THE RELATIONSHIP BETWEEN ELEMENTARY TEACHERS’ BACKGROUND IN MATHEMATICS, TEACHING SELF-EFFICACY, AND TEACHING OUTCOME EXPECTANCY WHEN IMPLEMENTING THE COMMON CORE STATE STANDARDS

by

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Liberty University

A Dissertation Presented in Partial Fulfillment Of the Requirements for the Degree

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ABSTRACT

The purpose of this correlation study was to identify a possible relationship between elementary teacher background in mathematics as measured by completed college math credit hours, district-provided professional development hours of training in Common Core math standards, and years of teaching experience, and teacher efficacy in math as measured by personal teaching self efficacy and outcome expectancy. The sample in the present study consisted of 69 elementary (K-5) math teachers in a medium-sized semi-rural district located within a southern state. The data was collected using the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI), an online survey that was sent to the teachers through their district email. Additional questions were added to the survey to collect information about teacher background training. A non-parametric Kendall’s Tau B analysis was conducted to assess the hypothesized relationship. A significant, positive relationship was found between years of teaching experience and teacher self efficacy, but not with outcome expectancy. Additionally, a significant, positive relationship was found between teacher self-efficacy and outcome expectancy. Results displayed no significant relationship between college credit hours or district-provided training hours with teacher self-efficacy or outcome expectancy.

Keywords: self-efficacy, mathematics, common core, teacher background, reform, teacher efficacy
Dedication

This work is dedicated to my sweet miracle boy, Noah. He has given me purpose and drive and it is because of him that I pushed through on this journey. He has shown me that I can be a dedicated mama and a student all at once. Much of my homework was completed during naptimes, very early mornings, and late nights, but I pushed through so he can know that all things can be done with Christ’s help and a large amount of determination.

Noah – never forget that your mama loves you, your daddy loves you, and Jesus loves you most of all!!


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First and foremost, I thank God for bringing me to Liberty University. He has blessed me with classmates who will be forever friends, and a greater spiritual understanding through this school and experience.

I am also forever thankful for the support of my husband who continued to push me and support me through my program. I started classes just before becoming pregnant with our son, and am finishing it as he turns 2 ½. In this time, my husband has stood by my side, taking over parent duties when needed so that I can have study time. He encouraged me whenever I felt discouraged and showed his love and dedication over the past few years. I could not have done it without him!

Dr. Barthlow has proven to be the greatest committee chairperson I could have had! She’s talked me through the ups and downs of the research process and guided me through my tears when things weren’t going the way I wished they were. I am so thankful God placed her in my path!
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List of Abbreviations

American Recovery and Reinvestment Act (ARRA)
Common Core State Standards (CCSS)
Council of Chief State School Officers (CCSO)
Florida Department of Education (FLDOE)
Language Arts Florida Standards (LAFS)
Mathematics Florida Standards (MAFS)
Mathematics Teaching Association (MTA)
Mathematics Teaching Efficacy Beliefs Instrument (MTEBI)
Mathematics Teaching Outcome Expectancy (MTOE)
National Governor’s Association (NGA)
National Assessment of Educational Progress (NAEP)
No Child Left Behind (NCLB)
Personal Mathematics Teaching Efficacy (PMTE)
Race to the Top (R2T)
Science, Technology, Engineering, and Mathematics (STEM)
Statistical Package for the Social Sciences (SPSS)
CHAPTER ONE: INTRODUCTION

Overview

A shortage of United States students entering careers in Science, Technology, Engineering, and Mathematics (STEM) has brought more attention to math instruction (Epstein & Miller, 2011; Rice, Barth, Guadagno, Smith, & McCallum, 2012). Math is one of the main academic subjects taught in American public schools. Students establish their mathematical foundation in elementary school and this foundation can directly affect student success in math throughout their entire academic career (Jordan, Glutting, & Ramineni, 2010). Teacher efficacy, comprised of self-efficacy and outcome expectancy (Enochs, Smith, & Huinker, 2000; Tschannen-Moran, Hoy, & Hoy, 1998), is one area of education that has been receiving more attention over recent years. Teachers who report higher teaching efficacy overall are more likely to follow and teach a curriculum in which they are efficacious (Martin, McCaughtry, Hodges-Kulinna, & Cothran, 2008) as well as demonstrate increased job performance (Olayiwola, 2011). Consequently, it is essential to understand variables that may be related to improving teacher efficacy within a specific curriculum in order to improve overall teaching efficacy. Policy makers, teachers, and parents recently developed new standards known as the Common Core State Standards (CCSS,) (Common Core State Standards [CCSS], 2015) that have been adopted in some form by the majority of the United States, though there has been a trend of states repealing and/or adjusting the CCSS to better suit the needs of the individual state (Academics Benchmarks, 2015). This study will seek to determine a relationship between elementary teacher background and teacher efficacy in math instruction while implementing the new CCSS (CCSS, 2015) that have changed the ways many elementary teachers must teach mathematics (Barrett, 2014; Porter, McMaken, Hwang, & Yang, 2011; Wumran & Wilson, 2012). The study will
focus on elementary teachers’ background, more specifically college credit hours in mathematics, professional development in Common Core Mathematics, as well as years of experience teaching math. Chapter One provides an introduction to the study. Included in Chapter One is the background on the topic, a problem statement that identifies a gap in the literature of previous research, information about the significance of the study, the research questions and corresponding null hypotheses, and also a section of definitions of necessary terms used within the study.

**Background**

Teachers in elementary schools come from many diverse backgrounds that may be related to their beliefs in ability to teach mathematics and their ability to guide students in math instruction successfully (Scarpello, 2010). The math instruction students receive in elementary school is the groundwork of their future academic career within math, indicating the importance of fruitful math training (Jordan, Glutting, & Ramineni, 2010). Unlike their peers in most middle and high schools, which are departmentalized according to subject area, elementary teachers typically teach all subject areas, including math; because of this, few elementary teachers have extensive backgrounds specifically in mathematics (Scarpello, 2010). Research has shown that the greater understanding an educator has in the area of math, such as that found in a rigorous calculus or statistics course (Epstein & Miller, 2011), the higher their math teaching self-efficacy, or belief in their abilities to teach math (Enochs, Smith, & Huinker, 2000), and outcome expectancy, the expectation of the teaching to result in learning (Enochs et al., 2000); furthermore, teaching efficacy has been determined to directly affect student performance in math (Bong, & Clark, 1999; Bates, Kim, & Latham, 2011). Student attitudes towards math and personal math efficacy are also directly affected by the teachers’ level of support in math and
personal attitudes towards math, which are often determined by the teachers’ math background (Rice, Barth, Guadagno, Smith, & McCallum, 2013; Sparrow & Hurst, 2010). For the purpose of this study, teacher background will be defined by previously completed hours in mathematics, years of teaching experience, and hours received of in-service training in Common Core math standards. When students are placed in positive learning environments and are given the opportunity to display success early in math, they have proven to be greater prepared for careers in the areas of science, technology, engineering, and mathematics (STEM) (Jordan, Glutting, & Ramineni, 2010).

