THE RELATIONSHIP BETWEEN MIDDLE SCHOOL MATHEMATICS TEACHER BACKGROUND AND EFFICACY DURING THE TRANSITION TO COMMON CORE

by

Stacy Plemons

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

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APPROVED BY:

Scott B. Watson, Ph.D., Committee Chair

Heidi Hunt-Ruiz, Ed.D., Committee Member

Rene' Walker, Ed.D., Committee Member

Scott B. Watson, Associate Dean, Advanced Programs

ABSTRACT

The purpose of this correlation study was to investigate the relationship between teacher background training and teaching efficacy for instructing mathematics in the middle grades during the transition to Common Core State Standards. Participants included 37 mathematics teachers in grades six, seven, and eight in the CORE East TN region. Surveys containing the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) were electronically administered to determine the dependent variables: self-efficacy (personal teaching efficacy) and outcome expectancy for teaching mathematics. Additional questions measured the independent variable, teacher background training, defined by number of college mathematics course hours taken, number TNCore mathematics training days attended, and years of experience teaching mathematics. Spearman's rho correlations were calculated using SPSS to determine the relationship between the independent and dependent variables. A significant, positive relationship was found for the number of college mathematics course hours taken and self-efficacy, but not for outcome expectancy. A significant, positive relationship was also found for self-efficacy and outcome expectancy. No significant correlations were indicated for TNCore mathematics training days attended or years' experience teaching mathematics on self-efficacy or outcome expectancy. Discussion of results, implications, and recommendations for future research are also included.

Keywords: teacher efficacy, mathematics, reform, common core, correlation

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List of Abbreviations

Common Content Knowledge (CCK)

Common Core State Standards (CCSS)

Council of Chief State School Officers (CCSSO)

Constructed Response Assessments (CRA)

End-of-Year Assessment (EOY)

Mississippi Curriculum Test (MCT2)

Mathematics Teaching Outcome Expectancy subscale of the MTEBI (MTOE)

Mathematics Teacher Efficacy Beliefs Instrument (MTEBI)

National Assessment of Educational Progress (NAEP)

National Governor's Association (NGA)

Partnership for Assessment of Readiness for College and Careers (PARCC)

Performance-Based Assessment (PBA)

Personal Mathematics Teaching Efficacy subscale of the MTEBI (PMTE)

SMARTER Balanced Assessment Consortium (SBAC)

Specialized Content Knowledge (SCK)

State Performance Indicator (SPI)

Tennessee Comprehensive Assessment Program (TCAP)

Tennessee Department of Education (TDOE)

Trends in International Mathematics and Science Study (TIMSS)

Tennessee Value-Added Assessment System (TVAAS)

CHAPTER ONE: INTRODUCTION

Mathematical understanding is essential for students as it used in personal finance, higher education, and career settings (Saffer, as cited in Burns, Kanive, & DeGrande, 2012; Mat Zin, 2009). Despite its importance, many students lack basic mathematics skills. The National Education Center for Education Statistics' 2013 Report indicated only 42% of fourth graders and 35% of eighth graders in the United States meet or exceed proficiency levels in mathematics (The Nation's Report Card, 2013a). Tennessee is among many states that have adopted the Common Core State Standards (CCSS) with the intent of better preparing students for higher education or entering the workforce (Common Core State Standards Initiative, 2014). The adoption of new standards called for changes in classroom instruction. To assist teachers in the transition to CCSS, Tennessee implemented a series of peer-led TNCore trainings in the standards. This study investigated the effect of teacher background training as measured by college course hours in mathematics and TNCore training days attended on teacher efficacy for teaching Common Core mathematics in the middle grades. The effect of the number of years of experience teaching mathematics was also investigated. It is important to evaluate the effect of teacher background training as participants in case study research have indicated that the increased rigor and depth of coverage in the Common Core State Standards (CCSS) standards could test the scope of teachers' content knowledge (Cristol & Ramsey, 2014). Self-efficacy is important to investigate as it affects many behavioral traits important to teaching and implementing innovative practices (Bandura, 2012; Oakes, Lane, Jenkins, & Booker, 2013). Additionally, outcome expectancy is important to investigate because it relates to teachers' view on students' abilities to learn from their instruction (Newton, Leonard, Evans, & Eastburn, 2012). Chapter One consists of the introduction. It includes the background, problem statement, purpose statement, significance of the study, research question and hypotheses, identification of variables, and definitions.

Background

Although state standards have existed since the early 1990s and have been implemented in every state since the 2001 No Child Left Behind Act, they have not proved an acceptable effectiveness level for preparing students for college or the work force (Common Core State Standards Initiative, 2014; TN Department of Education, 2014b). In fact, a 2004 American Diploma Project report claims high school diplomas have lost their value as employers and higher education institutions have indicated graduates do not possess the basic skills needed for success in college or to begin careers (TN Department of Education, 2014b). Inconsistency of state standards is one part of the problem, particularly in determining proficiency levels. Tennessee is a prime example of this issue. In 2007, a large number of Tennessee students were rated proficient according to Tennessee state tests and proficiency cut-off points; however, in that same year, a significantly lower percent of Tennessee students scored proficient according to National Assessment of Educational Progress tests and proficiency score levels (TN Department of Education, 2014b).

To address these issues of lack of preparedness for college and careers and inconsistency among state learning expectations, state policy makers collaborated, with teacher involvement, to develop the Common Core State Standards (CCSS) (Common Core State Standards Initiative, 2014). However, even the best-written standards are not enough to transform an education system. For real change to occur, teachers must be involved and on-board with the reform. The state of Tennessee devised a transition plan to help teachers be prepared for the full CCSS implementation in the 2014-2015 school year. Tennessee has been increasing state test alignment with CCSS since 2012 by dropping misaligned state standards from testing.

Additionally, Tennessee hired current teachers as Core Coaches to peer-lead TNCore training workshops at no cost to teachers or districts during the 2012, 2013, and 2014 summers (TN Department of Education, 2014b). This study was designed to investigate teachers' self-efficacy and outcome expectancy towards CCSS with relation to their background training as content knowledge and training plays a vital role in teachers' ability to be effective under CCSS since there is a significant increase in the depth of knowledge required by these standards.

Problem Statement

Teacher background training is of particular interest for research in middle school Common Core State Standards (CCSS) mathematics implementation as multiple teachers indicated the increased depth of knowledge required by CCSS can challenge or possibly exceed some teachers' level of content knowledge (Cristol & Ramsey, 2014, p. 18). Middle school mathematics teachers are particularly at risk for encountering subject matter beyond their training as multiple pathways and teacher certifications exist to meet requirements for teaching middle school. According to the 2011 Trends in International Mathematics and Science Study (TIMSS) of U.S. eighth grade mathematics teachers, 28% have majors in both mathematics and mathematics education, 25% have majors in mathematics education, but not mathematics, 15% have majors in mathematics, but not mathematics education, and 31% have majors in other fields (Mullis, Martin, Foy, & Arora, 2012). This means approximately one in grade eight middle grades mathematics teachers who are required to provide in-depth instruction of advanced mathematics material required by CCSS, such as solving systems of two linear equations in two variables algebraically, do not have specific training in mathematics or mathematics education (National Governors Association Center for Best Practices, 2010). The variation that exists in teacher background and the heightened content challenge of CCSS supports the need for research on the influence of teacher background training on CCSS instruction in middle grades mathematics.

The state of Tennessee is taking a proactive role in assisting teachers with the CCSS transition by providing teachers with peer-led professional development training through TNCore summer workshops. Making teachers active participants in the process may improve their opinions of and dedication towards the reform. However, simply providing professional development does not guarantee positive change. While research is limited, there is some support for the effectiveness of a workshop containing similar components to TNCore trainings (Rimbey, 2013). However, ample time is required for teachers to understand the standards, explore resources, examine and analyze student work, and test new strategies (Obara & Sloan, 2010). TNCore trainings for summers 2012, 2013, and 2014 were two or three days, which may not be enough time to be effective. Thus, the inclusion of TNCore training attendance in this study helped evaluate the effectiveness of the training program with regards to teacher self-efficacy and outcome expectancy towards teaching mathematics in the middle grades.

Purpose Statement

The purpose of this correlation study based on survey research was to evaluate the relationship between background training and efficacy for teaching mathematics under Common Core State Standards (CCSS) for middle school mathematics teachers from the CORE East TN region. Survey data was collected through an electronically administered survey. The independent variable, teacher background training, was generally defined as the number of college course hours taken in mathematics and number of TNCore mathematics training days attended. The dependent variable was generally defined as teacher efficacy, comprised of self-efficacy and outcome expectancy as measured by the two subscales of the Mathematics Teacher Efficacy Beliefs Instrument (MTEBI): the Personal Mathematics Teaching Efficacy (PMTE) subscale and the Mathematics Teaching Outcome Expectancy (MTOE) subscale. The control variables, participant school district location (CORE East TN region), grade level taught (middle grades: six, seven, or eight), and subject area taught (mathematics), were statistically controlled in this study. The purpose of this study was to evaluate the relationship between teacher background training and teacher efficacy towards teaching middle grades mathematics under Common Core State Standards in Tennessee.

Significance of the Study

There have been a number of studies conducted on teacher efficacy, particularly on pre-service teacher self-efficacy as Bandura's (1993, as cited in (Swackhamer, Koellner, Basile, & Kimbrough, 2009) concept of self-efficacy is thought to most impact novice individuals engaging in new learning (Swackhamer et al., 2009). The reform involved with Common Core State Standards (CCSS) allowed a new opportunity for teacher efficacy research of novice teachers and experienced teachers, as all are new to CCSS. Although support is not conclusive, efficacy in the current study was based on the idea that efficacy tends to be situational and context-specific (Bandura, 1977, 1982; Edwards, Green, & Lyons, 2002; Tschannen-Moran, Hoy, & Hoy, 1998). Therefore, research in teaching efficacy and CCSS is essential and adds to the body of knowledge in both areas.

Educational reforms such as the transition to CCSS can benefit greatly from research in teacher efficacy. Research supports that greater efficacy leads to greater effort and persistence, which increases performance, thereby increasing efficacy, and restarts the efficacy-building process until a stable set of efficacy beliefs is established (Tschannen-Moran et al., 1998). However, a reevaluation of efficacy is sometimes prompted by challenges such as the initial implementation of change, which has been found to have negative influence on teacher self-efficacy (Tschannen-Moran et al., 1998). Current studies of teacher efficacy and CCSS are limited and primarily utilize qualitative case study methods. Although case study research can provide valuable insight into individuals, it is limited in generalizability. The current study can help policy makers and school administrators, particularly in Tennessee, gain insight on how to support teachers through the transition to CCSS. Providing support for teachers is vital as they are more likely to commit to reform if it is perceived positively (Lee, Hong-biao, Zhong-hua, & Yu-le, 2011).

Research Questions and Hypotheses

Research Question 1: Does teacher background training in mathematics influence teacher self-efficacy towards teaching Common Core State Standards for mathematics in the middle grades?

Hypothesis 1: There will be no statistically significant correlation between teacher self-efficacy scores as measured by the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and the number of college mathematics course hours taken.

Hypothesis 2: There will be no statistically significant correlation between teacher self-efficacy scores as measured Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and the number of TNCore mathematics training days attended.

Hypothesis 3: There will be no statistically significant correlation between teacher self-efficacy scores as measured by the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and the number of years of experience teaching mathematics.

Research Question 2: Does teacher background training in mathematics influence outcome expectancy for teaching Common Core State Standards for mathematics in the middle grades?

Hypothesis 4: There will be no statistically significant correlation between outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument and the number of college mathematics course hours taken.

Hypothesis 5: There will be no statistically significant correlation between outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument and the number of TNCore mathematics training days attended.

Hypothesis 6: There will be no statistically significant correlation between outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument and the number of years of experience teaching mathematics.

Research Question 3: Does teacher self-efficacy influence teacher outcome expectancy towards teaching Common Core State Standards for mathematics in the middle grades?

Hypothesis 7: There will be no statistically significant correlation between teacher self-efficacy scores as measured by the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument.

Identification of Variables

The independent variable in this study was teacher background training. Teacher background training was measured by number of college mathematics course hours taken and number of TNCore mathematics training days attended. College mathematics course hours taken and the number of TNCore mathematics training days attended were measured on a continuous scale using raw numbers. An additional independent variable, years of experience teaching mathematics, were also be measured on a continuous scale using raw numbers. As required for correlation research, all data for the aforementioned variables was in quantifiable form (Gall, Gall, & Borg, 2007). Consistent with survey research, this study was based on self-report data (Daniel, 2010). The research was not purposed to intervene and measure change over time as in experimental research; rather, the research was based on teacher self-report data from one point in time (Daniel, 2010).

Definitions

1. *Common Core State Standards* - Common Core State Standards (CCSS) are college and career ready learning expectations in mathematics and language arts for students in kindergarten through twelfth grade. The standards were developed through a collaboration of teachers and policy makers in 48 states to allow for cross-state consistency in learning expectations and improve student readiness for college or the workforce (Common Core State Standards Initiative, 2014).

2. *Mathematics Teaching Efficacy Beliefs Instrument (MTEBI)* - The MTEBI was developed by Enochs, Smith, and Huinker (2000) by modifying the Science Teaching Beliefs Instrument (STEBI-B) to tailor to pre-service elementary mathematics teachers. The MTEBI consists of 21 items: thirteen items comprise the personal mathematics teaching efficacy (PMTE) subscale, and eight items comprise the mathematics teaching outcome efficacy (MTOE) subscale (Enochs et al., 2000). Each item has five response options: Strongly Agree, Agree, Uncertain, Disagree, and Strongly Disagree (Enochs et al., 2000).

3. *National Assessment of Educational Progress (NAEP)* - NAEP is the largest national assessment of student performance in the United States. Assessments are periodically conducted with a representative sample of fourth, eighth, and twelfth grade students to assess

subject area achievement and analyze long-term trends (U.S. Department of Education, 2014a).

4. *Personal teaching efficacy or self-efficacy* - Self-efficacy is, put simply, a person's judgment of how effectively he or she can deal with a situation or circumstance (Bandura, 1983). Self-efficacy is determined by self-perception, not actual competence (Tschannen-Moran et al., 1998). In this research, personal teaching efficacy or self-efficacy refers to a teacher's belief about his or her own teaching effectiveness.

5. *Partnership for Assessment of Readiness for College and Careers (PARCC)* - PARCC is a partnership of thirty states collaborating to create computer-based assessments to measure student progress towards college or career readiness and help teachers adjust instruction to meet student needs (PARCC, 2014a).

6. *Race to the Top* - Race to the Top is part of the American Recovery and Reinvestment Act of 2009 under which competitive grants were awarded to eleven states including Tennessee for educational reform (U.S. Department of Education, 2014b). Race to the Top is designed to provide support in four reform areas: (a) the adoption of rigorous standards to prepare students for college or careers; (b) the establishment of measures to access student achievement and inform instruction, (c) the recruitment and retention of quality educators; and (d) the improvement in the lowest performing schools (U.S. Department of Education, 2014b). Tennessee's Race to the Top four-year grant allotment totaled $500,741,220 (U.S. Department of Education, 2014b).

7. *Standards* – Standards statements that define student learning expectations (TN Department of Education, 2014b). Often standards decisions are made at the state level. Curriculum materials and instructional methods are not dictated by standards and are generally determined by local school districts (TN Department of Education, 2014b).

8. *Teacher content knowledge for teaching mathematics* - Teacher content knowledge for teaching mathematics is more than the ability to solve mathematics problems. Teacher content knowledge for teaching mathematics includes the ability to provide multiple, grade level conceptual and procedural explanations to students to help them not only be able to arrive at the correct answer, but also to be able to explain and demonstrate a true understanding of their work (Hill, Rowan, & Deborah Loewenberg, 2005, p. 372).

9. *TNCore* - TNCore is part of the Tennessee Department of Education. TNCore provides the summer Common Core State Standards workshops in Tennessee. The goal of TNCore resources is to provide support for teachers, education leaders, parents, and community members to aid student success in math and literacy expectations for learning (TN-Core Common Core Standards, 2014).

10. *Outcome Expectancy* - Outcome expectancy is when one expects a specific behavior to produce a desirable outcome (Bandura, 1977; Enochs et al., 2000). An outcome is something that follows as a consequence or result of an activity, including costs, and personal benefits (Bandura, 1983). This differs from a performance, which is something done or accomplished, according to the conventional definitions of performance and outcome (Bandura, 1983).

CHAPTER TWO: REVIEW OF LITERATURE

Student proficiency in mathematics positively affects success in higher education settings, general employment, careers in areas of science and technology, and management of personal finances (Saffer, as cited in Burns, Kanive, & DeGrande, 2012; Mat Zin, 2009). Mathematics proficiency showed a trend of improvement nationally on the NAEP from 2005 to 2009; however, no significant change was made in mathematics from 2009 to 2013 (The Nation's Report Card, 2013b). According to the National Education Center for Education Statistics' 2013 Report, only 42% of fourth graders and 35% of eighth graders in the United States meet or exceed proficiency levels in mathematics (The Nation's Report Card, 2013a). Further, 40% of Tennessee fourth grade students scored proficient, and only 28% of Tennessee eight grade students scored proficient (The Nation's Report Card, 2013a). Tennessee, along with 43 other states as of April 2014, have adopted the Common Core State Standards (CCSS) designed to prepare students to pursue higher education or enter the workforce (Common Core State Standards Initiative, 2014).

