will be contacted. If the teacher does not agree to participate, the next teacher on the list will be contacted. Once the teacher agrees to participate in the study, the principal of that teacher will be contacted by phone. The study will be explained to the principal and to determine if the principal is willing to participate. If the principal does not agree to participate in the study, the next teacher on the list will be contacted. Once the teacher and principal have agreed to participate in the study, the necessary consent forms will be emailed to the teacher and principal.

3. List specific eligibility requirements for subjects (or describe screening procedures), including those criteria that would exclude otherwise acceptable subjects.

Each subject chosen to participate will need to be willing to distribute and collect video release forms from each student, video tape a class, send the researcher the video file, and fill out a short survey. In addition, the principal of the selected teacher will need to be willing to complete a short telephone survey.

If the teacher is not able to collect video release forms from each student, any student that does not submit a video release form will remain in the classroom, but out of view of the camera. This will prevent students from missing instructional time while providing the researcher with the necessary data.

Since each teacher and principal will be in a different school system, permission will be obtained first from the teacher to determine if they are willing to participate in the study. Next permission will be obtained from the principal of that school to perform the study with them and the technology education teacher. If the principal requires additional permission be obtained, the proper procedures will be taken within that specific school district to conduct the study. If permission cannot be obtained after these measures, the next teacher on the list of candidates will be selected. This process will continue until a sufficient number of participants have agreed to participate in the study.

4. Explain any sampling procedure that might exclude specific populations.
The sampling procedure will involve a stratified sample to ensure all 8 geographic educational regions in NC are represented. One teacher of both teacher certification types will be randomly selected from each of the 8 regions, resulting in a maximum of 16 teachers. This is to ensure a more representative sample of the educational background and work experience of technology education teachers across NC.

5. Disclose any relationship between researcher and subjects - such as, teacher/student; employer/employee.

None.

6. Check any vulnerable populations included in study:

☐ minors (under age 18) - if so, have you included a line on the consent form for the parent/guardian signature
☐ fetuses
☐ pregnant women
☐ persons with mental, psychiatric or emotional disabilities
☐ persons with physical disabilities
☐ economically or educationally disadvantaged
☐ prisoners
☐ elderly
☐ students from a class taught by principal investigator
☐ other vulnerable population.

7. If any of the above are used, state the necessity for doing so. Please indicate the approximate age range of the minors to be involved.

This study involves the videotaping of a high school classroom. The subjects will include high school aged students. This is necessary to collect the data needed to determine how the students' engagement in the classroom is a result of the teacher behaviors and classroom management techniques. A video release form will be collected from each student in the class to be videotaped.

C. PROCEDURES TO BE FOLLOWED

1. In lay language, describe completely all procedures to be followed during the course of the experimentation. Provide sufficient detail so that the Committee is able to assess potential risks to human subjects. In order for the IRB to completely understand the experience of the subjects in your project, please provide a detailed outline of everything subjects will experience as a result of participating in your project. Please be specific and include information on all aspects of the research, through subject recruitment and ending when the subject's role in the project is complete. All descriptions should include the informed consent process, interactions between the subjects and the researcher, and any tasks, tests, etc. that involve subjects. If the project involves more than one group of subjects (e.g. teachers and students, employees and supervisors), please make sure to provide descriptions for each subject group.

The subjects (teachers) will be randomly selected by choosing one traditionally certified teacher and one alternatively certified teacher in technology education in each of the 8 geographical educational regions in NC. The researcher will then contact the teacher by email or phone to explain the study and request their participation. To confirm their participation in the study, the teachers will need to agree to sign the teacher consent form, distribute and collect video release forms from each student, setup a video camera in their classroom, videotape one class, complete a short survey, and send the release forms, video file, and survey to the researcher. Once the teacher agrees to participate, the researcher will collect a signed informed consent form from the teacher by mail. The teacher will then need to collect video release forms from each student in the class that will be videotaped. The teacher will be responsible for setting up the video camera and taping the class. Once the videotaping is complete, the teacher will then fill out a short survey so the researcher can gather background information about the teacher. The video file will be sent to the researcher by means of personal delivery/pick-up or the US Postal Service. Once the researcher receives the video file, student video release forms, and the survey, their role in the study will be complete. At this point the researcher will thank the teacher for participating with a $25 gift card from a store of the teacher's choice.

The principal of each teacher selected for the study will be contacted to ask for his or her participation in the study. A signed consent form will be collected from each principal. Once this form is received, the researcher will make an appointment with the principal to conduct a phone survey. The survey should last approximately 10-15 minutes and
will be recorded. Once the phone survey has concluded, the principal’s role in the study is complete.