To understand the concepts of self-efficacy and outcome expectancy and how they are related to education and student success in math, it is first important to understand the history behind the concepts. Psychologist Julian Rotter sought to determine the level of personal performance and contribution towards a situation contingent upon the beliefs related to reward and consequence (Rotter, 1966). Coined “locus of control,” this concept is divided into external control, when an individual has little to no control on a specific outcome, and internal control, when an individual considers an events’ outcomes to be contingent upon his or her behavior and/or personal characteristics (Rotter, 1966). Self-efficacy and outcome expectancy are concepts that resulted from studies on the locus of control and social cognitive behaviors. Bandura described self-efficacy as one’s perception of individual ability to perform a task successfully (Bandura, 1977, 2012; Carleton, Fitch, & Krockover, 2008). Tschannen-Moran, Hoy, and Hoy (1998) describe the difference between the concepts of locus of control and self-efficacy when they explain, “an individual may believe that a particular outcome is internal and controllable… but still have little confidence that he or she can accomplish the necessary actions” (p. 211). Outcome expectancy, a concept also revealed by Bandura (1977), is the extent
to which individuals perceive their behaviors will achieve the desired outcome. To further understand self-efficacy and outcome expectancy in teaching, Tschannen-Moran et al. related the concepts specifically to teacher efficacy to study teachers’ beliefs in their ability to perform teaching tasks and achieve desired learning outcomes in students as a result of their teaching. For the purpose of this study, the term teacher efficacy will be used when referring to both self-efficacy and outcome expectancy of the teacher.

Presently in the United States, education is experiencing drastic changes to the traditional system following the reform initiatives connected with the No Child Left Behind (NCLB) Act of 2001 (No Child Left Behind [NCLB], 2002) and the Race to the Top (R2T) grant program funded by the American Recovery and Reinvestment Act of 2009 (ARRA) (American Recovery and Reinvestment Act [ARRA], 2009); both of these place emphasis on returning the United States to the top of the competitive international education systems (McGuinn, 2014). When the NCLB Act of 2001 (NCLB, 2002) was passed by the George W. Bush administration, teacher expectations were changed, requiring teachers to achieve a status referred to as “highly qualified” so as to place the best possible teachers in America’s public school classrooms (McGuinn, 2014).

One way the education system attempted to meet the NCLB (NCLB, 2002) expected goal of 100% student proficiency by 2014 (Kubiszyn & Borich, 2013) was to adjust the academic standards being taught. Reviewing the previously adopted state standards, however, revealed 50 different sets of standards, often lacking in uniformity from one state to another (Kubiszyn & Borich, 2013). In order to better prepare students for college and career success and reach uniformity among all states, national standards, known as the Common Core State Standards (CCSS) (Common Core State Standards [CCSS] Initiative, 2015a) were developed by policy
makers with the help of teachers. The development and implementation of these standards was an attempt to increase expectations and uniformity throughout education standards, including math (Porter, McMaken, Hwang, & Yang, 2011). Ideally, if a student was to move from one state to another between grade levels, he would have had the same instruction in his old state than the students in his new state had, making it a smoother move into the following grade level.

The transition from traditional state standards to the CCSS (CCSS, 2015a) appears to have dramatically increased expectations in math performance from kindergarten through sixth grade for nearly all states (Wurman & Wilson, 2012). Porter et al. (2011) describe the change as a modest growth for all states, though the difference from state to state varies accordingly with their previously adopted standards. The CCSS (CCSS, 2015a) also encourage higher-level cognitive thinking for students and an increase in expected demonstration activities, where teachers are to observe students demonstrating their thinking as opposed to simply reciting knowledge (Faulkner, 2013; Porter et al., 2011). As of 2015, 42 states have adopted some form of the CCSS in math (CCSS, 2015b). With so many states having adopted the standards, teachers nationwide have been expected to adapt their methods of instruction in mathematics in order to obtain student mastery of the new standards. Many teachers have undergone professional development and trainings to work with these drastic changes and improve their ability to meet CCSS objectives.

Whether a teacher believes he can help his students meet the increased expectations of the math instruction is expressed by his teacher efficacy, combined of self-efficacy and outcome expectancy. These concepts are developed within Bandura’s social cognitive theory (Miller, 2011). Bandura (1997, 2012) posits that one’s surrounding environment has the power to impact motivation depending on whether the individual believes there will be a reward or consequence
resulting in chosen behaviors. Success and failure is a part of this environment. Success results in increased efficacy (Bandura, 2012). When teachers have experienced past successes, they are more likely to become efficacious in their teaching ability within that subject as well as display an increase in outcome expectancy (McCormick, Ayres, & Beechey, 2006). Adversely, a negative correlation is found between past failures and individual self-efficacy and outcome expectancy (Bandura, 2012; McCormick, Ayres, & Beechey, 2006). The theory behind teacher efficacy has repeatedly proven that people develop beliefs about their ability to cope with change (Enochs, Smith, & Huinker, 2000). Because change is inevitable within organizations, it is essential for all members within an organization to be confident in their ability to adapt with the changes (Morgan, 2006).