Common Core State Standards

Common Core State Standards (CCSS) Overview

The adoption of education standards or expectations of student learning is not a new concept. The adoption of educational standards began as early as the 1990s; by 2001 all states were required to have adopted standards in accordance with No Child Left Behind (NCLB) (TN Department of Education, 2014b). However, these state learning expectations lacked standardization for student proficiency and proved inadequate to prepare students (Common Core State Standards Initiative, 2014). A 2004 report by the American Diploma Project claimed high school diplomas have lost their value because most graduates required remedial coursework in college, never completed their degrees, and were said by employers to lack basic skills (TN

Department of Education, 2014b). Further, in 2007, Tennessee was graded an "F" for "Truth in Advertising" about student proficiency by the U.S. Chamber of Commerce; a large percentage of Tennessee students scored proficient on state tests but significantly less scored proficient on the National Assessment of Educational Progress (NAEP) (TN Department of Education, 2014b). In response, Tennessee created the TN Diploma Project and joined 30 states in working to align student standards to be career and college ready as part of the American Diploma Project Network (TN Department of Education, 2014b). Tennessee joined in efforts by the National Governor's Association (NGA) and the Council of Chief State School Officers (CCSSO) and the Common Core State Standards were released in 2010 (National Governor's Association, 2014; TN Department of Education, 2014b).

Although NGA and CCSSO led the development of the CCSS, teachers were also involved by:

1. Serving on work groups and feedback groups.
2. Providing feedback through the National Education Association, American Federation of Teachers, National Council of Teachers of Mathematics, and the National Council of Teachers of English.
3. Serving on state-developed teacher teams for providing regular feedback on standards.
4. Responding to two public comments periods, which allowed for additional teacher input (Common Core State Standards Initiative, 2014).

The primary motivation for developing the Common Core State standards was to:

1. Present clear, career and college aligned learning expectations,
2. Foster consistency so that students across the country can be competitive with both domestic and international peers, and

3. Allow cross-state collaboration on policies and resources such as teaching resources and assessments (TN Department of Education, 2014b).

The development of the CCSS was based on multiple sources of research and evidence including empirical research, surveys on required skills for college and workforce programs, assessment data, and comparisons with high-performing countries (Common Core State Standards Initiative, 2014).

Well-planned standards alone are not enough to prepare students for college and careers. Teacher effectiveness is a major factor in student achievement (Sanders & Horn, 1998). In a 2013 survey of 20,157 teachers, 40% indicated they strongly agree and 43% somewhat agreed that teachers have the greatest impact on student achievement (Bill & Melinda Gates Foundation & Scholastic, 2013). Standards describe what students are expected to learn, but do not prescribe the manner in which teachers should conduct instruction; teachers are to devise lessons that fit the needs of their individual classrooms (Common Core State Standards Initiative, 2014). The Common Core State Standards Initiative (2014) recognizes that teachers will be impacted by the standards in the following ways:

- CCSS provides teachers with consistent goals and benchmarks to ensure student progress toward success in college, career, and life skills.
- CCSS provides teachers with consistent expectations across districts and states, which will alleviate content discrepancies when students relocate.
- CCSS provides teachers the opportunity for countrywide collaboration with fellow teachers to develop materials and assessments.
- CCSS helps colleges and professional development programs more adequately prepare teachers (Common Core State Standards Initiative, 2014).

Despite the potential positive impact on teachers as described by the Common Core State Standards Initiative, teachers still need to continue teaching Tennessee State Performance Indicators (SPIs) while preparing for the transition to CCSS because state testing covers SPIs for grades three through eight through the 2014-15 school year. This may create stress on teachers as substantial time may be need to be spent understanding the standards and designing lesson plans tailored to help student meet new standards, while still preparing students for testing over state SPIs. These factors related to teachers' transition to CCSS make this examination of teacher efficacy towards CCSS worthy of study.

Education standards reform is not new to the state of Tennessee; actually, the Department of Education is mandated by the Tennessee State Board of Education's Rules, Regulations, and Minimum Standards to reassess the state's curriculum standards roughly every six years (TN Department of Education, 2008). Prior to the adoption of CCSS, a previous set of new mathematics standards were approved in 2008 and implemented in the 2009-2010 school year (TN Department of Education, 2008). Barely into the implementation of the revised Tennessee state standards for mathematics, the State Board of Education voted unanimously to pass the adoption of the Common Core State Standards on July 30, 2010 (TN Department of Education, 2014b). However, the Tennessee State Standards have remained in effect to some degree with the State Performance Indicators (SPIs) comprising the summative, high stakes Tennessee Comprehensive Assessment Program (TCAP) tests through the 2014-15 school year. In a 2013 study by The Gates Foundation and Scholastic, 90% of Tennessee teachers indicated constantly changing demands on students and teachers as the one of the most significant challenges faced by teachers, which is higher than the national percentage (82%) (Bill & Melinda Gates Foundation & Scholastic, 2013). This further exemplifies the need for research in teacher perception of the transition to CCSS.

Tennessee's Plan for Transitioning to Common Core

Implementation of CCSS has varied across Tennessee school districts with some districts fully implementing the new standards in some grades and others waiting until the new assessments begin (TN Department of Education, 2014b). Many districts began implementing CCSS in grades K-2 in the 2011-2012 school year and in grades 3-8 to some degree in the 2012-2013 school year (TN Department of Education, 2014b). Partial implementation in a district may consist of teachers instructing students in the tested State Performance Indicators (SPIs) as well as the state-determined Common Core Focus Clusters for that year in their grade level. To aid in the transition, the Tennessee Department of Education (TDOE) dropped several SPIs that did not align with CCSS, while at the same time adding Focus Clusters to the content that is to be instructed. For example, in the 2012-2013 school year, eight SPIs were dropped from the sixth grade math standards and were not included in TCAP tests, but the Common Core Standards within the following two focus clusters were added:

1. Understand ratio concepts and use ratio reasoning to solve problems.
2. Apply and extend previous understandings of arithmetic to algebraic expressions.

In the 2013-2014 school year, three more SPIs were dropped from the sixth grade math curriculum and two more Focus Clusters were added for a total of four focus clusters:

3. Apply and extend previous understandings of numbers to the system of rational numbers.
4. Reason about and solve one-variable equations and inequalities.

This combination curriculum creates a complex instructional plan for teachers to follow and may result in additional stress. The current study will investigate teacher efficacy surrounding the CCSS as Tennessee is completing its transition phase.

The Tennessee Department of Education has taken an active approach to providing no-cost training to teachers to aid in the transition to CCSS (TN Department of Education, 2014b). These trainings have been peer-led by current Tennessee teachers who were competitively selected to be Core Coaches. In 2012, 200 Core Coaches were selected, trained, and paid a stipend by the state to train a combined 13,000 Tennessee teachers and administrators during the 2012 summer (TN Department of Education, 2014b). In 2013, 700 additional coaches were hired to conduct further training. Peer-led trainings were also offered for administrators through Leadership Coaches.

In addition to the development of the standards and professional development, an appropriate assessment for the CCSS must follow. As part of the Race to the Top competition, the U.S. Department of Education has awarded two groups of states grants to develop a new generation of tests: Partnership for Assessment of Readiness for College and Careers (PARCC) and the SMARTER Balanced Assessment Consortium (SBAC) (U.S. Department of Education, 2010). These grants of $170 million for PARCC and $160 million for SBAC are for developing new tests that will move beyond the exclusive use of simple bubble-answer questions and will be aligned to CCSS for grades three through eight (U.S. Department of Education, 2010). The state of Tennessee is a founding member of PARCC.

The PARCC assessments, based on the CCSS, for grades three through eight include four components: two required summative and two optional non-summative assessments (PARCC, 2014b). The two summative components consist of a Performance-Based Assessment (PBA) administered after approximately 75% of the school year and an End-of-Year Assessment (EOY) administered after approximately 90% of the school year (PARCC, 2014b). The optional, non-summative assessments exist to provide additional progress-monitoring measures to help inform instruction. The PARCC assessments were to be ready for computer-based administration in the

2014-2015 school year and include a range of item types: innovative constructed response, extended performance tasks, and selected response (PARCC, 2014b). However, Tennessee announced in April 2014 the state would not use PARCC in 2014-15 as originally planned but would continue to administer TCAP for that school year. This may further add to the changes and uncertainties felt by Tennessee teachers.

In preparation for the originally planned PARCC implementation year, Tennessee is one of several states adjusting current state assessments to be more aligned with CCSS (National Governor's Association, 2014). As previously described, Tennessee removed SPIs and corresponding state test items not aligned with CCSS. Additionally, Tennessee added a series of Constructed Response Assessments (CRAs) administered multiple times per year to prepare students and teachers for the expectations of CCSS (National Governor's Association, 2014). In the initial year of the CRA tests, teachers were asked to score and submit a portion of scores to the state department; the highly-involved process of scoring tests of a constructed response nature added considerable time and potential stress to teachers' current workloads.

In addition to the extra work required of teachers to implement new standards, stress can also manifest from the pressure for students to perform on new assessments. Common Core State Standards have higher student expectations than most, if not all, former state standards. It is logical to conclude that a drop in the percentage of students scoring at or above proficiency will occur with the new implementation (National Governor's Association, 2014). Although not aligned with CCSS, the assessments associated with The Nation's Report Card can provide an approximation of how students will score on the new CCSS assessments. In 2013, a mere 27 percent of students in the median-scoring state nationally met or exceeded proficiency levels, whereas 71 percent of students in that same state scored proficient on state tests during the corresponding year (National Governor's Association, 2014, p. 7). This finding supports both that states can expect to see a drop in proficiency levels with the new standards assessments and that current state standards and assessments are not adequately preparing students for college and workforce success. Despite the indication that a drop in proficiency scores is expected, anxiety and concern for public opinion may be an additional side effect for teachers facing the new standards implementation. Qualitative research by Stauffer and Mason (2013) of 64 teachers from a major metropolitan district in the southeastern United States found many common stressors among teachers:

- Political and educational structures were mentioned by 91% of teachers and include administration, accountability pressure, lack of support, and public criticism.
- Instructional factors such as workload were also listed as a stressor by 91% of teachers.
- Student factors such as behavior, ability, and achievement levels were indicated by 67% of teachers.
- Parent and family factors including parent expectations, parental involvement, and home environment were listed as stressors by 63% of teachers.
- School climate factors such as school administrators, fellow teachers and staff, committees, and other duties additional to classroom planning and instruction were listed by 35% of teachers (Stauffer & Mason, 2013).

Anticipating stressors can help administrators be proactive in addressing issues in multiple ways such as providing reasons and data to support the reform, professional development, and resources (Stauffer & Mason, 2013). Insight into teachers' self-efficacy and outcome expectancy towards the CCSS implementation provides important information for policy makers and school leaders as teachers are at the forefront of the education system.

A final issue in relation to the new assessments associated with CCSS implementation is the move to computerized testing. There are benefits to computerized testing such as faster test results to both inform instruction and provide feedback from summative assessments. However, updating school and district technology capabilities may present a challenge. Not only do districts, schools, and teachers need to be concerned about having enough technology to conduct testing, they must also ensure students have the capability and comfort level to perform well when tested on computer format. Technology is an integral part of today's society, and both students and teachers need to possess an adequate level of technological proficiency. However, not all schools have equal access to technology. Some schools and districts may not have had the technology in the past or may have the technology, but no computer or technology teacher to help instruct students on proper use. In such cases, again, the extra work and responsibility falls upon the classroom teacher. It is important to understand teacher efficacy towards these transitions and responsibilities to make maximum educational progress.

Research on Tennessee Teachers and the CCSS Transition

A 2012 analysis of CCSS in comparison to various states' standards placed Tennessee in the second of five tier groups, with tier one states' current standards being the most congruent with CCSS. Further, Schmidt and Houang (2012) found most states to have a positive association between CCSS congruence and National Assessment of Education Progress (NAEP) scores (Schmidt & Houang, 2012). Although Tennessee, along with 12 other states, did follow this trend, these 13 states were performing at a lower level according to National Assessment of Education Progress (NAEP) scores (Schmidt & Houang, 2012). In 2013, 40% of Tennessee fourth graders and 27.5% of Tennessee eighth graders scored proficient or higher on NAEP (U.S. Department of Education, 2014b). Initially, Schmidt and Houang (2012) ranked Tennessee standards 15th nationally for congruence with CCSS. However, after state-selected proficiency cut points were taken into account, Tennessee was re-ranked 49th (Schmidt & Houang, 2012).

The discrepancy between state proficiency cut-offs highlights an argument for the transition to CCSS which would allow for more cross-state consistency.

In attempts to support the transition to CCSS, the Tennessee Department of Education has offered a series of trainings for teachers and administrators (Pepper, Burns, Kelly, & Warach, 2013). As previously stated, these trainings began with mathematics as 200 teachers were selected, trained, and paid a stipend by the state to be Core Coaches and train a combined 13,000 Tennessee teachers and administrators during the 2012 summer (Pepper et al., 2013; TN Department of Education, 2014b). The following year, 700 additional coaches were hired and 30,000 educators received training in the summer of 2013 (Pepper et al., 2013; TN Department of Education, 2014b). With a large financial investment in these trainings, $3.2 million just for the summer 2012 trainings, Tennessee has done some evaluation of the effects on teachers. However, additional research in the current state of teacher attitude and self-efficacy towards CCSS can help inform administrators regarding areas teachers are still concerned about and factors effecting teacher self-efficacy.

To assist in Tennessee's transition to CCSS, the state implemented the Core Coach training model "to develop a network of teachers with a deep content and pedagogical knowledge of the Common Core Content Standers for Mathematics and Standards for Mathematical Practice who could then pass the knowledge on to their peers" (TN Department of Education, 2013a, p. 3). Competitively-selected Coaches attended an eight-day training by the Institute for Learning and subsequently trained other teachers in three-day TNCore summer workshops (TN Department of Education, 2013a). The training was intended to be transformative through learning experiences, such as engaging with student work samples, designed to challenge trainees' current thinking and potentially transition to new beliefs (TN Department of Education, 2013a). A benefit to the Core Coach training model is that Coaches are able to further assist their home schools and districts as well as be contacts for summer participants to provide support long after the three-day workshops (TN Department of Education, 2013a). Training a network of teachers to peer-lead workshops allowed Tennessee to reach a large number of teachers. According to the 2013 First to the Top Survey of Tennessee teachers, an impressive 92% of teachers reported receiving some sort of Common Core training whereas a 2013 national survey of edweek.org users indicated only 71% of teachers reported receiving some sort of Common Core training (Editorial Projects in Education Research Center, 2013; Pepper et al., 2013).

Conducting the CCSS professional development trainings in Tennessee did not come without cost. From July 1, 2011, to June 30, 2012, over $172,000 of Tennessee's Race to the Top grant money was spent on CCSS professional development and over $6 million was spent the following year (U.S. Department of Education, 2014b). With high expenditures, research in the effect of these trainings on teacher observation and Tennessee Value-Added Assessment System (TVAAS) scores was conducted. Both TNCore training participants and Coaches made significant increases in teacher observation scores assessing instructional practices and in TVAAS student gain scores, with Coaches displaying the greater gains even when controlling for environment and past performance (TN Department of Education, 2013a). Tennessee also exceeded its 2012-2013 Race to the Top targets in grades three through eight as well as high school mathematics (U.S. Department of Education, 2014b). However, when teacher characteristics were taken into account, position as a Core Coach was no longer associated with increased effectiveness, indicating that those selected as coaches may have already been on a path of increased effectiveness prior to coaching (TN Department of Education, 2013a). Although the cost of the 2012 summer training was about $3.2 million, Tennessee estimates the benefit, as measured by projected increase in student lifetime earnings from standard deviation increases in student learning, to be about $108 million (TN Department of Education, 2013a). Subsequently, the statement was included that these numbers "are just estimates and should be interpreted with caution" (TN Department of Education, 2013, p. 11).