2. How much time will be required of each subject?

| The time required for each teacher is one class period and 10-15 minutes for the survey. |
| The time required for the principal is 10-15 for the phone survey. |

D. POTENTIAL RISKS

1. State the potential risks (physical, psychological, financial, social, legal or other) connected with the proposed procedures and explain the steps taken to minimize these risks.

| The biggest risk in this study will be a breach of confidentiality. To ensure confidentiality, all research data collection instruments will be coded with a master list stored in a separate location. The researcher will be the only person to have access to the coded materials or the data that is collected during this study. |

2. Will there be a request for information that subjects might consider to be personal or sensitive (e.g. private behavior, economic status, sexual issues, religious beliefs, or other matters that if made public might impair their self-esteem or reputation or could reasonably place the subjects at risk of criminal or civil liability)?

| No. |

a. If yes, please describe and explain the steps taken to minimize these risks.

b. Could any of the study procedures produce stress or anxiety, or be considered offensive, threatening, or degrading? If yes, please describe why they are important and what arrangements have been made for handling an emotional reaction from the subject.

| No. |

3. How will data be recorded and stored?

| Data will be collected by viewing videotaped classes, paper surveys, and audio recorded phone surveys. The data will be stored in a secure location at the researcher’s residence. All of these items will be coded so the video tapes and surveys will not include the teacher’s or principal’s name. A master list of the codes will be kept in a separate location to protect the identity of the subjects. The researcher will be the only person with access to this data. |

a. How will identifiers be used in study notes and other materials?

| Each subject will have a code assigned to the data so their name will be kept confidential. A master list will be kept in a separate secure location to ensure confidentiality. |

b. How will reports be written, in aggregate terms, or will individual responses be described?

| Survey responses may be reported in the dissertation, but subjects’ names and any identifying factors will not be included to ensure their confidentiality. |

4. If audio or videotaping is done how will the tapes be stored and how/when will the tapes be destroyed at the conclusion of the study.

| The video and audio tapes will be stored in a secure location at all times. Once the study is complete, the tapes will be recorded over and properly disposed of to ensure any footage will be destroyed. |

5. Is there any deception of the human subjects involved in this study? If yes, please describe why it is necessary and describe the debriefing procedures that have been arranged.

| No. |
E. POTENTIAL BENEFITS

This does not include any form of compensation for participation.

1. What, if any, direct benefit is to be gained by the subject? If no direct benefit is expected, but indirect benefit may be expected (knowledge may be gained that could help others), please explain.

The subject will not see a direct benefit of their participation in this study. The indirect benefit will be a contribution to the technology education field to improve the education and professional development of technology education teachers.

F. COMPENSATION

Please keep in mind that the logistics of providing compensation to your subjects (e.g., if your business office requires names of subjects who received compensation) may compromise anonymity or complicate confidentiality protections. If, while arranging for subject compensation, you must make changes to the anonymity or confidentiality provisions for your research, you must contact the IRB office prior to implementing those changes.

1. Describe compensation

Each participating teacher will receive a $25 gift card to the store of his or her choice.

2. Explain compensation provisions if the subject withdraws prior to completion of the study.

If the teacher withdraws from the study before the completion of their role, they forfeit the opportunity to receive the $25 gift card.

3. If class credit will be given, list the amount and alternative ways to earn the same amount of credit.

N/A

G. COLLABORATORS

1. If you anticipate that additional investigators (other than those named on Cover Page) may be involved in this research, list them here indicating their institution, department and phone number.

None.

2. Will anyone besides the PI or the research team have access to the data (including completed surveys) from the moment they are collected until they are destroyed.

No.

H. CONFLICT OF INTEREST

1. Do you have a significant financial interest or other conflict of interest in the sponsor of this project? NO

2. Does your current conflicts of interest management plan include this relationship and is it being properly followed? N/A

I. ADDITIONAL INFORMATION

1. If a questionnaire, survey or interview instrument is to be used, attach a copy to this proposal.

Attachment: Teacher Survey
Principal Survey

2. Attach a copy of the informed consent form to this proposal.

Attachment: Teacher Consent Form
Principal Consent Form
Student Consent Form (under 18)
Student Consent Form (18 and over)

3. Please provide any additional materials that may aid the IRB in making its decision.
J. **HUMAN SUBJECT ETHICS TRAINING**

*Please consider taking the Collaborative Institutional Training Initiative (CITI), a free, comprehensive ethics training program for researchers conducting research with human subjects. Just click on the underlined link.*