As teachers work to adapt to the changes brought on by continued reform initiatives and CCSS (CCSS, 2015a), their students’ performance could potentially be affected positively or negatively by their own personal teaching self-efficacy and outcome expectancy. Teachers’ past math experiences, abilities, and understanding can also impact student performance through their attitudes and efficacy beliefs (Bong, & Clark, 1999; Bates, Latham, & Kim, 2011; Rice, Barth, Guadagno, Smith, & McCallum, 2013; Sparrow & Hurst, 2010). Student success in math in elementary school has the potential to better prepare them for competitive careers in the STEM areas (Jordan, Glutting, & Ramineni, 2010), indicating a serious need for successful math instruction and learning. Developments in the social cognitive theories of locus of control, self-efficacy, and outcome expectancy have resulted in a better understanding in the beliefs of the extent to which teachers’ beliefs and behaviors can affect learning outcomes (Bandura, 1997, 2012; Carleton, Fitch, & Krockover, 2008; Rotter, 1966; Tschannen-Moran, Hoy, & Hoy, 1998).
Problem Statement

A significant portion of the research conducted in the area of math teaching self-efficacy and outcome expectancy has been done with preservice teachers who are involved in some form of teacher training (e.g., Bates, Kim, & Latham, 2011; Brown, 2012; Gresham, 2009; Isiksal, 2010). Little research, however, has been done to assess the teacher efficacy of teachers who are working with students on a day-to-day basis, implementing curriculum, assessing students, and continually working to increase knowledge on the changing environments within which they are employed. Due to this, there appears to be a gap in understanding teacher efficacy of in-service elementary math teachers while undergoing imposed reform, such as CCSS. Olgan, Alpaslan, and Öztékîn (2014) call for the need to not only study preservice teachers but also in-service teachers. Imposed environments found in reform initiatives, such as those connected with the NCLB (NCLB, 2002) and CCSS (CCSS, 2015a), can negatively affect teacher efficacy (Bandura, 2012; Cerit, 2013). With the influence of teacher efficacy and support, it is imperative to understand the aspects of self-efficacy and means of improving teachers’ efficacy in order to encourage their support of the required changes. Bandura (2012) calls for research regarding not the aspect of self-efficacy alone but along with other factors affecting motivation and behavior from his Social-Cognitive theory. Some of these factors include environmental enablers and impediments, as well as outcome expectancy (Bandura, 2012), which will be considered in the present study in the form of teacher background and outcome expectancy rates along with self-efficacy.

The problem is new, rigorous math standard reform requires more training and changes in traditional teaching methods to encourage successful reform implementation, which relies heavily on teacher efficacy levels (Cerit, 2013); there is a great need to understand which factors,
including teacher background, are related to teacher efficacy of in-service teachers (Olgan, Alpaslan, & Öztekin, 2014) who are presently teaching the new elementary CCSS (CCSS, 2015a) in mathematics.

**Purpose Statement**

The purpose of this bivariate correlation study is to determine if there is a relationship between elementary teachers’ background training and their self-efficacy in teaching Common Core State Standards. The study will involve the process of surveying in-service elementary math teachers in a southern school district. The predictor variable in the study is teacher background. Teacher background will include completed college credit hours in mathematics, hours in professional development focused on CCSS math, and years of teaching experience. The criterion variable in the study will be teacher efficacy, including teacher math self-efficacy and math outcome expectancy. Self-efficacy is a personal belief in ability to perform a specific teaching task (Bandura, 1977). Teacher outcome expectancy is the extent to which the teacher believes that his students will be able to learn from his teaching (Newton, Evans, Leonard, & Eastburn, 2012). Teachers surveyed will be elementary (K-5) teachers who teach math in a medium-sized, semi-rural southern school district. All teachers from the 32 elementary schools within the district will be contacted to participate in the survey.

**Significance of the Study**

The math standards of Common Core State Standards (CCSS, 2015a) have drastically changed the level of expectations in student performance and demonstration of a variety of skills in elementary mathematics (Faulkner, 2013; Porter, McMaken, Hwang, & Yang, 2011; Wurman & Wilson, 2012). With this increase of expectations, teachers across the nation have had to adjust their methods of teaching to match the requirements of CCSS. Barrett (2014) expresses
concern that when the Massachusetts Teaching Association (MTA) and Teach Plus Greater Boston conducted a survey of educators, only just over half of those teachers felt prepared to teach the CCSS. This means that just under half of educators teaching CCSS (CCSS, 2015) did not feel prepared for the instruction they were expected to be giving. Additionally, the MTA and Teach Plus survey results showed that teachers who’d received more training were more likely to support the new standards (Barrett, 2014). Teacher efficacy, comprised of self-efficacy, a teacher’s belief in his ability to provide instruction, and outcome expectancy, the teacher’s confidence that students will learn from his teaching (Enochs, Smith, & Huinker, 2000), has proven to be the best predictor of student achievement (Bong & Clark, 1999; McCormick & McPherson, 2003).

While looking at teacher background as it relates to teacher efficacy, this study will investigate the relationship between the two. Research has already been done in preservice teachers and has found positive relationships between math understanding and higher teaching efficacy (Bates, Kim, & Latham, 2011), as well as between math content knowledge and teaching efficacy (Newton, Evans, Leonard, & Eastburn, 2012). Carleton, Fitch, and Krockover (2008) as well as Mohamadi and Asadzadeh (2012) indicate that there is still a great level of uncertainty in how teaching efficacy can be acquired and/or improved.

This study is significant in that it will provide vital information to the field of education as to which aspects of teacher background, such as completed college credit hours in mathematics, in-service professional development focused on CCSS math, and years of teaching experience in math, may be related to self-efficacy in teaching and outcome expectancy of the teacher. These results could be used to encourage more preservice college math requirements, more in-service professional development, and greater support for less experienced teachers of
math in order to build stronger efficacy so that teachers can provide students with the best opportunity to succeed.

Research Questions

RQ1: Is there a relationship between elementary teachers’ background training in mathematics and teaching self-efficacy while implementing instruction of Common Core State Standards for Mathematics?

RQ2: Is there a relationship between elementary teachers’ background training in mathematics and teaching outcome expectancy while implementing instruction of Common Core State Standards for Mathematics?

RQ3: Is there a relationship between elementary teachers’ self-efficacy and teacher outcome expectancy while implementing instruction of Common Core State Standards for Mathematics?

Definitions

1. Common Core State Standards – Standards developed with the intention to ensure uniformity among public schools across the nation (Porter, McMaken, Hwang, & Yang, 2011).

2. Outcome Expectancy – The extent to which one perceives his or her actions will achieve desired results (Enochs, Smith, & Huinker, 2000).