While Tennessee is taking a proactive approach to the CCSS transition, it is important to consider more than student achievement and teacher evaluation effects. Thus, the current study on teachers' self-efficacy towards CCSS in East Tennessee can help further inform administrators and policy-makers about where to focus transition efforts in Tennessee. The 2013 Race to the Top Survey provides some overarching data on teacher perceptions of the impact of CCSS. A Race to the Top Survey had approximately 27,000 Tennessee teachers respond to survey questions regarding Common Core training and the potential impact on learning (Pepper et al., 2013). Of those surveyed, 70% of teachers indicated Common Core will require them to change how they teach (Pepper et al., 2013). This is consistent with a large-scale, national study that found 71% of middle school teachers think CCSS has/will require them to change their teaching practice (Bill & Melinda Gates Foundation & Scholastic, 2013). Further, it was reported that a majority of teachers agree the transition to Common Core will improve their teaching (Pepper et al., 2013). Although 53% is a majority, it also indicates that almost one out of every two teachers does not agree that transitioning to Common Core will improve his or her teaching. This is cause for concern as research indicates teachers need to be on board for reform to be effective (Lawrenz, Huffman, & Lavoie, 2005; Lee et al., 2011). From additional survey questions of those teaching a Common Core subject, 63% agreed that CCSS would improve their teaching (Pepper et al., 2013). Overall, 52% of Tennessee teachers surveyed agreed, and 8% strongly agreed that moving to CCSS will improve student learning, with agreement percentages decreasing with years' teaching experience (Pepper et al., 2013). This view is slightly more negative than two large-scale national studies: "The MetLife Survey of the American Teacher:

Challenges for School Leadership" and "Primary Sources: America's Teachers on Teaching in an Era of Change" that found 69% and 72%, respectively, of educators agree or strongly agree CCSS will have a positive effect on student learning (Bill & Melinda Gates Foundation & Scholastic, 2013; Markow, Macia, & Lee, 2013).

While Pepper et al. conducted a 2013 study on Tennessee teachers' perceptions of CCSS, there is a need for further study to support the validity of the results. First, the opinion questions included in Pepper et al.'s study did not have a neutral response option such as "neither agree nor disagree" or "neutral." In this design, participants are forced to commit to an option even when they may not really have one (Croasmun & Ostrom, 2011). Offering a neutral response could potentially reduce response bias or the likelihood of one response being chosen over another (Fernandez & Randall, 1991, as cited in Croasmun & Ostrom, 2011). The availability of a neutral response option has been shown to affect data; however, controversy remains over the preference of using or omitting the option (Croasmun & Ostrom, 2011). Conducting additional teacher perception research such as the current study can help corroborate or provide cause to question previous survey results. The inclusion of additional covariates including teacher background training and teacher efficacy as exist in the study described in this paper can also further add to current literature on Common Core and standards reform in general.

Theoretical Framework and Related Research

Change is not easy. Effective educational reform, including standards-based reform like the transition to Common Core State Standards (CCSS), needs the support of teachers as they are at the forefront of instruction. Thus, it is important to understand teacher attitude towards the reform as well as factors affecting teachers' effort and persistence in implementing reform. This study on teacher efficacy towards the Common Core transition and teacher background training can further contribute to literature in teacher efficacy during a time of innovation and reform as it relates to teacher content knowledge as well as increase understanding of teachers' views on CCSS. Education must continually adjust to keep pace with the evolution present in society. An increased understanding of teachers during times of change and factors affecting teacher efficacy can help improve current and future reform efforts.

Teacher Efficacy

According to Albert Bandura, teacher efficacy is comprised of two factors: personal self-efficacy and outcome expectancy (Newton et al., 2012). Bandura (1983; 1977) states self-efficacy and outcome expectancy are different; the current study employs a teacher efficacy instrument that assesses both, the MTEBI. Action and behavior are induced when people both believe in their ability to exhibit a behavior, self-efficacy, and believe the results of the behavior to be desirable, outcome expectancy (Enochs & Riggs, 1990). Bandura further adds that analyzing multiple forms of self-efficacy has a greater chance for increasing understanding of "self-referent thought" than expectancy (Bandura, 1986, p. 364). This study will include both aspects of teacher efficacy, but will maintain a greater focus on personal or self-efficacy than outcome expectancy.

Gaining an understanding of teachers' self-efficacy towards implementing CCSS is important as research has shown teachers with high self-efficacy to be more likely to implement innovations in the classroom (Guskey, 1988 as cited in Gür, Çakıroğlu, & Çapa Aydın, 2012). Further, teachers who see an innovation as advantageous for helping them become effective educators are more open to the change and willing to persist in light of setbacks (McKinney, Sexton, & Meyerson, 1999). Teachers with high self-efficacy tend to be more optimistic, willing to take on challenges, and are more likely to take personal responsibility for performance rather than attribute outside factors such as resources (Ware & Kitsantas, 2007). Understanding teacher attributes and characteristics as they relate to Tennessee's transition to CCSS can provide information on which teachers are transitioning well and how to help improve the transition for others.

The current study is based on Bandura's concept of self-efficacy which, put simply, is one's judgment about how effectively he or she can deal with a situation (Bandura, 1983). Bandura (1977) stated, "An efficacy expectation is the conviction that one can successfully execute the behavior required to produce the outcomes" (Bandura, 1977, p. 193). Although some of Bandura's research is in psychotherapy, it is generalizable to other psychological phenomena such as behavioral choices and regulation of effort in activities with potential for unfavorable effects (Bandura, 1977). Efficacy is more than just knowing what to do; self-efficacy is an individual's judgment of his or her ability to execute the actions needed to deal with potential situations (Bandura, 1982). Self-efficacy is based on self-perception rather than actual competence (Tschannen-Moran et al., 1998). Self-efficacy stems from four sources:

- Performance accomplishments have a strong influence on efficacy because they are built on mastery experiences (Bandura, 1977). Mastery experiences are important as resiliency of self-efficacy is built through overcoming obstacles with perseverance (Bandura, 2012).
- Vicarious experiences or social modeling is seeing others similar to oneself succeed in a particular situation, which can influence self-efficacy, but generally to lesser degree than person experience(Bandura, 1977, 2012).
- Verbal persuasion is the use of suggestion to lead someone to believe they can cope with a situation (Bandura, 1977). Although people tend to persevere more when persuaded to believe in themselves, verbal persuasion does not have as strong an influence on self-efficacy as mastery experiences (Bandura, 1977, 2012).

- Physical and emotional states can influence self-efficacy; self-efficacy can be strengthened by building physical strength, improving one's understanding of physical and emotional states, and reducing anxiety and depression (Bandura, 2012).

Much research has been conducted on self-efficacy in educational settings, but none could be found in relation to teaching self-efficacy of Common Core standards. Although some generalizations can be made using past research, it is important to empirically investigate teacher self-efficacy with relation to Common Core as the change that comes with reform can alter one's perception of instructional effectiveness. When something new is added, teachers may be able to apply past teaching successes to their teaching confidence but will also need to build their own mastery experiences specifically with CCSS.

Recent research supports Bandura's notion that mastery experiences are a significant factor affecting teachers' self-efficacy (Chang, 2010; Gür, Çakiroglu, & Aydin, 2012). There has been relatively little research conducted on raising inservice teacher efficacy, partly because Bandura's concept of self-efficacy is thought to most impact novice individuals engaging in new learning (Swackhamer et al., 2009). Some researchers maintain that once efficacy is established, it is resistant to change (Swars, Smith, Smith, & Hart, 2009). However, the transition to CCSS provides a unique opportunity to look at the efficacy of teachers that are truly new to the profession as well as seasoned teachers who are new to Common Core. During case study research of early CCSS implementers, Cristol and Ramsey (2014) cite a Metro Nashville Public Schools, Tennessee teacher as stating, "All our teachers feel like they're first year teachers right now" (Cristol & Ramsey, 2014, p. 18). Other teachers in this same case study expressed similar thoughts, including feeling overwhelmed at the need to find, rewrite, and implement new lessons that correlate with CCSS (Cristol & Ramsey, 2014). Through increasing understanding of teacher self-efficacy towards CCSS, schools can better help teachers through the transition as research by Prusaczyk and Baker (2011) suggests, anxiety may be reduced with increased math and math instruction efficacy.

Self-efficacy affects many behavioral traits important to teaching including motivation, perseverance in the face of difficulty, setting and reaching goals, expectations, effort, and perception of factors responsible for successes and failures (Bandura, 2012; Oakes et al., 2013). People are inclined to avoid situations that exceed their coping skills (Bandura, 1977). Conversely, people will be more inclined to act if they feel they can complete an act (self-efficacy), and if they believe that act will produce the desired result (outcome expectancy) (Enochs & Riggs, 1990). Further, the stronger a person's self-efficacy, the more he or she will persist against obstacles or negative experiences, and those who experience setbacks but detect progress increase self-efficacy (Bandura, 1977); this persistence is vital during reform implementation.

Several research studies have examined characteristics associated with and factors affecting teacher efficacy. Teacher empowerment in standards implementation has been found to be positively correlated at a low to moderate level with teaching self-efficacy, personal teaching efficacy, and outcome efficacy (Edwards et al., 2002). Teaching self-efficacy is the belief that "teachers can make a difference," personal teaching efficacy is the belief that "I can make a difference," and outcome efficacy is the belief that "I can make a difference with this student" (Edwards et al., 2002, pp. 72-73). Many factors have been indicated as influencing teacher self-efficacy including curriculum materials and resources, government policies, attitudes and actions of colleagues, administrator dispositions and practices, teaching experience, student mathematics achievement, teacher collaboration, and mathematics education programs (Amankonah, 2013).

Efficacy also influences teachers' commitment to the profession. In a large, national study (n=3,060 for factor analysis; n=26,257 for multiple regression), Ware and Kitsantas (2007) found 18% of the variance in commitment to teaching to be explained by three factors: Teacher Efficacy to Enlist Administrator Direction, Collective Efficacy: Teacher's Influence on Decision Making, and Teacher Efficacy for Classroom Management (Ware & Kitsantas, 2007). These results suggest commitment to teaching was enhanced by teachers' belief in efficacy to "(a) enlist the support of their principals, (b) influence policies at their schools, and (c) control their instruction" (Ware & Kitsantas, 2007, p. 309). The aforementioned studies indicate teachers need to feel valued, involved, and exercise some control to have high teaching-related efficacy.

In addition to perceptional factors, studies have been conducted to include investigation of correlations between efficacy and demographics. Moore and Esselman (1992) found elementary teachers generally reported higher levels of personal and teaching efficacy when compared to middle and high school teachers. Additionally, a significant inverse relationship was found between personal efficacy and educational attainment ($p < .012$) and perception of positive school environment and educational attainment ($p < .034$) (Moore & Esselman, 1992). Higher educational degrees have also been associated with higher levels of emotional exhaustion and depersonalization of teaching (Oakes et al., 2013). The field of study was not included in these reports; further study is warranted to investigate the relationship of teaching training/knowledge and content training/knowledge with relation to efficacy. Moore and Esselman's (1992) study unveiled many interesting findings including finding no significant changes in 1,802 Kansas teachers' level of efficacy over a five month study period, which potentially contradicts Bandura's (1977) notion that efficacy is not static (Moore & Esselman, 1992).

The inverse relationship noted in Moore & Esselman's 1992 study is alarming as there are often monetary incentives associated with advanced degrees with the assumption that higher degrees equal more qualified, more effective educators. Additionally, a Norwegian study of 264 teachers grades one through ten found a negative relationships between perceived collective teacher efficacy and years in the teaching profession ($\beta = -.23$), conflict with other teachers ($\beta = -.18$) and those who felt forced to organize their teaching in a less than optimal manner ($\beta = -.14$) (Skaalvik & Skaalvik, 2007). The negative relationship of collective teacher efficacy and years in the teaching profession is of particular concern as it implies that the longer teachers are in the profession, the lower their faith in education. Unfortunately, years' experience was also found to be negatively related to motivating students ($\beta = -.14$), coping with changes and challenges ($\beta = -.28$), and cooperating with colleagues and parents ($\beta = -.15$) (Skaalvik & Skaalvik, 2007). Studying inservice teachers is of great importance in the transition to Common Core State Standards (CCSS) as the current study highlights that seasoned teachers may not be as adept in adjusting to reform. Preserving and enhancing inservice teacher self-efficacy is important as Skaalvik and Sklaavik (2007) found teacher self-efficacy and teacher burnout to be strongly and inversely correlated (ranging from $\beta = -.32$ to $\beta = -.40$).

Gür, Çakiroglu, and Aydin (2012) found many factors such as gender, subject taught, and years' experience not to be significantly related to efficacy for instructional strategies, classroom management, and student engagement. Guskey (1988) also found grade level taught and years' experience did not have a significant relationship to perceptional and attitudinal variables. Conversely, a Tiawanese study of 282 elementary science teachers found that teachers with eleven or more years teaching experience had higher levels of personal teaching efficacy and outcome expectancy when compared to teachers with ten or fewer years' experience according to the science version of the instrument used in the current study (Liu, Jack, & Chiu, 2008).

Interestingly, the same study also found outcome expectancy significantly predicted personal science teaching efficacy ($\beta = .722$, $p < .000$) and attributed 52% of the variance to the effect of outcome expectancy (Liu et al., 2008). Although there have been some mixed indications, this research is based on the idea that efficacy tends to be situational and context-specific (Bandura, 1982; Edwards et al., 2002; Tschannen-Moran et al., 1998). For this reason, research in teaching efficacy and Common Core is vital. Further, student achievement is also affected by teacher efficacy. Research indicated, “more efficacious teachers generally liked teaching more and expressed greater confidence in their teaching abilities” (Guskey, 1988, p. 67). Moore and Esselman (1992) found student achievement rates of high self-efficacy teachers greater by three months compared to low self-efficacy teachers.

Teacher efficacy is an important consideration during educational reforms such as the transition to CCSS. Greater efficacy leads to greater effort and persistence, which increases performance, which increases efficacy, and restarts the efficacy-building process (Tschannen-Moran et al., 1998). “Over time this process stabilizes into a relatively enduring set of efficacy beliefs” (Tschannen-Moran et al., 1998, p. 234). However, challenges such as reform can cause teachers to reevaluate their efficacy, and the initial implementation of change has been found to have a negative influence on teacher self-efficacy (Tschannen-Moran et al., 1998). Teachers with high self-efficacy tend to be more optimistic, willing to take on challenges, and take personal responsibility for their performance (Ware & Kitsantas, 2007). In agreement, Cerit’s (2013) Turkish study on moving towards student-centered instruction led researchers to conclude efficacy for student engagement, efficacy for instructional strategies, and efficacy for classroom management had a significant, positive relationship with teachers’ willingness to implement reform. “All reforms, especially curriculum reforms, required significant changes in routine behaviors of teachers and need for new methods and understanding by teachers in performing teaching activities” (Cerit, 2013, pp. 255-256). While CCSS is a standards-based reform, new curriculum will also be necessary with the transition. The culture of the school and teachers plays a vital role in implementing innovation (Cerit, 2013). Teacher and collective efficacy can be enhanced through organizational support, staff collaboration, and provisions and training of resources (Chester & Beaudin, 1996, as cited in Ware & Kitsantas, 2007).

In addition to affecting teachers, teacher self-efficacy has also been studied for its effect on student achievement. A 2012 study of high school English teachers in Iran found a positive, moderate correlation (r = .446) between teacher self-efficacy and student motivation (Mojavezi & Tamiz, 2012). Further, a one-way ANOVA supports that higher teacher self-efficacy is associated with higher student achievement as post hoc tests revealed students of teachers with higher self-efficacy had significantly higher achievement (Mojavezi & Tamiz, 2012). Another 2012 study conducted with high school students and teachers in Pakistan also found a positive correlation between teacher self-efficacy and student achievement with a Pearson’s r value of .713 at a .002 significance level for math and .906 at a .000 significance level for English (Khan, 2012); positive correlations were seen across genders and rural and urban settings in Khan’s study.

Despite the aforementioned research supporting the positive effect of teacher self-efficacy on student achievement, these results are not consistent across all studies. A 2010 study of six school districts in the Mississippi Delta found no significant relationship between teacher self-efficacy and language arts or mathematics achievement for students in grades three through eight on the Mississippi Curriculum Test (MCT2) (Towner, 2010). Further, Davis-Langston’s 2012 study of students in grades three through five in 16 Georgia elementary schools did not find a statistically significant relationship between teacher self-efficacy for teaching mathematics and student performance in mathematics on the 2010 Georgia Criterion-Referenced Competency Test

(Davis-Langston, 2012). Finally, Fox's 2014 study found no significant correlation (r =.026) between student achievement on the end of course Algebra 1 exam for both middle and high school students (Fox, 2014). While there is some discrepancy among research studies, it appears that high teacher self-efficacy is either associated with no statistically significant difference in student achievement or is positively associated with higher student achievement; no instances of a negative relationship were found. Further research in self-efficacy may provide more insight into a variety of effects for teachers, students, and learning.

Studies addressing teacher efficacy and Common Core are very limited and consist primarily of case studies. Wilborn (2013) used qualitative case study method to investigate teacher attitude towards the critical thinking, collaboration, communication, and creativity of Common Core using the 21st century learning framework. Wilborn (2013) included self-efficacy in the study but found metacognitive processes difficult to deduce into concrete terms. In case study research by Sheppard (2013), three teachers reported no change in their teaching efficacy because how they taught did not change with the implementation of CCSS; however, the researcher noted uncertainty in the responses of these teachers (Sheppard, 2013). Inconsistency existed in teacher-reporting of perceived change in teaching efficacy as one teacher felt she was a less effective teacher after the implementation of CCSS, while two others reported an increase in teaching efficacy with the reform (Sheppard, 2013).