3. Self-efficacy – One’s perceptions of his or her ability to control events within his or her life (Bandura, 1977)

4. Teacher Background – Experiences, prior knowledge, and values that teachers bring with them to the classroom that shape their beliefs and behaviors (McCormick & Ayres, 2009).
5. *Teacher Efficacy* – A teacher’s beliefs in the extent to which he or she can control the results of his or her actions and teaching (Tschannen-Moran, Hoy, & Hoy, 1998).
CHAPTER TWO: LITERATURE REVIEW

Overview

This chapter begins with the theoretical framework that guides this study. Those theories include the theory of locus of control and the theory of self-efficacy. The theoretical framework is followed by a thorough review of the literature in the Related Literature section. Topics reviewed are reform in education, teacher efficacy, and teacher background, which consists of college credit hours in mathematics, hours of professional development, and years of teaching experience. The chapter concludes with a summary.

Theoretical Framework

The concept of locus of control refers to the extent to which people have the ability to exercise control over events in their own life, or in the situation of a teacher, over events within the classroom (Cook, 2012). Rotter (1966) theorized this concept in response to the natural phenomenon of human perception of merit in regards to reward and consequence to actions, positing that the amount of self-worth an individual feels towards consequences is directly connected to the degree of which the individual believes he had control over the situation leading into such consequence. If one were to receive a prestigious award for a lifetime’s worth of work, naturally, due to the amount of time and effort, she would appropriately feel that the recognition is directly related to her work. Alternatively, if the award were presented in error, whether she chose to accept it or not, internally she would likely not feel that she was in control or deserving of such an award.

Two forms of locus of control were described in Rotter’s (1966) work: external locus of control and internal locus of control. External locus of control refers to the perception an individual has of his own level of control over different events taking place in his life and to
what degree he attributes such events to concepts such as fate, chance, and luck (Rotter, 1966). Akça (2013) uses the concepts “destiny, fortune, and power” (p. 136) to which those of external control attribute their experiences and occurrences in life. Though many people seek to gain and maintain control over the events and circumstances in their lives, there are some things in life that cannot be controlled and fall into the realm of external locus of control. Teachers can seldom choose their students’ backgrounds and/or home life; therefore, teachers who perceive greater external locus of control would be more likely to pass off student performance to things outside of the teacher’s control than on the effectiveness of their teaching.

The second locus of control, internal, represents the perception that an event is contingent upon one’s own behavior choices or characteristics (Rotter, 1966). When people perceive they have control over their circumstances and the events occurring in their lives they are more likely to change their behavior in order to obtain the desired result. Internal locus of control often represents a level of success that is dictated by the individual’s skill set, ability, and effort (Akça, 2013). A teacher with strong internal locus of control would believe that a student’s performance were directly related to her instruction and, if desiring student success, would seek to do everything she could to ensure that her student was receiving the best instruction she could provide. Studies have shown that a positive relationship between students with internal control and success in academic areas (Akça, 2013). Along with the locus of control, self-efficacy also plays a great part in individuals’ decision-making and control.

In an effort to better understand individual behavioral change and coping behaviors people demonstrate, Bandura (1977) developed the theory of self-efficacy and has since spent decades studying, defining, and refining the theoretical concept. Bandura (2012) makes sure to note that though they may be easily confused, self-efficacy and self-esteem are not the same, as
self-esteem refers to self-worth; self-efficacy refers to a belief in one’s ability. Kilday, Lenser, & Miller (2016) define self-efficacy as the perception one holds in his ability to perform a specific task as well as to achieve a desired outcome; this outcome is referred to as outcome expectancy, and is a vital component of self-efficacy (Bandura, 1977). In regards to self-efficacy, Bandura (1977) states that, “The strength of people’s convictions is likely to affect whether they will even try to cope with given situations” (p. 193). According to this concept, people’s level of self-efficacy and outcome expectancy could potentially affect their perceptions related to their internal locus of control. Beliefs of self-efficacy have been proven to directly determine and impact people’s behaviors in various situations (Bates, Kim, & Latham, 2011). Bandura (2012) explains that individuals are capable and responsible for the direction their lives can take, as well as for the events that take place within their lives, or at least for how people choose to respond to such events.

It is in human nature that as people grow and gain new experiences, their beliefs about their ability to cope with change develop and grow (Enochs, Smith, & Huinker, 2007). People are not restricted to prescribed responses and reactions towards change, but are able to impact their individual responses (Bandura, 2012). These growing coping beliefs are the underlying building blocks that form an individual’s level of self-efficacy. Developing self-efficacy beliefs based on capabilities is the first step people take towards the responsibility of understanding and subsequently determining what they plan to do with their abilities and knowledge they have obtained (Bates et al., 2011). Whether they are aware of these decisions they are making, or if they are doing so subconsciously, the results of such decisions can greatly impact the behaviors people use, all based on people’s individual self-efficacy. The environment within which one exists can greatly impact the motivation behind his behavior and self-efficacy (Bandura, 1977).
Bandura (2012) claims that self-efficacy can be not only simply affected by external factors, but that it can actually be distorted by those external factors, depending on the circumstances; Bandura also states that people’s perceptions of environmental structure characteristics can impact the actions and behaviors they take. Added stress pressure in the workplace, for example, could potentially negatively affect one’s self-efficacy in regards to performance ability. Additionally, past successes have been shown to increase self-efficacy levels in the areas of which the success was obtained (Bandura, 1997; McCormick, Ayres, & Beechey, 2006). These past successes, referred to as Mastery Experiences (Bandura, 1997) have repeatedly proven to have some of the greatest impacts on an individual’s self-efficacy as past success encourages individuals to put forth greater effort towards future tasks of similar nature (Mohamadi & Asadzadeh, 2012). Alternatively, repeated failure can have the opposite effect, hindering one’s perceived efficacy, regardless of actual ability or external factors (Mohamadi & Asadzadeh, 2012).

Self-efficacy has repeatedly proven to be the greatest predictor of achievement and highly correlates with past success and achievements in studies measuring motivation and self-efficacy (Bandura, 1997; Bong & Clark, 1999; Sitzman & Yeo, 2013). An increase in self-efficacy leads to more effort put towards a task as well as more effort and motivation to overcome obstacles (Bandura, 2012). “Self-efficacy beliefs influence how well people motivate themselves and persevere in the face of difficulties through the goals they set for themselves, their outcome expectations, and causal attributions for their successes and failures” (Bandura, 2012). Self-efficacy in mathematics can also improve an individual’s performance and effort put into completing mathematical problems, regardless of a person’s actual mathematical ability (Bates et al., 2011). If self-efficacy has the power to affect motivation and perseverance, it is vital to
understand the various forms of self-efficacy that could potentially influence one’s performance and behaviors as they apply to different responsibilities and positions. Self-efficacy can be related to many specific aspects of a person’s life, including teachers’ individual self-efficacy as regards to their teaching.