A high level of self-efficacy was also found in most participants in case study research conducted mid-year of the initial CCSS implementation year in a parochial middle school (Mazze, 2013). Similar to research by Sheppard (2013), Mazze (2013) reported teachers perceived little to no change in their instructional approach or student learning with the implementation of CCSS. While case study research can provide important information on teacher views of the transition to CCSS, generalizability is limited. Quantitative studies such as the research conducted in the current study can help address these issues with larger sample sizes and standardized measurements.

Teacher Background and Content Knowledge

Middle school (grades 6-8) mathematics teachers' efficacy during the transition to Common Core State Standards is worthy of study for multiple reasons. First, in comparison to elementary and high school, "much less is known about middle school teachers and students" (Hill, 2007, p. 96). Some middle school teachers are specifically trained and certified for middle grades; others may have been trained for elementary or high school (Hill, 2007). Teachers with secondary certifications are required to have training in their subject as well as specific pedagogical techniques training whereas elementary teachers are content generalists (Curran Neild, Nash Farley-Ripple, & Byrnes, 2009). According to the 2011 Trends in International Mathematics and Science Study (TIMSS) of U.S. eighth grade mathematics teachers,

- 62% have post graduate degrees,
- 28% have majors in both mathematics and mathematics education,
- 25% have majors in mathematics education, but not mathematics,
- 15% have majors in mathematics, but not mathematics education, and
- 31% have majors in other fields (Mullis, Martin, Foy, & Arora, 2012).

With various school grade configurations, qualification requirements, and certifications, "it is not surprising that the middle grades in the United States are currently staffed by teachers who represent a hodgepodge of teaching credentials" (Curran Neild et al., 2009, p. 733).

Studies have varied in methods used to assess content knowledge such as number of college courses or course hours in mathematics, college majors, teacher certification exam scores, and teaching content knowledge questionnaires. Accordingly, the results of these studies are also mixed. Jepson's (2005) study found teacher education and certification to have no significant impact on mathematics achievement of first and third grade students. Surprisingly, this study also found teacher enthusiasm to be negatively related to mathematics achievement (Jepsen, 2005). Different results have been found with students at the middle school level. Curran Neild (2009) found secondary teacher certification had a positive, but non-significant effect on middle school students' mathematics achievement. Further, Goldhaber and Brewer (1997) analyzed data from the large scale (24,000 eight graders, 18,000 resurveyed as tenth graders) National Education Longitudinal Study of 1988 to find holding a master's degree to have a negative but non-significant effect on student achievement, while teachers with a bachelor's or master's degree specifically in mathematics had a significant, positive association with student mathematics scores.

When looking specifically at teacher content knowledge measures, teachers with mathematics backgrounds and experience and certification in high school mathematics tend to score higher (Hill, 2007). Elementary teachers with generalist credentials do not tend to score as well, which is logical as elementary experience and credentials are less related to teacher content knowledge (Hill, 2007). This is of concern as middle school teachers are expected to be more knowledgeable in their specialized content area than lower grades teachers who teach all subject areas. To support the expectation of higher content knowledge for middle grades teachers, data from a national sample revealed close to 95% of middle school teachers did not teach in a self-contained environment (Hill, 2007). Hill's 2007 study also found years' experience to be positively linked to higher scores on content knowledge assessments, and this trend was not limited to improvements in the first few years teaching (Hill, 2007). Further, research has indicated teachers with training to teach high school are also more prepared to teach middle school mathematics (Hill, 2007). This has the potential to create learning gaps between middle school students instructed by elementary generalists compared to those with specific training in mathematics. Of further concern are the related statistics for high poverty and high minority middle schools; these schools were found to have less experienced teachers, a higher percentage of middle school mathematics teachers who were formerly elementary educators, and fewer middle school mathematics teachers who possess mathematics credentials (Hill, 2007).

Teacher content knowledge for teaching mathematics is of importance as Hill, Rowan, and Lowenberg Ball (2005) found it to be a significant predictor of student gains. Teachers need to be able to do more than just calculate; they “also need to know how to use pictures or diagrams to represent mathematics concepts and procedures to students, provide students with explanations for common rules and mathematical procedures, and analyze students’ solutions and explanations” (Hill et al., 2005, p. 372). In an educational setting, content knowledge can be broken down into two subdivisions according to Hill (2007). Common content knowledge (CCK) refers to teachers’ ability to solve mathematics problems. Specialized content knowledge (SCK) is the ability to break down problems into different representations and provide explanations in a grade-level-appropriate manner and tends to be more of a challenge for teachers than simple CCK (Hill, 2007). Additionally, mathematics teacher preparation including content and methods courses positively predicted third grade students’ achievement, but at a slightly less than significant level (p =.06) (Hill et al., 2013). CCK and SCK have been found to be highly correlated at .79 (Hill, 2007). A questionnaire measuring SCK might include items that ask teachers to evaluate non-standard solutions. An example of a question to measure SCK would be to show three methods for solving two-digit by two-digit multiplication problems and ask teachers to evaluate whether each method would work for all two-digit by two-digit multiplication problems (Hill et al., 2005).

Measuring content knowledge in this manner can increase the difficulty in executing research, as it will require more time and effort for participants to answer a questionnaire including these types of questions in comparison to simple questions of background and training. Hill (2007) suggests teachers need to complete 15 to 30 content problems for a reasonably reliable measure of subject matter knowledge. Many studies do not have this accurate, functional measure of teacher knowledge and rely on more simplistic, weaker measures (Hill et al., 2005). There is room for literature to be added to all aspects of teacher content knowledge, but is important for researchers to clarify the measurement of content knowledge. Content knowledge is of particular interest with relation to CCSS mathematics implementation as numerous teachers within case study research on early CCSS implementers indicated, "The standards' emphasis on going deeper in math content, versus "mile-wide-and-inch-deep" coverage, means teachers sometimes reach the limits of their own knowledge" (Cristol & Ramsey, 2014, p. 18). With the increased emphasis on conceptual understanding, teachers must be able to discuss and redirect various student interpretations, helping them not only get to the correct answer, but also to be able to explain it. Increases in depth of knowledge requirements warrants the inclusion of teacher content knowledge effects in CCSS research.

Reform

Both efficacy and content knowledge can change with reform. The transition to Common Core State Standards (CCSS) is a standards-based reform, which for many teachers will require adjustments to curriculum, content taught, and teaching practices. "Standards-based reform has a process-driven concept of educational change that explicitly links schooling and policy to student outcomes" (Lawrenz et al., 2005, p. 2). Successful implementation is not easy. The current study on teacher efficacy and attitude towards CCSS can inform and aid the process of current and future educational reform as teachers are on the frontline of reform implementation. Teachers need a sense of ownership in educational change; it cannot effectively be forced from the top-down (Lawrenz et al., 2005).

Although CCSS are clearly stated to be standards or learning targets rather than a prescribed curriculum, standards and curriculum are closely linked. Therefore, research in both areas of reform are applicable to this study. Stauffer and Mason (2013) state, "Considering the feasibility and appropriateness of curriculum changes based on district or school data, as well as including teachers in the adoption process, is key" (Stauffer & Mason, 2013, p. 827). Doyle and Ponder (1977, as cited in Gusky, 1988) suggest three criteria influencing teacher decision to implement recommended practice:

- Instrumentality- clarity and specificity of presentation of practices;
- Congruence- the alignment of new practice to current practice; and
- Cost- teacher ideas on the extra time and effort required by the new practice in comparison to its benefits (Guskey, 1988).

Understanding and anticipating stressors during reform can help administrators be proactive to address issues and aid implementation (Stauffer & Mason, 2013). Effective proactive administrative actions may include presenting reasons and data to support the reform and resources and professional development to support implementations (Stauffer & Mason, 2013).

Some teachers will react more positively and be more willing to implement reform than others. High efficacy teachers may see a challenging task as something to be mastered rather than avoided, whereas, low efficacy teachers are less willing to take on challenges (Nie, Tan, Liau, Lau, & Chua, 2013). Brenner (2013) found total teacher efficacy to be significantly and positively (r = .22, p = .001) related to teacher attitudes towards change . A Singapore reform study found teacher efficacy to be a significant predictor of constructivist (innovative reform) instruction, explaining 39% of the variance (Nie et al., 2013). Further, research has shown more efficacious teachers to view innovative instructional practice as more in line with current practice and more important to implement (Ghaith, 1997; Guskey, 1988). However, research has also indicated efficacious teachers do not view the cost of implementation differently from low efficacy teachers (Ghaith, 1997; Guskey, 1988). In Guskey's (1988) study more efficacious teachers viewed innovative practices as less difficult to implement (r = -33). However, Ghaith and Yaghi (1997) found no significant difference in teachers' view of difficulty of innovative implementation based on teacher efficacy. Interestingly, Ghaith and Yaghi (1997) also found less experienced teachers rated an innovative practice as more similar to current practice and less difficult, but more important to implement when compared with more experienced teachers.

Exploring teacher efficacy and attitude is a continuous process as attitudinal and perceptional variables are not fixed and can vary with time and context (Bandura, 1982; Edwards et al., 2002; Tschannen-Moran et al., 1998). A longitudinal replication study of high school curriculum reform in Australia found in both the initial and follow-up studies as teacher understanding of what was required by the reform increased, self-efficacy decreased for both new ways of teaching and using technology as needed to implement the new curriculum (McCormick & Ayres, 2009). However, Stauffer and Mason (2013) found teachers indicated self-efficacy of a new curriculum increased with more use, as did teachers' ability to cope with the stress of implementation.

Gaining an understanding of teacher perception and efficacy towards teaching CCSS is important as teacher willingness to implement new practices is a key factor in educational improvement (Ghaith, 1997). Teachers are more likely to commit to reform if they view it positively (Lee et al., 2011). In a National Curriculum Reform study conducted in China, Lee et al. (2011) found primary teachers to have lower sense of empowerment, but they ranked higher on receptivity of the reform. Further, teacher empowerment did not have a significant effect on teachers' intention to implement the reform (Lee et al., 2011). However, receptivity did have a significant, positive effect on behavior intentions, with cost-benefit appraisal being the most significant predictor of intention to implement (Lee et al., 2011). Additionally, behavioral intentions and perceived outcome had a high, positive correlation ($r = .70$, $p < .01$) (Lee et al., 2011). Professional development and school support were shown to significantly predict perceived outcomes. Interestingly, decision-making had a significant, negative relationship with teachers' perceived outcomes ($\beta = -.16$, $p < .05$). The lack of or negative impact of teacher empowerment and decision-making contradicts Lawrenz et al.'s (2005) conclusions that teachers need ownership in reform, but it is important to note that Lee et al.'s (2011) study was conducted outside of the U.S. and cultural differences may have an influence on the contradiction of the studies. Additionally, Lee et al.'s (2011) suggestion that teachers may already be so busy that increasing involvement in the decision-making process will further detract them from their teaching duties may explain these views by teachers.

Professional Development

As with any reform, teachers need to be provided training and support for CCSS implementation. This is supported by Harris's (2012) qualitative study concluding that standards alone did not fix issues with varying student skills and engagement levels. Teachers in this study felt all students could be exposed to new, more rigorous standards, but were less confident that all students could master the standards (Harris, 2012). Transforming these teacher deficit beliefs must occur with standards-based reform to promote real change in schools (Harris, 2012). Teachers need continual training and support in areas such as understanding standards, implementing and differentiating instruction to help all students learn, and assessment strategies.

With little efficacy research involving inservice teachers, studies involving preservice teachers may be applicable. Plourde (2000) used the Science Teaching Efficacy Beliefs Instrument (STEBI) to find that student teaching did not significantly impact personal science teaching efficacy, but a decrease was found in outcome expectancy with this classroom experience (Plourde, 2002). Further, Hoy and Woolfolk (1990) found preservice teachers showed a decrease in general teaching efficacy [$t(58) = 1.74, p < .05$], but an increase in personal teaching efficacy [$t(57) = 5.74, p <. 01$] with student teaching experience. However, students in this study who were taking a methods course, but not student teaching, did not have a significant change in efficacy (Hoy & Woolfolk, 1990). Conversely, Dooley and Swars (2010) found that preservice teachers in a science teaching methods course had a significant increase in personal science teaching efficacy, but no change in science teaching outcome expectancy as measured by the STEBI –B (Dooley & Swars, 2010). Swars's (2009) study involving two courses on constructivist teaching methods showed students increased in both personal teaching efficacy and outcome expectancy, but only the change in outcome expectancy was significant. Further, students in the second course showed a significant increase in personal teaching efficacy; as students had more time to increase their comfort level with constructivist methods, their personal teaching efficacy increased (Swars et al., 2009). Although the coursework was found to increase outcome expectancy, a decrease occurred during student teaching, possibly due to overly optimistic initial expectations (Swars et al., 2009). Personal teaching efficacy remained constant during the student teaching experience (Swars et al., 2009).

In Tennessee, CCSS professional development has been conducted through peer-led TNCore training sessions as previously described. Those attending the TNCore trainings are then able to pass along the information to other teachers in their districts and schools, expanding the scope of the trainings. Understanding the effects of this and other professional development programs can help improve and inform future professional development offerings.

As with reform in general, teachers will also vary in receptivity to professional development offerings. Swackhamer et al., (2009) found teachers with high self-efficacy took more professional development courses to increase content knowledge and were motivated both professionally and personally to do so. Further, a significant difference in teaching outcome expectancy was found in teachers taking a high number of courses (4 or more) compared to teachers taking a low number of courses (3 or less) (t = -2.65, p =.01, d = .54); however, no significant difference was found with regards to personal teaching efficacy (Swackhamer et al., 2009). Long-term professional development programs can also be effective as Mintzes, Marcum, Messerschmidt-Yates, and Mark (2013) found participants in a 3-year science professional learning community (PLC) to show significant increases in personal teaching efficacy and outcome expectancy compared to a non-equivalent comparison group. The current study's investigation in the effect of TNCore mathematics trainings can investigate whether a similar effect is possible for mathematics trainings.

Professional development for reform is not effectively done in a one-session format. Obara and Sloan's (2010) study of a 5-day training on the effects of Georgia's Connected Mathematics project concluded that the training helped teachers with familiarization of material and served as an introduction to a new way of teaching; sufficient time is needed for teachers to understand standards, examine resources, evaluate student work, and try new approaches. Rimbey's (2013) study of the effects of a 50-hour CCSS workshop including predicting student difficulties in tasks, analyzing student work samples, study of standards for mathematical practices, discussions, and planning time for classroom implementation yielded positive results. Participants attending the 50-hour CCSS workshop showed significantly higher gains on the Learning Mathematics for Teaching instrument (p = .044) as well as the Knowledge of Standards instrument (p = .002) when compared to a control group not receiving treatment at that time (Rimbey, 2013).

Summary

Although all states adopted and assessed standards in accordance with the 2001 No Child Left Behind legislation, students graduating under these standards were found to still be lacking basic skills to be prepared for career and college (Common Core State Standards Initiative, 2014; TN Department of Education, 2014b). To further the argument that change was needed, Tennessee received an “F” in “Truth in Advertising” for student proficiency in 2007 by the U.S. Chamber of Commerce because a large percent of Tennessee students scored proficient on state tests, but significantly fewer scored proficient on the National Assessment of Educational Progress (NAEP) (TN Department of Education, 2014b). To address these issues, Tennessee worked with 30 states to align student standards for preparing students to be career and college ready as part of the American Diploma Project Network, and then joined efforts to create the Common Core State Standards (National Governor’s Association, 2014; TN Department of Education, 2014b). In a 2013 study by The Gates Foundation and Scholastic, 90% of Tennessee teachers indicated constantly changing demands on students and teachers as the one of the most significant challenges faced by teachers, which is higher than the national percentage (82%) (Bill & Melinda Gates Foundation & Scholastic, 2013). This further exemplifies the need for research in teacher perceptions of the transition to CCSS.

Teacher perceptions will vary, but gaining a better overall understanding of teachers’ views on CCSS is important for creating an effective environment for the transition. Some teachers will react more positively and be more willing to implement reform than others. Research has indicated teachers with high self-efficacy are more likely to view a challenging task as something to be mastered rather than avoided (Nie et al., 2013); conversely, teachers with low self-efficacy may be less willing to take on challenges. Further, Brenner’s (2013) research indicated teacher efficacy to be significantly and positively ($r = .22$, $p = .001$) related to teacher attitudes towards change .

Teacher efficacy research is not new to educational settings, but none was found relating self-efficacy and outcome expectancy to CCSS. Efficacy is more than just knowing what to do; self-efficacy is an individual's judgment of his or her ability to execute the actions needed to deal with potential situations (Bandura, 1982). This study builds on Bandura's concept of efficacy which states that self-efficacy can be affected by performance accomplishments through mastery experiences, vicarious experiences, verbal persuasion, and physical and emotional states (Bandura, 1977, 2012). Mastery experiences have the most impact on self-efficacy, and teachers need to experience success with CCSS to build their efficacy. Professional development can help teachers be more prepared for success.

Content knowledge is of particular interest with relation to CCSS mathematics implementation as numerous teachers indicated that with the greater depth of knowledge required by CCSS challenges or possibly exceeds some teachers' level of content knowledge (Cristol & Ramsey, 2014, p. 18). Teachers now must be able to do more than provide one standardized method for completing a type of problem; they must also be capable of discussing and redirecting various student interpretations. Students in turn are now required to not only get to the correct answer, but also to be able to explain their reasoning. Increases in depth of knowledge requirements warrants the inclusion of teacher content knowledge effects in CCSS research.

The state of Tennessee is working to aid the CCSS transition by training teachers to be peer-leaders in conducting professional development training. Making teachers active participants in the process may improve their opinion of and dedication towards the reform. In the summer of 2012, 13,000 teachers were peer-trained by 200 competitively-hired Core

Coaches (TN Department of Education, 2014b). The training was further expanded in 2013 with the hiring of an additional 700 coaches. These trainings consisted of multi-day workshops within teachers' designated regions. Trainees and coaches would then be available to further assist fellow teachers with CCSS instruction throughout the year.

Simply providing professional development does not ensure improvement. Rimbey's (2013) study of the effects of a 50-hours CCSS workshop of similar components to TNCore trainings yielded positive results (Rimbey, 2013). However, sufficient time is needed for teachers to understand standards, examine resources, evaluate student work, and try new approaches (Obara & Sloan, 2010). Summer TNCore trainings are two to three days, which may not be enough time for teachers to feel comfortable with the new standards. This training time will be even less for teachers who did not attend the official TNCore training, but received training at their home schools from fellow teachers who redelivered the content.

As previously described, CCSS alone will not be enough to make significant changes; teachers must be involved and on board with reform efforts to see results. Anticipating teacher stressors can help administrators be proactive in addressing issues and providing teacher support (Stauffer & Mason, 2013). Teachers are on the front line of instruction and ultimately educational success in Tennessee and the United States. An improved understanding of attitudes and self-efficacy towards the CCSS implementation provides important information for policy makers and school leaders.

CHAPTER THREE: METHODOLOGY

Mathematics proficiency is important for success in personal finance, higher education settings, general employment, and specialized careers, particularly in mathematics, science, and technology fields (Saffer, as cited in Burns, Kanive, & DeGrande, 2012; Mat Zin, 2009). Although some improvements in mathematics proficiency have been made, according to the National Education Center for Education Statistics' 2013 report, only 42% of fourth graders and 35% of eighth graders in the United States meet or exceed proficiency levels (The Nation's Report Card, 2013a). In attempts to further improve student preparedness to pursue higher education or enter the workforce, Tennessee, along with 43 other states as of April 2014, have adopted the Common Core State Standards (CCSS) (Common Core State Standards Initiative, 2014). Tennessee was in particular need of reform as the state was graded an "F" for "Truth in Advertising" about student proficiency by the U.S. Chamber of Commerce in 2007 because a large percent of TN students were reported as proficient on state tests, but significantly fewer scored proficient on the National Assessment of Educational Progress (NAEP) assessment (TN Department of Education, 2014b).

To aid in the transition to CCSS, Tennessee has offered a series of peer-led TNCore trainings in the standards. Teacher support is vitally needed for reform to be effective (Lawrenz et al., 2005; Lee et al., 2011). The current study investigated teacher efficacy with regard to teacher background training as measured by college course hours in mathematics and the number of days attending TNCore trainings. Additionally, the effect of the number of years teaching mathematics will be explored. Teacher background training is important to investigate with CCSS as case study research on early CCSS implementers suggests, participants indicated the increased rigor and depth of coverage in the standards sometimes resulted in teachers reaching the limits of their own knowledge (Cristol & Ramsey, 2014). Self-efficacy is important to investigate as it affects many behavioral traits important to teaching and the improvement of instructional practices (Bandura, 2012; Oakes et al., 2013). The stronger a person's self-efficacy, the more he or she will persist against obstacles or negative experiences (Bandura, 1977), which is inevitably a part of working through a period of reform. Chapter Three consists of the methodology used to execute this study. It includes the rationale for the design, research questions, hypotheses, setting, participants, instrumentation, procedures, and methods for data analysis.

Design

This is a correlation study based on survey data. Correlation is the most appropriate research design as the study is investigating a cause and effect relationship of multiple variables (Gall et al., 2007). A correlation design will allow for the degree of the relationship between variables to be determined (Gall et al., 2007). Specifically this study seeks to determine the effect of teacher background training on self-efficacy towards teaching CCSS mathematics in the middle grades. Furthering support for the use of a correlation research design, the researcher was unable to manipulate the independent variable, teacher background, preventing the researcher from employing an experimental design (Gall et al., 2007). Finally, the data collection meets the quantifiable requirement of correlation research (Gall et al., 2007). The independent variable, teacher background, will be measured on a continuous scale for the number of college course hours taken in mathematics and the number of TNCore mathematics training days attended. An additional independent variable, years of experience teaching mathematics, will also be measured on a continuous scale. Consistent with survey research, this study was based on self-report data (Daniel, 2010). The research is not purposed to intervene and measure change over time as in experimental research; rather, the research is based on teacher self-report data from one point in time (Daniel, 2010).

Research Questions and Hypotheses

Research Question 1: Does teacher background training in mathematics influence teacher self-efficacy towards teaching Common Core State Standards for mathematics in the middle grades?

Hypothesis 1: There will be no statistically significant correlation between teacher self-efficacy scores as measured by the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and the number of college mathematics course hours taken.

Hypothesis 2: There will be no statistically significant correlation between teacher self-efficacy scores as measured Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and the number of TNCore mathematics training days attended.

Hypothesis 3: There will be no statistically significant correlation between teacher self-efficacy scores as measured by the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and the number of years of experience teaching mathematics.

Research Question 2: Does teacher background training in mathematics influence outcome expectancy for teaching Common Core State Standards for mathematics in the middle grades?

Hypothesis 4: There will be no statistically significant correlation between outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument and the number of college mathematics course hours taken.

Hypothesis 5: There will be no statistically significant correlation between outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the

Mathematics Teaching Efficacy Beliefs Instrument and the number of TNCore mathematics training days attended.

Hypothesis 6: There will be no statistically significant correlation between outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument and the number of years of experience teaching mathematics.

Research Question 3: Does teacher self-efficacy influence teacher outcome expectancy towards teaching Common Core State Standards for mathematics in the middle grades?

Hypothesis 7: There will be no statistically significant correlation between teacher self-efficacy scores as measured by the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument.

Participants

Participants consisted of mathematics teachers in grades six, seven, and eight in the 21 school districts comprising the CORE East TN region, one of the eight CORE divisions in Tennessee. The region was selected as of interest to the researcher due to geographical proximity. The inclusion of all middle grades mathematics teachers in the region allowed for an increased sample size and reduced the likelihood of problems of small sample size due to a potentially low survey return rate. Including a representation across the East division also allows for greater generalizability for other regions and states compared to the inclusion of a single school district. As is important in correlation research, limiting the geographic area and grade levels taught allowed for a fairly homogeneous group of participants to reduce the likelihood of causal results being skewed by participant differences (Gall et al., 2007). As a quantitative study, this research employed surveys to collect data to make generalizations about a population (Gall et al., 2007).

Permission to conduct the study was first requested through the Liberty University Institutional Review Board (IRB). Following IRB approval, a letter requesting permission to contact school level administration and the survey to teachers was sent electronically to each school system superintendent or director of schools. A follow-up email was sent after approximately one week of no response from school district superintendents. The superintendent permission letter is located in Appendix C. One school district denied the researcher permission to survey teachers. Another school district only served students in grade kindergarten through fifth grade and was not included in the study. Eight school districts did not respond despite multiple contact attempts and were not included in the study. Eleven school district superintendents/directors of schools granted the researcher permission to contact principals and/or teachers and were included in the study. After approval was received to survey teachers within a district, a letter of permission and request for assistance was sent to school principals for distributing the survey to middle grades mathematics teachers. The mathematics coordinator/principal permission letter is located in Appendix D. Where superintendent/director of schools permission indicated approval and contact information was available, individual teachers were emailed by the researcher. Appendix E consists of the IRB approved recruitment and consent letter to teachers explaining the purpose of the study, time limit, assurance of confidentiality, and permission for survey data use implied by participant completion of the survey. This survey cover letter and link to the electronic version of the survey through SurveyMonkey® was sent to teachers through the district mathematics coordinators or school principals, unless otherwise approved by school district or school level administration. A two and a half week survey window was allowed with electronic reminders sent approximately nine days after the survey window opening. From communications received from teachers or principals who responded when asked for confirmation of receipt of the survey, it is estimated that 66 teachers received the survey link and 38 submitted a complete survey (57.58% response rate). One of those responses was eliminated due to an extreme response, assumed to be an error. Final participants included 37 teachers (56.06% response rate from estimated number of teachers who received surveys).

Setting

The teacher survey was administered electronically to teachers in the CORE East TN school districts in which superintendents granted permission to administer the survey. Teachers received the survey link through an email forwarded by their principal unless district administration indicated approval for direct teacher contact by the researcher. Teachers completed the survey within a two and a half week window at the location of their choice with internet access. The electronic survey was administered through SurveyMonkey®.

Instrumentation

The Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) was used to measure the dependent variable, teacher efficacy for teaching mathematics under CCSS. The MTEBI was developed by Enochs, Smith, and Huinker (2000) by modifying the Science Teaching Beliefs Instrument (STEBI-B) to tailor to pre-service elementary mathematics teachers. As the current study involves inservice teachers, the instrument was modified from future tense to present tense. The instrument was modified to be administered electronically through SurveyMonkey®. Written permission was granted for use of MTEBI by Dr. Larry Enochs (see Appendix A). In the survey cover letter, teachers were asked to complete the MTEBI with regards to their opinion on teaching CCSS, rather than the former Tennessee State Performance Indicators (SPIs).

MTEBI originally consisted of 23 items; however, two items were dropped as the item correlations were less than .30 (Enochs et al., 2000). The final version of MTEBI consisted of 21 items. Thirteen items comprise the personal mathematics teaching efficacy (PMTE) subscale: Item 2, Item 3, Item 5, Item 6, Item 8, Item 11, Item 15, Item 16, Item 17, Item 18, Item 19, Item 20, and Item 21. Eight items comprise the mathematics teaching outcome efficacy (MTOE) subscale: Item 1, Item 4, Item 7, Item 9, Item 10, Item 12, Item 13, and Item 14 (Enochs et al., 2000). Each item has five response options: Strongly Agree, Agree, Uncertain, Disagree, and Strongly Disagree (Enochs et al., 2000).

MTEBI scores are summative for each subscale in accordance with the following response values: Strongly Agree = 5, Agree = 4, Undecided = 3, Disagree = 2, and Strongly Disagree = 1 (Enochs et al., 2000). However, Item 3, Item 6, Item 8, Item 15, Item 17, Item 18, Item 19, and Item 21 were reverse scored to have scoring compatibility of positively and negatively worded items (Enochs et al., 2000). Scores range from 13 to 65 on the PMTE subscale and from 8-40 on the MTOE subscale (Enochs et al., 2000). The reliability, as measured by Cronbach's alpha was .88 for the PMTE and .77 for the MTOE (Enochs et al., 2000). Further, confirmatory factor analysis (CFA) supported that the PMTE and the MTOE were independent, which improves the construct validity of the MTEBI (Enochs et al., 2000).

Data for the independent variable, teacher background training, was gathered through teacher demographic questions included in the same electronic survey as the MTEBI. The full survey administered to teachers is located in Appendix B. Teacher background training was measured by the number of college course hours taken in mathematics and the number of TNCore mathematics training days attended.

In addition to collecting data for the dependent and independent variables and demographics, questions on teachers' overall opinion/attitude towards CCSS was included. This information was included and reported to provide a background for this study of the effect of teacher background training on self-efficacy towards teaching CCSS. However, it was determined that these responses were not needed or applicable in data interpretation, and thus were not used in this study. The full teacher survey can be viewed in Appendix B.

Procedures

Initial approval to conduct this research was granted through review by the Liberty University Institutional Review Board (IRB). The data collection for this study involved a non-sensitive subject matter survey with adult participants, and surveys cannot be linked back to individual teachers. Following IRB approval, a letter requesting permission to administer the survey to teachers was sent electronically to each school system superintendent/director of schools. A follow-up email was sent after approximately one week of no response from school district superintendents. The superintendent permission letter is located in Appendix C. After approval for permission to contact administrators and/or teachers within a district, a letter of permission and assistance request was sent to the district middle school mathematic supervisor or school principals unless otherwise suggested by the superintendent to gain further permissions and assistance in survey distribution. The mathematics coordinator/principal permission letter is located in Appendix D. Where superintendent/director of schools permission indicated appropriate, the researcher attempted to individually contact teachers electronically. Appendix E contains the Liberty University IRB approved recruitment and consent letter to teachers explaining the purpose of the study, time limit, assurance of confidentiality, and permission for survey data use implied by survey completion. This survey cover letter and link to the electronic version of the survey through SurveyMonkey® was sent to teachers by district mathematics coordinators or school principals unless the researcher was granted permission to contact teachers directly. The survey was only administered to teachers in districts with administrative approval received by the deadline outlined in the permission request letter. Teachers were allotted approximately a two and a half week window to complete the survey. Reminders were issued to school administrators/teachers. Survey data was exported from SurveyMonkey® into an Excel spreadsheet. From the spreadsheet, the IBM Statistical Package for the Social Sciences (SPSS) 21 was utilized to conduct the data analysis.

Data Analysis

The teacher survey data was collected electronically, entered into an Excel spreadsheet, and imported into the SPSS program. Initially, descriptive statistics were viewed for teacher demographic information, teacher attitude towards CCSS, and independent variables. Specifically, participant frequency information was reported for grade level taught, gender, teacher certification, years of experience teaching mathematics, grade level taught, number of hours of mathematics courses taken, and number of days attending TNCore trainings.

The product-moment correlation coefficient (*r*), also known as Pearson product-moment correlation (Pearson's *r*), was planned to be conducted through SPSS to test each null hypothesis as all variables are measured are on a continuous scale (Gall et al., 2007; Sheskin, 2010). The Pearson product-moment correlation is the most frequently used bivariate correlation measure that assesses the degree or magnitude of the relationship between variables (Gall et al., 2007; Sheskin, 2010). The most stable technique for bivariate correlation, the Pearson product-moment correlation has the smallest standard error (Gall et al., 2007).

Pearson product-moment correlation assumptions required for the correlation research design include the measurement variables on a continuous scale (Laerd Statistics, 2013a). Scatter plots were used to check for a linear relationship between each independent variable and the dependent variables being tested and to check for significant outliers (Laerd Statistics, 2013a). Finally, the Shapiro-Wilks test was used to check for normality (Laerd Statistics, 2013a). The assumption of a linear relationship between variables was difficult to confirm with confidence, and the sample size was small. Therefore, the nonparametric statistic, Spearman's rho (ρ) was used for all hypothesis analyses.

The correlation value will always be between negative one and positive one with negative values indicating a negative or indirect relationship between variables and positive values indicating a positive or direct relationship between variables (Sheskin, 2010). The absolute value of the correlation statistic indicates the strength of the relationship, with the relationship stronger the closer the absolute value is to one (Sheskin, 2010). Correlation research can be used to investigate cause and effect relationships as is the purpose of this study; however, if a relationship is found in a correlation study, a follow-up experiment would be needed as a definitive conclusion for cause and effect relationships (Gall et al., 2007).

CHAPTER FOUR: FINDINGS

The purpose of this correlation study was to determine if a significant relationship exists between background training and efficacy for teaching mathematics under Common Core State Standards (CCSS) for middle school mathematics teachers from the CORE East Tennessee region.

Research Questions and Hypotheses

The research question and hypotheses that guided this study were:

Research Question 1: Does teacher background training in mathematics influence teacher self-efficacy towards teaching Common Core State Standards for mathematics in the middle grades?

Hypothesis 1: There will be no statistically significant correlation between teacher self-efficacy scores as measured by the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and the number of college mathematics course hours taken.

Hypothesis 2: There will be no statistically significant correlation between teacher self-efficacy scores as measured Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and the number of TNCore mathematics training days attended.

Hypothesis 3: There will be no statistically significant correlation between teacher self-efficacy scores as measured by the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and the number of years of experience teaching mathematics.

Research Question 2: Does teacher background training in mathematics influence outcome expectancy for teaching Common Core State Standards for mathematics in the middle grades?

Hypothesis 4: There will be no statistically significant correlation between outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument and the number of college mathematics course hours taken.

Hypothesis 5: There will be no statistically significant correlation between outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument and the number of TNCore mathematics training days attended.

Hypothesis 6: There will be no statistically significant correlation between outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument and the number of years of experience teaching mathematics.

Research Question 3: Does teacher self-efficacy influence teacher outcome expectancy towards teaching Common Core State Standards for mathematics in the middle grades?

Hypothesis 7: There will be no statistically significant correlation between teacher self-efficacy scores as measured by the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument.