Related Literature

Elementary school is the foundation of formal education for children all across the United States. Though elementary students are far from making lifelong career selections, research has proven that students who are successful in math in their early grades are also successful later in careers involving science, technology, engineering, and mathematics (STEM) (Epstein & Miller, 2011). With the increase of technology in society, it may be assumed that there would be an overabundance of people applying for these positions. On the contrary, Rice, Barth, Guadagno, Smith, and McCallum (2012) indicate that there is a severe shortage of students attempting to enter careers in these areas. Due to this shortage, a greater amount of attention has been directed towards education within the STEM areas as well as preparing students for college and career-training readiness (Rice et al., 2012). Curriculum and standards are not the only important aspect of instruction; the teachers giving the instruction are placed in a vital position and must not be overlooked. Understanding what guides the teachers and providing them with the means of which to teach with confidence and assurance is essential for the success of the educational system. Elementary teachers typically teach all academic subjects including math, science, reading, writing, and social studies. Though content knowledge is not always an indicator of effective teaching (Boyd et al., 2012), most elementary teachers do not have extensive training in math (Epstein & Miller, 2011). A teacher’s prior experiences related to math can directly affect the teacher’s efficacy about teaching math (Newton, Evans, Leonard, & Eastburn, 2012).
Teacher efficacy has repeatedly been linked to student performance (Mohamadi & Asadzadeh, 2012; Varghese, Garwood, Bratsch-Hines, Vernon-Feagans, 2016), making it imperative to fully understand what can be done to help teachers increase efficacy and provide the teachers with what they need to ensure student-learning success. Despite the increased standards and expectations of students in math, the National Assessment of Educational Progress (NAEP), only 41% of Florida fourth grade students received a score considered proficient or above in math (The Nation’s Report Card, 2013). Between the 2011 and 2013 assessments, Florida fourth grade math student scores showed no significant change, regardless of statewide efforts to improve their scores (The Nation’s Report Card, 2013). Clearly, something more must be done to encourage these students and guide them with needed instruction. Chapter Two looks at reform in the educational system, a theoretical/conceptual framework, the importance of teacher background, and how all of these merge together.

Reform in Education

History of educational reform.

Public education in the United States is a systematic organization that operates to educate the children of the nation. According to Morgan (2006), the success of any organization rests in its ability to thrive on change with the intention of growth and improvement for the overall organization. Resistance to this change causes the organization to fade over time and allows other organizations the opportunity to take its place (Morgan, 2006). Public education has undergone many changes throughout its operating years. President Ronald Reagan’s National Commission on Excellence in Education drew national attention towards the inadequacies within the public education system when the Commission released a manuscript titled A Nation at Risk: The Imperative for Educational Reform in 1983 (Kapalka Richerme, 2012; Kubiszyn & Borich,
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2013, National Commission on Excellence in Education, 1983). This manuscript was released to address the issues of societal change. The Commission recognized that society was changing and education needed to rise up to meet the needs of these changes in order to provide successful, contributive citizens and prepare those young citizens for the changing workforce (Kapalka Richerme, 2012). This release led to an endless number of reform initiatives to provide better education and hold public schools, teachers, and administrators accountable for their performance (Kubiszyn & Borich, 2013).

Some major educational reform initiatives include “raising expectations, establishing academic and performance standards, Common Core State Standards (CCSS) (Common Core State Standards Initiative, 2010), high-stakes testing, greater accountability, incentives for improved performance, improved teacher salaries, local or site-based management and decision making, and innovations in teacher training” (Kubiszyn & Borich, 2013, p. 14). Bautista and Ortega-Ruiz (2015) explain that intense curriculum and instructional changes are some of the fundamental impacts of educational reform on teachers. Though these and more reform efforts often seek to regulate uniformity, there is a great issue at hand. McGuinn (2014) identifies the 50/14,000/130,000 problem as a major problem found in American education reform. This references the face that within the 50 states, there are approximately 14,000 public school districts; these districts govern roughly 130,000 schools, allowing for countless variations in education practices and methodologies (McGuinn, 2014).

Johnson (2014) warns that lack of sustainable funding is one cause of reform cessation. An overabundance of focus on short-term implementation as opposed to long-term transformations can also discourage educational systems to maintain reform (Johnson, 2014), which could open the door to yet another reform, a pattern that has been seen repeatedly over the
past few decades in education. Ferguson (2015) also establishes that the timelines, as well as the
over-expectations, that accompany education reforms are often unrealistic, not allowing full
implementation to be successful. When these reforms are deemed unsuccessful after a short
period of time, they are often immediately replaced by another reform system, causing the public
to lose faith in teachers’ and students’ abilities to succeed (Croft, Roberts, & Stenhouse, 2016).
For example, within a dozen years, three major reform initiatives, No Child Left Behind (NCLB,
2002), Race to the Top (ARRA, 2009), and Common Core State Standards (CCSS, 2015a), were
designed and put in place in an effort to fix the problems with the American education system.
Croft, Roberts, and Stenhouse (2016) warn that catastrophe is likely to ensue when a system
repeatedly attempts to align major reform initiatives.

Educational reform is not only an American phenomenon; global competition in
education has become a major priority in many countries. A United Kingdom manuscript
released in 1997 drew attention to this competition as it addressed the state of education (Parker-
Rees, 2011). This document, titled Excellence in Schools, challenged the education system to
increase its expectations and change its methodology to provide all, instead of some, students
with an equal opportunity to be successful in their academic careers with the end goal to increase
society and workforce productivity (Parker-Rees, 2011; Secretary of State for Education and
Employment, 1997). This reform initiative clearly demonstrates the importance of education as
it relates to the success of a society as a whole as well as how it dictates the direction a nation
can take in the global community.