The independent variable, teacher background training, was defined as the number of college course hours taken in mathematics and number of TNCore mathematics training days attended. Analysis was also completed on an additional independent variable: years' experience teaching middle grades mathematics. The dependent variable was defined as teacher self-efficacy and outcome expectancy as measured by the Mathematics Teacher Efficacy Beliefs

Instrument (MTEBI), consisting of two subscales: personal mathematics teaching efficacy (PMTE) and mathematics teaching outcome expectancy (MTOE). Consistent with validity testing of the MTEBI instrument, analyses were performed separately on the two subscales. The control variables, participant school district location (CORE TN East region), grade level taught (middle grades: six, seven, and/or eight), and subject area taught (mathematics), were statistically controlled in this study.

Analyses were conducted using IBM SPSS Statistics 21. Thirty-eight complete teacher surveys were submitted through SurveyMonkey®. Initial descriptive statistics were calculated for the two measures of the dependent variable (teacher efficacy): the PMTE and MTOE subscales of the MTEBI. One participant survey was eliminated due to a response error by the participant on the college course credit hour question. Thus, statistical analyses were run based on the remaining 37 participant survey responses.

This chapter provides results for descriptive statistics, assumptions testing, and tests of each hypothesis. Survey Monkey®, Excel, and Statistical Package for Social Sciences (SPSS) 21 were utilized for all descriptive, assumption, and hypothesis data collection and analysis.

Descriptive Statistics

Surveys resulted in a sample of 37 usable participant mathematics teachers for grades six, seven, and/or eight. Of the 37 participants, 78.4% (29 teachers) were female and 21.6% (8 teachers) were male. Participants were also asked to indicate the grade(s) they teach. Of the sample, 45.9% taught sixth grade (17 teachers), 48.6% taught seventh grade (18 teachers), and 40.5% taught eighth grade (15 teachers). Some teachers instructed multiple grades; thus, a percentage of over 100 (135.1%) resulted from the teacher responses on this question.

Teacher participants with elementary certifications greatly outnumbered those with middle and secondary certifications. The frequency distribution of teacher certification type is shown in Table 1.

Table 1

Frequency Distribution by Certification of Teacher Participants

	Frequency	Percent
Elementary	22	59.5
Middle	6	16.2
Secondary	9	24.3
Total	37	100.0

Participants' years' experience teaching middle grades mathematics ranged from 1 to 32 years with a mean of 10.19 years. Participants with five or fewer years' experience (45.9%) greatly outnumbered all other frequency intervals. The frequency distribution for teachers' years' experience is shown in Table 2.

Table 2

Frequency Distribution by Years' Experience of Participants Teaching Middle Grades Mathematics

Years' Exp.	Frequency	Percent
<= 5	17	45.9
6 – 10	6	16.2
11 – 15	6	16.2
16 – 20	1	2.7
21 – 25	3	8.1
26 – 30	3	8.1
31 – 35	1	2.7
Total	37	100.0

Teachers were asked to report the number of mathematics course hours taken in college to assess teachers' background training in the subject of mathematics. Survey responses included in the data analyses indicate the number of mathematics course hours taken ranged from 3 to 48 with a mean of 17.57 credit hours. The frequency distribution for college mathematics course hours taken is shown in Table 3.

Table 3

Frequency Distribution by College Mathematics Course Hours of Teacher Participants

Credit Hours	Frequency	Percent
<= 10	11	29.7
11 – 20	11	29.7
21 – 30	11	29.7
31 – 40	2	5.4
41 – 50	2	5.4
Total	37	100.0

To assess the influence of TNCore sponsored mathematics training, teachers were asked to indicate the number of TNCore mathematics training days they have attended. Teachers reported attending from zero to 12 days of TNCore sponsored mathematics training days with a mean of 4.35 days. The frequency distribution of TNCore training days attended is shown in Table 4.

Table 4

Frequency Distribution of TNCore Training Days Attended by Teacher Participant

Training Days	Frequency	Percent
<= 2	9	24.3
3 – 4	10	27.0
5 – 6	12	32.4
7 – 8	1	2.7
9 – 10	4	10.8
11 – 12	1	2.7
Total	37	100.0

Descriptive statistics are shown in Table 5 to indicate teacher participants' scores on the two subsections (self-efficacy and outcome expectancy) of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI). The final version of MTEBI consisted of 21 items. Thirteen items comprise the Personal Mathematics Teaching Efficacy (PMTE) subscale. Eight items comprise the Mathematics Teaching Outcome Efficacy (MTOE) subscale (Enochs et al., 2000). The MTEBI consists of Likert-type questions and scores are summative for each scale (Enochs et al., 2000). Scores range from 13 to 65 on the PMTE subscale (Enochs et al., 2000). Possible scores range from 8-40 on the MTOE subscale (Enochs et al., 2000). Higher scores on the PMTE scale indicate higher personal self-efficacy or "…a belief in one's ability to teach effectively…" (Enochs et al., 2000, p. 195). Higher scores on the MTOE scale indicate higher outcome efficacy or "the belief that effective teaching will have a positive effect on student learning" (Enochs et al., 2000, p. 195). Descriptive statistics for the dependent variables are shown in Table 5.

Table 5

Descriptive Statistics for PMTE and MTOE

	N	*Range*	*Min.*	*Max.*	*M*	*SD*
Self-Efficacy	37	19	46	65	54.57	5.194
Outcome Expectancy	37	21	16	37	26.54	4.908

Assumptions Testing

To confirm proper use of the parametric statistic, Pearson's *r*, assumptions analyses were performed using SPSS. The first assumption, continuous nature of the variable, was met by the independent variable, mathematics course hours taken, as it is a ratio variable. Second, a scatterplot was created using SPSS for the independent variable, college mathematics course hours taken, against the PMTE subscale measure from the MTEBI to visually check for a linear relationship (Laerd Statistics, 2013a). Due to the small sample size (N=37), it was difficult to visually confirm a linear relationship. The scatterplot trend line for correlation coefficient (r) was .11, with a r^2 value of .065, meaning approximately 6.5% of the personal mathematics teaching efficacy is explained by the number of mathematics course hours taken in college (Gall et al., 2007). This indicates that college course hours taken has little influence on teacher personal self-efficacy for teaching mathematics in the middle grades.

The assumption of a normal distribution was assessed by the Shapiro-Wilk test in SPSS. The PMTE has a significance of .311 and the MTOE has a significance of .650. Shapiro-Wilk results of .05 or greater indicate the variables do not significantly differ from normal (Laerd Statistics, 2013c). Therefore, the assumption of normality was found tenable for both the PMTE and the MTOE subscales. Since linearity was unable to be confirmed with confidence, and due to the small sample size, it was concluded that the nonparametric statistic, Spearman's rho, would be run in SPSS. Spearman's rho is generally used for ordinal scale data. Additionally, Spearman's rho can be run when there is a small sample size or a question about linearity preventing Pearson correlations from being effectively conducted (Wheeler, Shaw, & Barr, 2004, p. 181). SPSS will automatically convert data to ranks as was the case with the ratio data in this study to instill some level of normality (Wheeler et al., 2004, pp. 181, 190).

Results

Research Question 1: Does teacher background training in mathematics influence teacher self-efficacy towards teaching Common Core State Standards for mathematics in the middle grades?

Hypothesis 1: There will be no statistically significant correlation between teacher self-efficacy scores as measured by the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and the number of college mathematics course hours taken.

Following assumptions testing, scatterplots were created in SPSS. The correlation coefficient (r) was .11, with *a* r^2 value of .065, meaning approximately 6.5% of the personal mathematics teaching efficacy is explained by the number of mathematics course hours taken in college (Gall et al., 2007). This indicates that the number of college mathematics course hours taken has little influence over teacher personal self-efficacy for teaching mathematics in the middle grades. Correlation testing in SPSS revealed a Spearman's rho p-value of .041. As standard in practice, a p-value of .05 or less is indicative of statistically significant correlation (Gall et al., 2007). Thus, the researcher rejected the null hypothesis as indicated by the Spearman's rho correlation test. The correlation statistic is shown in Table 6.

Table 6

The Spearman's Rho Correlation between Mathematics Course Hours Taken in College Scores and Scores on the Personal Mathematics Teaching Efficacy Subscale

	ρ	p	df
Mathematics Course Hours Taken in College	.338	.041	35

Hypothesis 2: There will be no statistically significant correlation between teacher self-efficacy scores as measured Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and the number of TNCore mathematics training days attended.

The Spearman's rho correlation test did not indicated a statistically significant correlation between TNCore mathematics training days attended and personal teaching efficacy. Thus, the researcher failed to reject the null hypothesis, suggesting the number of TNCore mathematics training days attended does not have an influence on personal teaching efficacy. The correlation statistic is displayed in Table 7.

Table 7

The Spearman's Rho Correlation between TNCore Mathematics Training Days and Scores on the Personal Mathematics Teaching Efficacy Subscale

	ρ	p	df
TNCore Mathematics Training Days Attended	.201	.232	35

Hypothesis 3: There will be no statistically significant correlation between teacher self-efficacy scores as measured by the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and the number of years of experience teaching mathematics.

Following assumptions testing, a scatterplot was created for the hypothesis. The resulting correlation coefficient (*r*) indicated years' experience teaching middle grades mathematics has little influence on personal self-efficacy for teaching mathematics in the middle grades. Further, the Spearman's rho test did not indicate a statistically significant correlation between years' experience teaching mathematics and personal teaching efficacy. Thus, the researcher failed to reject the null hypothesis, suggesting years' experience teaching middle grades mathematics does not have influence on personal teaching efficacy. The correlation statistic is displayed in Table 8.

Table 8

The Spearman's Rho Correlation between Years' Experience Teaching Middle Grades Mathematics and Scores on the Personal Mathematics Teaching Efficacy Subscale

	ρ	p	df
Years' Experience Teaching Middle Grades Mathematics	.261	.119	35

Research Question 2: Does teacher background training in mathematics influence outcome expectancy for teaching Common Core State Standards for mathematics in the middle grades?

Hypothesis 4: There will be no statistically significant correlation between teacher outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument and the number of college mathematics course hours taken.

Following assumptions testing, a scatterplot was created for the hypothesis. The correlation coefficient (*r*) was .06, with a r^2 value of .019, meaning approximately 1.9% of the outcome expectancy is explained by the number of mathematics course hours taken in college (Gall et al., 2007). Thus, the results suggest the number of mathematics course hours taken in college has little influence on outcome expectancy for teaching mathematics in the middle grades. Further, Spearman's rho did not indicate a statistically significant correlation between mathematics course hours taken in college and outcome expectancy. Thus, the null failed to be rejected, suggesting that college course hours taken does not have influence on outcome expectancy. Correlation statistics are displayed in Table 9.

Table 9

The Spearman's Rho Correlation between Mathematics Course Hours Taken in College and Scores on the Mathematics Teaching Outcome Expectancy Subscale

	ρ	p	df
Years' Experience Teaching Middle Grades Mathematics	.166	.327	35

Hypothesis 5: There will be no statistically significant correlation between teacher outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument and the number of TNCore mathematics training days attended.

Following assumptions testing, a scatterplot was created for the hypothesis. The resulting correlation coefficient *(r*) was .16, with a r^2 value of .010, meaning approximately 1% of the personal mathematics teaching efficacy is explained by the number of TNCore training days attended (Gall et al., 2007). This indicates that TNCore mathematics training days has little influence on outcome expectancy for teaching mathematics in the middle grades. Further, the Spearman's rho test did not indicate a statistically significant correlation between TNCore mathematics training days attended and outcome expectancy. Thus, the researcher failed to reject the null hypothesis, suggesting TNCore mathematics training days attended does not influence on outcome expectancy. The correlation statistic is shown in Table10.

Table 10

The Spearman's Rho Correlation between TN Core Mathematics Training Days Attended and Scores on the Mathematics Teaching Outcome Expectancy Subscale

	ρ	*p*	*df*
TNCore Mathematics Training Days Attended	-.146	.389	35

Hypothesis 6: There will be no statistically significant correlation between teacher outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument and the number of years of experience teaching mathematics.

Following assumptions testing, a scatterplot was created for the hypothesis. The resulting correlation coefficient (r) was .07, with a r^2 value of .018, meaning approximately 1.8% of the outcome expectancy is explained by the teachers' years' experience teaching middle grades mathematics (Gall et al., 2007). This indicates that years' experience teaching middle grades mathematics has little influence on outcome expectancy for teaching mathematics in the middle grades. Further, the Spearman's rho test did not indicate a statistically significant correlation between years' experience teaching middle grades mathematics and outcome expectancy. Thus, the researcher failed to reject the null hypothesis, suggesting years' experience teaching middle grades mathematics does not have influence on outcome expectancy. The correlation statistic is shown in Table11.

Table 11

The Spearman's Rho Correlation between Years' Experience Teaching Middle Grades Mathematics and Scores on the Mathematics Teaching Outcome Expectancy Subscale

	ρ	*p*	*df*
Years' Experience Teaching Middle Grades Mathematics	.051	.764	35

Research Question 3: Does teacher self-efficacy influence teacher outcome expectancy towards teaching Common Core State Standards for mathematics in the middle grades?

Hypothesis 7: There will be no statistically significant correlation between teacher self-efficacy scores as measured by the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument.

Following assumptions testing, a scatterplot was created for the hypothesis. The resulting correlation coefficient (*r*) was .34, with a r^2 value of .132, meaning approximately 13.2% of the outcome expectancy is explained by personal teaching efficacy or vice versa (Gall et al., 2007). This indicates that there is a relationship between personal teaching efficacy and outcome expectancy for teaching mathematics in the middle grades. The Spearman's rho correlation test indicated a statistically significant correlation between personal teaching efficacy and outcome expectancy for teaching mathematics in the middle grades mathematics. Thus, the researcher rejected the null hypothesis, suggesting there is a relationship between personal teaching efficacy and outcome expectancy for teaching mathematics in the middle grades. The correlation statistic is shown in Table12.

Table 12

The Spearman's Rho Correlation between Scores on Personal Mathematics Teaching Efficacy Subscale and the Mathematics Teaching Outcome Expectancy Subscale

	ρ	p	df
Personal Mathematics Teaching Efficacy Subscale	.438*	.007	35

*Correlation is significant at the .01 level (2-tailed)

CHAPTER FIVE: DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Adequate mathematics competency is critical for greater success in individual financial decisions and improved employment, particularly in mathematical and technical fields (Saffer, as cited in Burns, Kanive, & DeGrande, 2012; Mat Zin, 2009). A National Education Center for Education Statistic's 2013 Report implies mathematics proficiency has increased, however, a mere 42% of fourth graders and 35% of eighth graders in the United States satisfy or excel beyond proficiency marks (The Nation's Report Card, 2013a). In an effort to produce more high school graduates who are better prepared for the workforce or higher education pursuits, Tennessee and 43 other states, as of April 2014, elected to implement the Common Core State Standards (CCSS) (Common Core State Standards Initiative, 2014).

To assist in the changeover to CCSS, Tennessee has implemented a gradual transition plan and accompanying peer-led TNCore trainings on the new standards. The purpose of this correlation study based on survey research is to evaluate the relationship between background training and efficacy for teaching mathematics under CCSS for middle school mathematics teachers from the CORE East TN region.

To investigate the relationship between teacher background training and teacher efficacy, middle grades mathematics teachers were administered the Mathematics Teacher Efficacy Beliefs Instrument (MTEBI), consisting of two subscales, the Personal Mathematics Teaching Efficacy (PMTE) and Mathematics Teaching Outcome Expectancy (MTOE) to access participants teaching efficacy (Enochs et al., 2000). Participants were also asked questions to identify the components of the independent variable, teacher background training: number of mathematics course hours taken in college, the number of TNCore training days attended, and years' experience teaching mathematics. Chapter Five consists of the discussion of the hypotheses and summary of results, conclusions, implications, limitations, and recommendations for future research.

Summary of Results

Research Question 1: Does teacher background training in mathematics influence teacher self-efficacy towards teaching Common Core State Standards for mathematics in the middle grades?

Hypothesis 1: There will be no statistically significant correlation between teacher self-efficacy scores as measured by the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and the number of college mathematics course hours taken.

Correlation testing in SPSS revealed a Spearman's rho *p*-value of .041 and *a* ρ of .338. As standard in practice, a *p*-value of .05 or less is indicative of statistically significant correlation. Therefore, the researcher rejected the null hypothesis, and concluded that college mathematics course hours taken may affect personal teaching efficacy (Gall et al., 2007).

Hypothesis 2: There will be no statistically significant correlation between teacher self-efficacy scores as measured Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and the number of TNCore mathematics training days attended.

Correlation testing in SPSS revealed a Spearman's rho *p*-value of .232. As a *p*-value of .05 or less is indicative of statistically significant correlation, the researcher's failure to reject the null hypothesis was supported by the Spearman's rho correlation test. Therefore, results suggest the number of TNCore Mathematics training days attended does not influence personal self-efficacy for these participants.

Hypothesis 3: There will be no statistically significant correlation between teacher self-efficacy scores as measured by the Personal Mathematics Teaching Efficacy (PMTE) subscale of the

Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and the number of years of experience teaching mathematics.

Correlation testing in SPSS revealed a Spearman's rho *p*-value of .119. As a *p*-value of .05 or less is indicative of statistically significant correlation, the researcher failed to reject the null hypothesis. Therefore, the results suggest the number of years' experience teaching mathematics does not influence personal self-efficacy for these participants.

Research Question 2: Does teacher background training in mathematics influence outcome expectancy for teaching Common Core State Standards for mathematics in the middle grades?

Hypothesis 4: There will be no statistically significant correlation between outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument and the number of college mathematics course hours taken.

Correlation testing in SPSS revealed a Spearman's rho *p*-value of .327. As a *p*-value of .05 or less is indicative of statistically significant correlation, the researcher failed to reject the null hypothesis. Thus, results suggest the number of college mathematics course hours taken does not influence outcome expectancy for these participants.

Hypothesis 5: There will be no statistically significant correlation between outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument and the number of TNCore mathematics training days attended.

Correlation testing in SPSS revealed a Spearman's rho *p*-value of .389. Thus, the researcher failed to reject the null hypothesis. Therefore, results suggest the number of TNCore mathematics training days attended does not influence outcome expectancy for these participants.

Hypothesis 6: There will be no statistically significant correlation between outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument and the number of years of experience teaching mathematics.

Correlation testing in SPSS revealed a Spearman's rho *p*-value of .746. As a *p*-value of .05 or less is indicative of statistically significant correlation, the researcher failed to reject the null hypothesis. Thus, results suggest years' experience teaching middle grades mathematics does not influence outcome expectancy for these participants.

Research Question 3: Does teacher self-efficacy influence teacher outcome expectancy towards teaching Common Core State Standards for mathematics in the middle grades?

Hypothesis 7: There will be no statistically significant correlation between teacher self-efficacy scores as measured by the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and outcome expectancy scores as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument.

Correlation testing in SPSS revealed a Spearman's rho *p*-value of .007. As a p-value of .05 or less is indicative of statistically significant correlation, the researcher rejected the null hypothesis. Therefore, results indicate there is a positive relationship, $\rho(35) = .438$, $p < .01$ between personal teaching efficacy and outcome expectancy for these participants.

Discussion

Result from hypotheses 1-6 add to mixed results already in existence regarding teacher efficacy. Some studies related to teacher efficacy have found significant results. Although in a different subject area, Lui et al.'s 2008 study of elementary teachers in Taiwan found those with 11 or more years teaching experience teaching science had significantly higher levels of personal teaching efficacy and outcome expectancy compared to those 10 or fewer years' experience teaching science (Liu et al., 2008). Conversely, Skaalvik and Skaalvik (2007) found a negative relationship between years' experience teaching and collective teacher efficacy ($\beta = -.23$). Further, years' experience was also found to be negatively related to motivating students ($\beta = -.14$), coping with changes and challenges ($\beta = -.28$), and cooperating with colleagues and parents ($\beta = -.15$) (Skaalvik & Skaalvik, 2007). In light of these results, a non-significant relationship between teaching efficacy and years' experience teaching middle grades mathematics may be interpreted as a favorable in light of previous negative correlations. Improving efficacy is important as a negative correlation (ranging from $\beta = -.32$ to $\beta = -.40$) was found between teacher efficacy and teacher burnout (Skaalvik & Skaalvik, 2007). During this time of transition and uncertainty, preventing teacher burnout is an important consideration for school leaders. Despite the previously discussed studies, similar to the current results, multiple studies have also resulted in non-significant relationships with efficacy and years' experience (Gür et al., 2012; Guskey, 1988).

Mathematics content knowledge has also had mixed research results. A 2012 study found a positive correlation between mathematics content knowledge and scores on the PMTE (personal or self-efficacy), but no relationship with the MTOE (outcome expectancy) subscale of the MTEBI (Newton et al., 2012). It is important to note, however, that these studies differed in their measurement of background training. Newton et al.'s (2012) study used a researcher-developed mathematics content test to measure mathematics content knowledge. This differs in measurement related to content knowledge from the current study, which uses the number of college mathematics course hours taken.

Bandura's notion that mastery experiences are a significant factor affecting teachers' self-efficacy is supported by multiple studies (Chang, 2010; Gür et al., 2012). Non-significant results, such as were the results in the present study, may indicate teachers have not had enough positive or negative mastery experiences with the instructing CCSS. Teacher background training was researched in the current study because teacher content knowledge has been linked by some research to higher student achievement (Hill et al., 2005). However, results related to content knowledge and training have varied. Jepsen's (2005) study did not find a relationship between student achievement and highest degree earned, which, although less direct, may be a factor related to content knowledge (Jepsen, 2005). Although college course hours taken did show a significant, positive effect on personal teaching efficacy, the sample size (N=37) in the current study is small and results should be interpreted with caution. After more time with the standards, teachers with greater mathematics training, such as increased number of mathematics course hours taken in college, may show greater teacher efficacy as they gain positive mastery experiences, further supporting the results of this study. Thus, more research is recommended after teachers have had more extensive time teaching and receiving student achievement feedback on CCSS.

Reform cannot effectively be forced from the top-down (Lawrenz et al., 2005). The peer-led nature of TNCore Mathematics trainings may not have instilled a sense of ownership in the reform that expanded to the participants in this study. This potential lack of ownership may contribute to a lack of significant results for teacher efficacy and the number of days participants have attended TNCore trainings. Prior research specifically addressing teachers and the transition to CCSS is limited primarily to qualitative studies. The current quantitative results have compatibility with ideas presented in those studies as Wilborn (2013) found it difficult to draw conclusions for metacognitive processes, such as self-efficacy, and Sheppard (2013) found no change in teacher efficacy with the transition CCSS for three teachers in the study. It is important to note, however, that the teachers in Sheppard's (2013) and teachers in Mazze's

(2013) studies did not report changing teaching methods with CCSS. However, Mazze's (2013) participants indicated a high level of efficacy during the first year of CCSS implementation. Additionally from Sheppard's (2013) study, one teacher reported feeling less effective, while the remaining two teachers in the study reported feelings of increased efficacy with the transition to CCSS (Sheppard, 2013). These results suggest a lack of conclusiveness about change in teacher self-efficacy during the transition to CCSS. Teacher efficacy measures were not taken prior to the implementation of CCSS, so no comparisons for pre-and post- CCSS can be made from the current study's results.

With regard to the results for Hypothesis 7, research was not able to be located that related personal teaching efficacy and outcome expectancy with relation to CCSS. However, a person is more inclined to act when he or she has confidence in both the ability to exhibit a behavior, self-efficacy, and in the belief of the results of that behavior to be advantageous, outcome expectancy (Enochs & Riggs, 1990). As this study is based on Bandura's theory of teacher efficacy which indicates there is a difference in self-efficacy and outcome expectancy (Bandura, 1977, 1983), assessing the relationship between the two factors is warranted. As both are factors that comprise teacher efficacy, it is logical and supported by the results from this study that a positive relationship is present between self-efficacy and outcome expectancy.

Conclusions

Mathematics course hours taken did yield significant results for the nonparametric Spearman's rho correlation statistic on the self-efficacy measure only $\rho = .338$, $p = .041$) at the .05 significance level $N = 37$. These results indicate a positive relationship exists between college mathematics course hours taken and self-efficacy for teaching mathematics in the middle grades. However, this data still does not lead to strong conclusions. Due to the low number of participants, linearity (assumption for Pearson's r) was difficult to confirm with confidence

(Laerd Statistics, 2013b). Thus, the non-parametric Spearman's rho correlation test was conducted; this non-parametric test did indicate a significant, positive relationship. Therefore, this research can support the possibility that the number of college mathematics course hours taken can positively affect self-efficacy for teaching mathematics to the middle grades, but further research is warranted to confirm these results. Mathematics course hours taken is one factor attributing to teacher background training. Theoretically, the greater the number of mathematics course hours taken in college, the higher mathematics content knowledge a person may possess. However, this knowledge may or may not translate into the ability to provide adequate or exemplary mathematics instruction.

Relating these results to previous research, Hill (2007) found teachers with mathematics backgrounds and experience and certification in high school mathematics tend to score higher on mathematics content measures (Hill, 2007). As many middle grades mathematics teachers have an elementary generalist certification (K-6, 1-8, or K-8), teachers in these grades are of particular concern as they need more advanced mathematical knowledge than teachers in lower grades. According to Hill (2007), teacher content knowledge has two subdivisions: common content knowledge (CCK) (ability to solve mathematics problems) and specialized content knowledge (SCK) (ability to break down problems into different representations and provide explanations in a grade level appropriate manner) (Hill, 2007). Therefore, a teacher may have a high understanding of mathematical concepts, but still struggle to effectively teach the material to students. This may account for instances where teachers have taken a high number of mathematics course hours taken in college, but still lack confidence in their teaching ability (self–efficacy) or in the outcome of quality instruction if they do feel capable (outcome expectancy).

Further convoluting ideas on background training, Swars's (2009) study results indicated significant increases only in outcome expectancy for two courses covering constructivist teaching methods for science. The results of the present study found mathematics courses to significantly affect only personal teaching efficacy rather than outcome expectancy. This may indicate that methods training can have a greater impact on outcome expectancy, while content training can more greatly affect personal teaching efficacy. It is, however, important to note the subject area of the two studies differed, one being mathematics and the other science.

Due to the small sample size, the results of the present study should be interpreted with caution for the impact of the number of mathematics course hours taken on personal teacher efficacy. Nonparametric results indicated the potential for an effect on personal teaching efficacy, but failed to indicate a significant impact on outcome expectancy.

It is clear that mathematics education in Tennessee and the United States is not at the high level desired for international competitiveness and for future personal success for many students. The planned transition to CCSS was an attempt by Tennessee to improve student preparedness for college or career success. To aid in the transition to these new, more rigorous standards, Tennessee hired current teachers as Core Coaches to conduct peer-led trainings for teachers (TN Department of Education, 2014b). It is logical to conduct trainings for the transition to CCSS as a high number professional development courses was found to increase outcome expectancy in one study (Swackhamer et al., 2009). Further, both personal teaching efficacy and outcome expectancy, the two components of teacher efficacy, were found to increase with professional learning communities (PLCs) in science (Mintzes et al., 2013). The current study investigated the effects the TNCore trainings may have on middle grades mathematics teacher efficacy. The study took place after 2-3 day TNCore trainings had been offered during each of the 2012, 2013, and 2014 summers. The teacher survey for the present study was conducted in the fall of 2014. However, teachers were not required to have attended one of these trainings to participate. The frequency distribution of the number of TNCore training days attended is shown in Table 4 in Chapter Four.

Although no significant results were found for the number of TNCore mathematics trainings attended for the participants in this study, it may be that these teachers have not had enough time in the trainings for a significant effect to be observed. In the prior research discussed, significant results were only seen in outcome expectancy and only for teachers who took four or more professional development courses, which would be a greater amount of time than the average participant in the current study (2.57 days) (Swackhamer et al., 2009). Further, Mintzes et al.'s (2013) study included 3-year PLC participants, which is also likely a greater professional training time than the TNCore training received by participants in this study.

Although, TNCore mathematics trainings have been offered multiple times, not all participants attended every training; in fact, five participants indicated zero training days attended. This may account for the differing results from those in Rimbey's (2013) study involving a 50-hour Common Core training workshop that yielded positive results. These conflicting results may indicate teachers need additional training or the TNCore mathematics trainings need to be altered to increase the effectiveness of teacher training. Thus, despite the lack of effect seen in this study, further research on the effect of TNCore or other transitional mathematics standards training should be continued to confirm results.

Years' experience teaching mathematics did not significantly affect teacher efficacy for teaching mathematics in the middle grades in the present study. These non-significant results for years' experience are consistent with other studies on teacher efficacy (Gür et al., 2012; Guskey, 1988). Although years' experience did not appear to impact teacher efficacy, it is still an important factor that warrants further discussion. Ghaith and Yaghi (1997) found that more experienced teachers found innovative practices as less similar to current practice and less important to implement in comparison with novice teachers.

Implications

As presented by many researchers, this study was based on the idea that efficacy can depend on the circumstance (Bandura, 1977, 1982; Edwards et al., 2002; Tschannen-Moran et al., 1998). Therefore, gaining an understanding of teacher efficacy in relation to teaching CCSS was deemed worthwhile. Further, the specific focus on middle grades mathematics teachers was because middle grades mathematics teachers can vary greatly in background training as some are elementary generalists and others possess middle-grades or secondary certifications, requiring additional training or coursework in mathematics. As previously discussed, Tennessee's adoption of CCSS was purposed to apply more demanding standards to better prepare Tennessee youth for future college and/or occupational success. With more stringent standards, it is possible that teachers' content knowledge may be tested in trying to provide instruction accessible to their students' current mathematical level. Limited research has been conducted on CCSS, but teachers have indicated feeling overwhelmed by creating lessons for the new standards (Cristol & Ramsey, 2014). Further, the in-depth mathematics content in CCSS may result in teachers reaching "…the limits of their own content knowledge" (Cristol & Ramsey, 2014, p. 18). The current study did not administer a pre- and post- common core state standards assessment of teacher efficacy, so a change in efficacy cannot be determined from this study. However, this study did investigate background training as a possible factor impacting teacher efficacy during a time of transition to more rigorous mathematics standards in the state of Tennessee.

The purpose of this correlation study was to investigate the relationship between teacher background training and teaching efficacy for instructing mathematics in the middle grades during the transition to CCSS. Research supports the assertion that teacher efficacy is important for reform as Nie et al.,'s (2013) Singapore study found teacher efficacy to be significant in predicting innovative instruction. Two measures comprised teacher background training in the current study: the number of mathematics course hours taken and the number of TNCore mathematics training days attended. Further, years' experience was also analyzed for its impact on participant efficacy for teaching mathematics to the middle grades. The quantitative results of this study generally indicated that teacher background training had little, if any, effect on teacher efficacy for teaching CCSS mathematics in the middle grades. Neither the number of TNCore mathematics training days attended nor years' experience teaching mathematics resulted in significant effects according to the Spearman's rho of teacher efficacy as measured by the MTEBI which is comprised of two components: personal teaching efficacy (self-efficacy) and outcome expectancy.

Despite the non-significant relationship identified for the number of TNCore trainings attended and years' experience, this information may still be useful to administrators, policy-makers, and future researchers. The correlation data indicates TNCore trainings have not had a significant impact on teacher efficacy. There are two possible implications from these results: 1. Teachers may not have attended enough TNCore mathematics trainings for a significant effect to be evident; or 2. The TNCore trainings are not effective and need to be improved. These results are important for consideration as Tennessee has invested a large amount of money ($3.2 million for summer 2012 trainings alone) towards TNCore workshops (TN Department of Education, 2013a), which have not proved to have a significant impact for participants in the current study. It is important to note that five participants indicated attending zero TNCore trainings. Teachers involved in Rimbey's (2013) study showed higher gains in measures for mathematical knowledge for teaching and knowledge of standards after attending a 50-hour CCSS workshop in comparison with a control group. Workshop activities included predicting student difficulties in tasks, analyzing student work samples, study of standards for mathematical practices, discussions, and planning time for classroom implementation (Rimbey, 2013). Some of these activities, such as engaging with student work, are similar to those included in TNCore trainings (TN Department of Education, 2013a). TNCore's *Recommendations for Delivering Math Grades 3-8 Common Core State Standards Teacher Training, Fall 2013- Spring 2014* includes five suggested models for those who attended the trainings to redeliver to other teachers:

1. Making Sense of the CCSS via a Set of Tasks,
2. Using Assessing and Advancing Questions to Target Essential Understandings,
3. Using Academically Productive Talk Moves: Orchestrating a Focused Discussion,
4. Selecting and Sequencing based on Essential Understandings, and
5. Constructing an Argument and Critiquing the Reasoning of Others (TN Department of Education, 2013b).

In addition to previously stated topics, TNCore trainings also included progression of mathematics content through the grade levels to reach a more in-depth content knowledge and higher expectations (TN Department of Education, 2014a). Additional training materials are available to Tennessee teachers through http://www.tncore.org/ but require a username and password. Considering the in-depth content described by the training materials, it may simply be that teachers need more training and instructional time for the TNCore trainings to have a significant impact on efficacy. The possibility also exists that the content in TNCore mathematics trainings was not executed well enough or the teachers attending were not receptive to the training information and activities.

Receptivity by teachers is an important factor to consider as research supports positive teacher opinion of reform to be essential for an effective transition (Lawrenz et al., 2005; Lee et al., 2011). If teachers do not view CCSS in a positive light, this may result in a negative impact on the transition process, teacher efficacy, and ultimately student learning. In Guskey's (1988) study more efficacious teachers viewed innovative practices as less difficult to implement (r = -33). Teacher perception and efficacy towards CCSS is important as teacher willingness to implement innovations are crucial for educational improvement (Ghaith, 1997). Teacher receptivity was found to have a significant, positive effect on behavior intentions, meaning teachers are more likely to commit to reform if they view it positively (Lee et al., 2011). A negative opinion of teachers in the present study towards CCSS may have impacted teacher receptiveness to training and, therefore, the effectiveness of the TNCore trainings. Information on teachers' attitude towards teaching CCSS is useful for administrators and policy makers as anticipating teacher stressors allows administrators to take a proactive approach in hearing and giving support to alleviate teacher concerns (Stauffer & Mason, 2013).