The President George W. Bush administration passed the No Child Left Behind (NCLB)
Act of 2001 (No Child Left Behind [NCLB], 2002) in response to the United Kingdom’s
Excellence in Schools (Secretary of State for Education and Employment, 1997). This act
presented a lofty goal of 100% of public education students to demonstrate proficiency in both reading and math by 2014 as demonstrated by scores on standardized assessments (Kubiszyn & Borich, 2013; NCLB, 2002). To many present educators, NCLB represented the commencement for an influx in high-stakes testing put in place to measure the increase of standards and accountability. McGuinn (2014) posits one of the reasons NCLB was not met with success is due to the fact that it imposed superficial changes in educational practice by trying to force the states to change. Results of these changes led to political resistance within the states and significant gaps between the original objectives and the actual ability to implement the changes (McGuinn, 2014). For example, NCLB’s objective of achieving 100% student success resulted in what Croft, Roberts, and Stenhouse (2016) call a “colossal failure” (p. 72). Harris and Sass (2011) determined that teacher attitudes and efficacy levels are negatively affected when environments and initiatives are imposed upon them, especially without appropriate support. On a larger scale, this is what took place nationally with the implementation of the NCLB Act, with unrealistic expectations, a short time frame, and lack of public support (Croft, Roberts, & Stenhouse, 2016; Ferguson, 2015; McGuinn, 2014).

In response to the NCLB failure, a federal competitive grant program, Race to the Top (R2T), funded by the American Recovery and Reinvestment Act of 2009 (ARRA) (American Recovery and Reinvestment Act [ARRA], 2009), was proposed in 2009 (McGuinn, 2014). Together, NCLB and R2T are held revolutionary for incorporating the federal role in education and seeking to reform state schools (McGuinn, 2014). The purpose of R2T was to provide financial incentive to teachers, schools, and states to increase expectations and instructional quality to encourage students to perform more competitively on standardized assessments, as well as increase emphasis in STEM subject areas (U.S. Department of Education, 2009). It is a
grant that states can voluntarily apply for, as opposed to former grants that have allocated funds for states based on needs of students and schools according to demographics. When being considered for R2T grant funds, states are graded in these four areas: “development of common standards and assessments; improving teacher training, evaluation, and retention policies; developing better data systems; and the adoption of preferred school turnaround strategies” (McGuinn, 2014, p. 64). In 2010, Florida applied for R2T funds and was awarded $700 million; this amount was related to the population level and was the equivalent of New York’s funds allocation (U.S. Department of Education, 2010). Upon awarding of R2T funds, the Florida department of education sought out to aid school districts in an effort to improve methods of evaluation of teachers and principals (Florida Department of Education, 2013). The state also utilized funds to guide and prepare school districts for the upcoming transition to a nationally developed set of standard reform known as the Common Core State Standards (CCSS) (CCSS, 2015a).

**Common Core State Standards**

The development Common Core State Standards (CCSS) began in 2009 in an effort by state leaders to provide “consistent, real-world living goals” (CCSS, 2015a, para. 1). Governors and educational leaders alike recognized that schools in the United States are not graduating students who are best prepared to competitively participate among the competitive global market (National Governor’s Association [NGA], Council of Chief State School Officers [CCSO], & Achieve, 2008). The National Governor’s Association (NGA), Council of Chief State School Officers (CCSO), and Achieve, INC. (2008) posited that “more jobs are going to the best educated no matter where they live, which means that Americans will face more competition than ever for work” (p. 5). Developing the CCSS was in an effort to provide students with an
education what would better prepare them for the competitive workforce. After developing college and career readiness standards and K-12 standards in English language arts and mathematics, the CCSS were released in June 2010 and were adopted by 45 states in 2013; two years later, 42, three fewer, states including Florida chose to continue using state-revised versions of CCSS (CCSS, 2015a). States who chose to adopt CCSS (CCSS, 2015a) were permitted to modify the standards with added content at no more than a 15% change (McLaughlin & Overturn, 2012).

One subject area that recognized significant change with the CCSS is mathematics. Specifically, Wurman and Wilson (2012) noted that the K-6 math performance standards had increased exponentially through the adoption of the CCSS. In an effort to compete internationally in STEM areas, CCSS have changed the face of elementary math. Traditional math instruction often focused on utilizing only one method to search out the correct answer, placing emphasis on timeliness of completion; this often led to greater focus on memorization and recitation than thorough understanding of the math concepts (Finlayson, 2014). Barrett (2014) noted that a CCSS expert had shown concern about the speed of changes and how the expectations at the elementary level, especially the early grades, may end up being too difficult in the age level for which they were created. Alternatively, Wurman and Wilson argue that protecting young students from doing hard math is not going to help prepare them for the harder math they are going to see as they grow older and as the curriculum continues to intensify. In fact, it has been discovered that math anxieties often surface in primary grade levels and continue to increase as students are provided a growing curriculum in which they do not feel confident in the basic skills the curriculum is based upon (Finlayson, 2014). Earlier grade levels were dramatically impacted by the severe changes in math instructional methods and concepts of math.
with the adoption of CCSS (Faulkner, 2013). Whether one agrees with more difficult standards for elementary students or not, the CCSS were intentional in becoming more focused than previously used statewide standards (Porter, McMaken, Hwang, & Yang, 2011).

When the CCSS were developed, 48 states agreed to sign on and adopt the new, rigorous standards (McGuinn, 2014). Florida was one of those states that chose to use CCSS for their academic instruction standards and the state sought to ensure that school districts were supplied with math and language arts curriculum that sufficiently aligned with CCSS (Florida Department of Education [FLDOE], 2013). Many within the state of Florida, however, were not fully pleased with the methods of CCSS and demanded that the state review and adapt the standards. In response to these demands from the public, Florida adjusted the 2010 finalized CCSS and officially released and adopted the Mathematics Florida Standards (MAFS) and Language Arts Florida Standards (LAFS) in February 2014; these standards were put into place for the 2014-2015 school year (FLDOE, 2015c). Though they go by a different name, the MAFS and LAFS are still modified CCSS, as states were given a certain range of flexibility to adjust the standards as needed (CCSS, 2015a). According to Academic Benchmarks (2015), only 24 states, from which two states have since withdrawn, adopted the CCSS verbatim, 20 states adopted with local modifications, and Minnesota adopted only the English Language Arts portion of the standards set. At a local level, responding to feedback from parents, teachers, and educational leaders, FLDOE continues to adjust the standards in order to best fit the needs of schools (FLDOE, n.d.). The adopted CCSS for math presented teachers with expectations of instructional methods that were drastically different from previous practices. Teacher involvement and support in reform is vital to reform success (Brown, 2012); therefore the following section explains the theoretical
framework behind the influence of the locus of control (Rotter, 1966) and self-efficacy (Bandura 1977).