The results for the number of mathematics course hours taken in college did yield significant results for the non-parametric statistics, Spearman's rho for personal teaching efficacy or self-efficacy. These results (ρ = .338, p = .041), although significant, still indicate only a low to moderate, positive relationship. No significant relationship was observed for outcome expectancy. This indicates that teacher content training may improve a teacher's belief they understand and can effectively present content to students. However, with no significant correlation between mathematics course hours taken and outcome expectancy, it appears that increasing the amount of mathematics content training did not impact teachers' belief that effective teaching would produce the desired result with students (outcome expectancy). Thus, teacher content knowledge appears to increase teachers' confidence in their ability to teach CCSS effectively, but not that quality teaching under CCSS will yield the desired outcome. This lack of mathematics training's effect on outcome expectancy may be due to concern over student ability or high stakes standardized testing measures. Both of these concerns are factors affecting student performance on standardized tests. Since student achievement data accounts for 50% of teacher evaluation scores in Tennessee, high student scores is assumed to be an outcome teachers are hoping for in addition to general student learning (Tennessee Department of Education, 2013). With this in mind, it is important to note that current high stakes testing in Tennessee is still based on SPIs rather than CCSS. The department of education has selected standards most aligned with CCSS, but did not make the transition to the CCSS-based PARCC assessment in the 2014-2015 school year as was originally planned.

Limitations

There are several limitations associated with this study. First, correlations from a causal relationship study, such as the current research, cannot establish a cause and effect relationship between variables (Gall et al., 2007). Correlation studies can support the existence or non-existence of relationships between variables, but are criticized because "… this type of study breaks down complex abilities, personality characteristics, and behavior patterns into simpler components" (Gall et al., 2007, p. 341). Since efficacy is complex, the current research can provide useful information for how to support teachers in the transition to CCSS; however, additional research, including experimental studies, is needed to validate presented conclusions.

Additional limitations are related to the small number of participants in the sample. Further, the sample may not be representative of the desired population due to difficulties encountered in contacting school districts and/or administrators. Final survey participants consisted of 37 teachers, which is an estimated 56.06% response rate from the approximated number of teachers who received surveys. This number is significantly lower than the actual number of middle grades mathematics teachers in the CORE East TN district. A small sample size reduces the statistical power or the probability that a significance test will result in a rejection of a false null hypothesis (Gall et al., 2007). The small number of participants also contributed to the decision to run the nonparametric correlation measure, Spearman's rho, as it was difficult to visually confirm linearity from scatterplots with a sufficiently high level of confidence. The parametric (Pearson's r) and nonparametric (Spearman's ρ) were both initially run in SPSSS. Despite the small sample size, the two results were consistent for years' experience teaching middle grades mathematics and the number of TNCore training days attended. Therefore, this was not of as much concern as the results for the number of mathematics course hours taken, which was significant only according to Spearman's rho, the nonparametric correlation measure.

Additionally, the use of the number of mathematics course hours taken in college may not be the best measure of content knowledge in mathematics. Hill (2007) claims content knowledge is comprised of two subdivisions: Common content knowledge (CCK) (teachers' ability to solve mathematics problems) and Specialized content knowledge (SCK) (teachers' ability to break down problems into different representations and provide explanations in a grade level appropriate manner) (Hill, 2007). Research recommends having teachers complete 15 to 30 content problems for a reliable measure of subject matter knowledge (Hill, 2007). Questions may include asking teachers to evaluate non-standard solutions. Teachers in the current study were not asked to complete content problems or evaluate answers to mathematical problems to assess teacher content knowledge. Rather, a simpler measure of teachers' content knowledge, mathematics course hours taken in college, was evaluated. Since enrollment in a higher number of courses does not ensure teachers actually have a greater understanding of content or can provide better instruction, it may be a weaker measure in comparison with studies such as Hill's (2007) that utilize a more complete measure of content knowledge or training.

Recommendations for Future Research

Recommendations for future research include addressing weaknesses in the present study as well as replicating the research to increase the validity or, possibly dispute the results of the present study.

Most importantly, future research is needed to address issues associated with the small sample size ($N = 37$) present in this study. This study included only teachers in the CORE East TN region with the intent to generalize results to the rest of Tennessee as well as other states in the process of transitioning to CCSS. To improve the validity of results, it is recommended that the study be repeated with surveys being sent to all middle grades mathematics teachers in Tennessee rather than limiting it to the CORE East TN region. This should increase the number of participants as well as the geographic sampling area.

The present study aimed to assess the effect of teacher background training on teacher efficacy for teaching CCSS because these new standards are intended to involve instruction delving deeper into mathematical concepts. Teacher background training in this study included the number of mathematics course hours taken in college and the number of TNCore mathematics training days attended. Since increased training time or courses taken does not guarantee increased mathematical knowledge or teaching ability, it is recommended that measures of CCK and SCK as described and recommended in the previously described research by Hill (2007) be included in future studies. This would allow for correlation analysis between the number of mathematics course hours taken in college and the number of TNCore mathematics trainings with in-depth measures of content knowledge. In this design, correlations could also be conducted to assess the relationship between CCK and SCK with teacher efficacy (MTEBI) for a more complete understanding of factors contributing to teacher efficacy with CCSS.

Finally, it is recommended that future studies include teachers of elementary and high school mathematics. Including these teachers would allow for comparisons of teaching certification (elementary versus secondary) and/or grade level. Including these analyses can provide information for policy makers and administrators on the efficacy of each level of teachers and where the direst need for increased or improved teacher training to aid in the transition to CCSS is expressed by teachers. As training is expensive to conduct, this information may assist in the prioritization of training in the instance of budgetary concerns. Further, future studies would allow for analysis to be conducted after teachers have had more time teaching CCSS, contributing to mastery experiences that may cause changes in efficacy.

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APPENDIX A

Permission to Use MTEBI

Re: Request to use MTEBI

LARRYENOCHS <enochsl@onid.orst.edu>

Tue 6/10/2014 9:46 PM

To:

Plemons, Stacy;

You replied on 6/11/2014 12:57 AM.

You certainly may use the MTEBI

Larry G Enochs

Professor Emeritus

Science and Mathematics Education

Oregon State University

Corvallis, OR 97331

541-829-4777

enochsl@onid.orst.edu

http://smed.science.oregonstate.edu/node/42

“Students should continue to learn and use their learning in more effective problem solving for the rest of their lives. When one takes life-long learning and thinking as the major goal of education, knowledge becomes a means rather than an end, and other formerly implicit goals become more explicit.” (McKeachie et al, 1986, p1.)

On Jun 10, 2014, at 7:05 PM, "Plemons, Stacy" <splemons3@liberty.edu> wrote:

Dr. Enochs,

I am a doctoral student from Liberty University writing my dissertation on middle school mathematics teacher self-efficacy for teaching Common Core State Standards under the direction of my dissertation committee chaired Dr. Scott Watson. I am writing to request to use your Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) as described in article, "Establishing Factorial Validity of the Mathematics Teaching Efficacy Beliefs Instrument," in the April 2000 issue of *School Science and Mathematics* in my study. The only planned modification to the instrument is to change the verb tense from future to present tense as I plan to survey inservice teachers and to modify the instrument to be administered through an electronic survey.

Please respond to let me know if you agree to my use of the MTEBI. I am happy to provide additional information or answer any questions you may have about my study.

Sincerely,

Stacy Plemons

EdD Student, Liberty University

APPENDIX B

Participant Survey

*These questions were put SurveyMonkey® and were administered electronically

Teacher Survey for Dissertation Study: THE RELATIONSHIP BETWEEN MIDDLE SCHOOL MATHEMATICS TEACHER BACKGROUND AND SELF-EFFICACY DURING THE TRANSITION TO COMMON CORE

1. Part 1 of 2: Demographics and Common Core Opinion
Completion of this survey implies that you have read and agree to the terms stated in the Participant Consent Form and Survey Instructions attached to the email containing the survey link. The survey should take approximately 10 minutes to complete. Thank you for your time and participation!

1. What grade level(s) do you teach mathematics? (select all that apply)

6 7 8

2. Please select the best description of your certification.

Elementary k-6

Elementary k-8 or 1-8

Middle grades 4-8 or 5-8

Secondary mathematics 7-12

Alternative licensure, please specify ____________

3. Including this school year, how many years have you taught middle grades mathematics? _____

4. What is your gender?

Female Male

5. How many mathematics course credit hours did you take in college? (A typical course is three credit hours. Please make your best estimate if you cannot remember the exact number) ______

6. How many TNCore sponsored mathematics training days have you attended? _____

Please indicate the degree to which you agree with each statement with regards to teaching mathematics under Common Core State Standards.

7. Most students will benefit from the transition to Common Core State Standards in mathematics.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

8. I have the training I need to be successful in teaching middle school mathematics under the Common Core State Standards.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

9. I have changed my teaching strategies to teach Common Core State Standards.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

10. I enjoy teaching math from Common Core State Standards to middle grade students.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

11. The transition to teaching Common Core State Standards has been easy.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

12. The transition to Common Core State Standards will be worthwhile for improving student college and career readiness.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

13. If given the option, I would continue teaching the Tennessee SPIs rather than CCSS.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

14. I am considering retiring earlier than planned or changing careers due to the struggle associated with the transition to new standards.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

15. My greatest concern about teaching Common Core State Standards in mathematics to middle grades students is (select up to two):

Student ability or background knowledge

Student motivation

Teacher motivation

Administrative support

Parental and/or community support

Lack of adequate teacher training

Lack of teaching resources and materials

Classroom management issues

Additional time required to plan lessons or grade student work

Feeling of constant change and uncertainty

Concern with high stakes standardized assessment measures

16. Additional comments or concerns about teaching CCSS mathematics to middle grades

students. ____

Please select next to go on to page 2.

Teacher Survey for Dissertation Study: THE RELATIONSHIP BETWEEN MIDDLE SCHOOL MATHEMATICS TEACHER BACKGROUND AND SELF-EFFICACY DURING THE TRANSITION TO COMMON CORE

2. Part 2 of 2: Mathematics Teach Efficacy Beliefs Instrument (modified for inservice teachers)

Please indicate the degree to which you agree with each statement with regards to teaching Common Core State Standards in mathematics by selecting the appropriate bubble under each answer option.

17. When a student does better in mathematics, it is often because the teacher exerted a little extra effort.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

18. I continually find better way to teach mathematics.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

19. Even if I try very hard, I do not teach mathematics as well as most subjects.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

20. When the mathematics grades of a student improve, it is most often due to their teacher having found a more effective teaching approach.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

21. I know how to teach mathematical concepts effectively.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

22. I am not very effective at monitoring mathematics activities.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

23. If students are under achieving in mathematics, it is most likely due to ineffective mathematics teaching.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

24. I generally teach mathematics ineffectively.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

25. The inadequacy of a student's mathematics background can be overcome with good mathematics teaching.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

26. When a low achieving child progresses in mathematics, it is usually due to extra attention by the teacher.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

27. I understand mathematics concepts well enough to be effective in teaching middle school mathematics.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

28. The teacher is generally responsible for the achievement of students in mathematics.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

29. Students' achievement in mathematics is directly related to their teacher's effectiveness in mathematics teaching.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

30. If parents comment their child is showing more interest in mathematics at school, it is probably due to the performance of their child's teacher.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

31. I find it difficult to use manipulative to show students why a mathematics works.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

32. I am typically able to answer students' questions.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

33. I wonder if I have the necessary skills to teach mathematics.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

34. Given a choice, I do not invite the principal to evaluate my mathematics teaching.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

35. When a student has difficulty understanding a mathematics concept, I am usually at a loss as to how to help the student understand it better.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

36. When teaching mathematics, I usually welcome student questions.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

37. I do not know what to do to turn students on to mathematics.

Strongly Disagree Disagree Uncertain Agree Strongly Agree

Please select "Done" at the bottom of the page to submit your answers. I can be contacted at splemons3@liberty.edu with any questions, comments, or concerns. Thank you so much for your time and participation!

APPENDIX C

Letter to Superintendent/Director of Schools

Date: September **, 2014

XXXXXXX
Superintendent of Schools
[Company]
[Address 1]
[Address 2]
[Address 3]

Dear *XXXXXX*:

As a graduate student at Liberty University, I am conducting research as part of the requirements for a Doctor of Education (Ed.D) degree in Curriculum & Instruction. The tentative title of my research project is The Relationship between Middle School Mathematics Teacher Background and Self-Efficacy during the Transition to Common Core and the purpose of my research is to evaluate the effect of teacher background training as measured by college mathematics course hours taken and number of TNCore mathematics training days attended. I am focusing on schools in the CORE East Tennessee region.

I am writing to request your permission to survey mathematics teachers in grades six, seven, and eight in the *XXXXXX* School System.

Upon you approval, I will contact school principals or the district middle school mathematics coordinator, if you suggest, to request assistants in the electronic distribution of the participant information and consent letter and link to the survey to teacher of the correct grade level and subject area. Participants will be asked to click on the link provided and complete the survey created through SurveyMonkey®. The data will be combined with other school districts in the CORE East TN division to be analyzed for research purposes only. Individual participants, schools, and school districts will not be identified in the reporting of the research. Participants will be presented with informed consent information prior to participating. Taking part in this study is completely voluntary, and participants are welcome to discontinue participation at any time.

Thank you for considering my request**. If you choose to grant permission, please indicate such in a signed statement on district-approved letterhead and**

mail to:	**or**	**fax to:**
Stacy Plemons		Stacy Plemons

Address 1 *XXX-XXX-XXXX*
Address 2

Sincerely,

Stacy Plemons
Liberty University Doctoral Student

APPENDIX D

Letter to Principals
XXXXXXX
Principal
[Company]
[Address 1]
[Address 2]
[Address 3]

Dear XXXXXX:

As a graduate student at Liberty University, I am conducting research as part of the requirements for a Doctor of Education (Ed.D.) degree in Curriculum & Instruction. The tentative title of my research project is The Relationship between Middle School Mathematics Teacher Background and Self-Efficacy during the Transition to Common Core and the purpose of my research is to evaluate the effect of teacher background training as measured by college mathematics course hours taken and number of TNCore mathematics training days attended.

I am writing to request your permission to survey mathematics teachers in grades six, seven, and eight in *XXXXXX* School. Permission has already been granted by the school system superintendent.

Upon you approval, please email confirmation of your permission to me at splemons3@liberty.edu and include the email addresses of the mathematics teachers for grades 6, 7, and 8 at your school, or I can send you the consent letter and link to the survey to teacher of the correct grade level and subject area for you to forward to your mathematics teachers for grades 6, 7, and 8. Participants will be asked to *click on the link provided and complete the survey created through SurveyMonkey®.* The data will be *combined with other school districts in the CORE East TN division to be analyzed for research purposes only. Individual participants, schools, and school districts will not be identified in the reporting of the research.* Participants will be presented with informed consent information prior to participating. Taking part in this study is completely voluntary, and participants are welcome to discontinue participation at any time. Please feel free to contact me with further questions. Thank you for considering my request.

Sincerely,
Stacy Plemons
Liberty University Doctoral Student

Appendix E

PARTICIPANT CONSENT FORM AND SURVEY DIRECTIONS

The Relationship between Middle School Mathematics Teacher Background and Self-Efficacy during the Transition to Common Core

Stacy Plemons
Liberty University
Doctor of Education

You are invited to be in a research study of the relationship between teacher background training and self-efficacy for teaching middle school mathematics. You were selected as a possible participant because teach mathematics in grades 6, 7, or 8 in a school district in a TN CORE East school district. Please read the following information before completing the survey. Completion of the survey will indicate your consent for your responses to be used the described study. Participation in the survey is optional and you may discontinue at any point.

Background Information:

The purpose of this study is to investigate the relationship between teacher background training and self-efficacy for teaching middle school mathematics.

Procedures:

If you agree to be in this study, I would ask you to go to the following website by clicking the link or pasting it in your browser and complete the survey via SurveyMonkey®. The survey should take about 10 minutes to complete. Please be honest in your answers as confidentiality will be maintained.

Risks and Benefits of being in the Study:

The study has minimal foreseen risks as the survey will be conducted anonymously. All mathematics teachers for grades 6, 7, and 8 in the TN CORE East region will be invited to take the survey, and the researcher will not be able to discern your answers from any other survey answers provided you do not include your name in any of the written response answers. The data will be used for analysis in the described dissertation study and have the potential to be published, however, anonymity and confidentiality will be maintained.

Compensation:

There will not be compensation for your participation in the survey.

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions:

The researcher conducting this study is Stacy Plemons. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at splemons3@liberty.edu

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd, Suite 1837, Lynchburg, VA 24515 or email at irb@liberty.edu.

Please notify the researcher if you would like a copy of this information to keep for your records.

Statement of Consent:

I have read and understood the above information. I have asked questions and have received answers. Your completion of the online survey implies your consent to participate in the study.

Thank you for your time and participation!

Sincerely,

Stacy Plemons
Liberty University Doctoral Student