**Teacher Efficacy**

Teacher efficacy encompasses both teacher personal self-efficacy and outcome expectancy (Tschannen-Moran, Hoy, & Hoy, 1998). Teacher personal self-efficacy refers to the perceived belief that teachers hold about their ability to accomplish the task of providing sufficient instruction to their students (Newton, Evans, Leonard, & Eastburn, 2012). A math teacher who is considered to have high teacher personal self-efficacy would believe he was prepared and fully capable of giving his students the best mathematics instruction that he possibly could. A math teacher with low teacher personal self-efficacy, on the other hand, would be much less confident in his ability to provide adequate teaching in math. Vadahi and Lesha (2015) express the importance of a teacher’s personal self-efficacy levels as it can greatly impact the establishment of classroom dynamics required to maintain a well-balanced and harmonious classroom. Additionally, Vadahi and Lesha posit personal self-efficacy does not only impact student academic success, but in turn, it can also impact the teacher’s success, making improvement of teacher efficacy an overall attainable and desirable goal.

The second aspect of teacher efficacy is the concept of outcome expectancy, which refers to the belief a person holds that her chosen behavior will end in a desirable outcome (Enochs, Smith, & Huinker, 2000). As it relates to teaching, Newton et al. (2012) describes outcome expectancy as the extent to which teachers believe their students will be able to learn from the teaching they provide. An elementary math teacher with strong outcome expectancy would feel extremely confident that her students would learn from her math teaching and likely demonstrate their learning by performing well on a standardized math assessment because of her instruction.
Alternatively, teachers with weak outcome expectancy do not believe their children will be able to learn from their teaching, whether is it because of their teaching or because of external factors. “When teachers are more attuned to classroom-based outcomes, they may be more confident in creating environments that better support students’ instructional needs” (Varghese, Garwood, Bratsch-Hines, Vernon-Feagans, 2016, p. 229). Teacher expectancies are developed from a composite of personal stereotype beliefs as well as information on a student’s previous performance (Friedrich, Flunger, Nagengast, Jonkmann, & Trautwein, 2012). These expectancies have repeatedly proven to directly impact students’ performance in a self-fulfilling prophecy referred to as the Pygmalion effect (Friedrich et al., 2012). To create a greater understanding, the following section describes teacher efficacy and the impacts these beliefs have the potential to make.

According to Tschannen-Moran et al. (1998), the concept of teacher efficacy first emerged in a study conducted by the RAND organization in 1976 and has since been researched extensively and measured in many ways. Initial studies of teacher efficacy sought to determine the extent to which teachers believed they could control the outcome of their actions or if the control lies in the environment, as Rotter’s external locus of control indicates (Tschannen-Moran et al., 1998). Varghese et al. (2016) describe how teacher self-efficacy beliefs affect the teachers’ professional behaviors, which consist of instructional efforts put into learning activities as well as the level of diligence the teachers demonstrate towards providing an effective education for all students, regardless of individual student abilities. Teachers often provide different treatment to students once they have formed their own expectancies; to this, students react with either more or less, relative to teacher expectancy, motivation and effort, which in turn affect the actual performance of the students (Friedrich et al., 2012). Because the students
perform according to teacher expectancies, the teacher then feels justified in his previous assessment, thus continuing the cycle (Friedrich et al., 2012). Understanding that the level of outcome expectancy could directly affect a teacher’s performance and subsequently guide the teacher’s decisions within the classroom can be vital information for teacher preparation programs, professional development decisions, as well as for those in educational leadership positions. “Efficacy beliefs affect the effort teachers invest in teaching, the goals they set, and their level of aspiration” (Mohamadi & Asadzadeh, 2012, p. 427).

Teacher retention may also be affected by teacher efficacy. According to a study by Gibson and Dembo (1984), the higher the teacher outcome expectancy and self-efficacy, the longer the teacher should persist in the profession. Throughout their careers, if provided with appropriate continuous education, guidance, and encouragement, teachers feel more empowered, lowering teacher attrition and turnover levels (Bautista & Ortega-Ruiz, 2015). Prior to actual teaching experience, preservice teachers who believed themselves to be highly efficacious in their abilities to teach mathematics were still unsure that they would be able to ensure that their future students would be impacted either positively or negatively by their teaching (Bates et al., 2011). Bates et al. (2011) indicate this could be simply because these future teachers lack experience actually teaching, and therefore have yet to learn the extent to which they were truly capable of directly impacting student learning. Vadahi and Lesha (2015) specify that some research studies (e.g., Brousseau, Book, & Byers, 1988; Soodak, Podell, & Lehman; 1997) have revealed that teacher self-efficacy is often its greatest in preservice teachers than any subsequent period; this indicates that perhaps the programs preservice teachers have been a part of have provided substantial means of fostering teacher efficacy in students prior to entering into the field of education, but these results raise the question of why self-efficacy levels lower once
teachers enter into their careers. Past success has great potential to improve self-efficacy (Bandura, 1997); therefore, prior success in instructing a certain topic, subject, or even grade level, is likely to increase the teacher’s efficacy in their ability to teach and consequently encourage the teacher to continue to press forward.

Teachers who are highly efficacious in a particular subject and/or curriculum are more likely to teach that curriculum than their less efficacious peers and display greater passion for teaching (Bandura, 1977; Isbel & Szabo, 2015; Martin, McCaughrty, Hodges-Kulinna, & Cothran, 2008). They are also likely to be more open to new methods and ideas (Mohamadi & Asadzadeh, 2012), which is a vastly important characteristic when facing reform changes in an educational system. Though it is vital for school leaders to provide teachers with support and guidance to improve teacher efficacy through reform (Vadahi & Lesha, 2015), the level of confidence in and openness to change will guide those teachers through the challenges they will face. Strong levels of self-efficacy also encourage risk-taking behaviors from teachers (Varghese et al., 2016). When a teacher feels more confident about his own teaching abilities, he may be more likely to put forth more effort and leave his proverbial comfort zone when faced with an unprecedented circumstance within his classroom, demonstrating that he has grown as a teacher because of his increased self-efficacy levels.

A teacher’s level of outcome expectancy also has the power to impact student performance. When studying teacher expectancy effects, Friedrich et al. (2014) indicate that a teacher’s low expectancies have the potential to “result in the selection of less difficult tasks, repeated problem talk, and less appreciation by the teacher” (p. 3). The alternative may also be true. When a teacher holds high expectations for her low-performing students, those students are likely to perform higher than if the expectations were aligned with their actual abilities, because
students overall perform better when their teacher holds high expectations for their performance (Friedrich et al., 2014). Additionally, according to Mohamadi and Asadzadeh (2012) there are many study results that have linked teacher efficacy with different student behaviors, including “achievement (Ashton and Webb 1986; Ross 1992), motivation (Midgley et al. 1989), and sense of efficacy (Anderson et al. 1988)” (p. 427). In a study conducted by Guo, Connor, Yang, Roehrig, and Morrison (2012), fifth grade students’ literacy outcomes were significantly and positively predicted by teacher self-efficacy. Knowledge that teacher efficacy does not simply affect individual teachers but also students in various ways should, in itself, provide an argument for continued study regarding teacher self-efficacy within the classroom settings.

Efficacious teachers have been found to display stronger problem solving skills, establish new strategies to continually improve teaching effectiveness, manage emotions, and demonstrate persistence when placed in discouraging positions (Isbel & Szabo, 2015; Martin et al., 2008). Therefore, it is essential to understand what, if anything, aids in improving teacher efficacy to ensure that teachers are efficacious in their position. While studying the relationship between Bandura’s (1986, 1997) sources of efficacy in teachers and student achievement, Mohamadi and Asadzadeh discovered a clear relationship that proved to be mediated by the teachers’ self-efficacy beliefs, suggesting that strong teacher self-efficacy could possibly be directly related to student achievement, which has been supported in other studies as well (e.g., Varghese et al., 2016). Naturally, these results led Mohamadi and Asadzadeh to iterate the importance of continuously working to improve teacher self-efficacy beliefs in order to guide students better in the problems they are facing academically. Regardless of the extensive prior research on teacher efficacy, however, researchers posit that the origin of teacher efficacy acquirement is still unclear (Carleton, Fitch, and Krockover, 2008.)
Teacher Background

Teachers do not come to the profession as a proverbial blank slate, but instead bring with them their own personal beliefs, experiences, and values, all of which work together to contour their pedagogy, motivation, and self-efficacy. Self-efficacy can be affected positively and negatively by one’s surroundings (Bandura, 1977, 2012); therefore, it is necessary to understand the background of teachers and how those various aspects of background can relate specifically to personal teaching self-efficacy and outcome expectancy. One aspect of teacher background is teacher preparation. Though it may be commonly assumed that most teachers have undergone extensive training in teaching prior to entering the classroom, the number of practicing teachers who entered the profession by means of an alternative certification program is on the rise. Alternative certification programs vary by state level in requirements and are put in place to provide teachers with a different means by which to obtain a teaching certificate without attending a traditional teacher preparation program (Boyd et al., 2012). These alternative certification programs may have similar content and methods course requirements as traditional programs but be provided in a much shorter timeline or they may have entirely different course requirements, depending on the state in which a teacher desiring certification resides (Boyd et al., 2012). According to the National Center for Educational Statistics (2012), 14.6% of teachers in the 2011-2012 school year reported entrance through alternative certification programs, which is an increase from the 13.2% reported in the 2007-2008 school year. Epstein and Miller (2011) specify that these alternative certification programs do not often, but absolutely should, require specific math and science courses to ensure that alternative certifications represent the knowledge and abilities teachers need in order to be strong teachers, especially in these very important subjects. Even with the increasing number of alternative certifications, the majority of
teachers still appear to be taking the traditional route towards professional certification, leaving teacher preparation programs as a key component of understanding teacher background as it relates to teacher efficacy.

Traditional teacher preparation programs are typically provided by colleges and universities and are, as their namesake claims, designed to prepare future educators for the teaching profession. Research studies on teacher preparation and college courses have revealed inconsistent results, leaving room for continued research within the subject. Preservice elementary teachers often are able to obtain licensure without undergoing an intensive STEM course and training or even demonstrating mastery in math or science (Epstein & Miller, 2011). Recent literature shows less attention has been given to the pre-service training received by teachers prior to entering the profession (Harris & Sass, 2011), even though most teachers are entering into the profession by means of these training programs. Another aspect of college education that is often considered to be an indication of better teaching performance in the classroom is the process of obtaining an advanced degree; however, Harris and Sass (2011) determined that teachers’ advanced degrees were not directly related to their teaching productivity. Huang, Li, Kulm, and Willson (2014) also indicate that teachers with an advanced degree, specifically a Master’s Degree, do not demonstrate a significantly higher level of performance or understanding of advanced mathematics than their peers with lesser degrees. Another study looked at the level of education a teacher has received, referring to the obtaining of Master’s Degrees as well; in this study, the education level did not predict student outcomes though a prediction had been anticipated (Guo, Connor, Yang, Roehrig, & Morrison, 2012). These studies provide a slightly dismal view of pre-service college courses and their abilities to prepare teachers with what they need to enter the work force. Other results, however, support
extensive college training, especially in regard to mathematics. For example, Huang et al. (2014) explain that research shows secondary teachers who have a math background, primarily a degree specifically in mathematics, produce students who score significantly higher on math assessments than students in classes of teachers who do not have such degree.

Due to the nature of elementary school, most elementary teachers teach multiple subjects, keeping the same students with them throughout the entire day; alternatively, secondary level schools often departmentalize their teachers according to subjects and those teachers transition through multiple classes of students daily, often at varying levels of intensity within the designated subject. This makes it more challenging for elementary teachers to obtain degrees specific to only one subject due to the fact that they will be teaching numerous subjects and need to have an adequate understanding of all. Even if all teachers underwent a traditional educator preparation program, that would not mean that elementary teachers would have received substantial, intensive training in each subject that they are preparing to teach. Epstein and Miller (2011) posit that though many elementary teachers teach math on a daily basis, few of those teachers have extensive backgrounds in mathematics. Bates, Kim, and Latham (2011) state that programs involved in teacher preparation need to “examine their general education mathematics expectations along with their mathematics pedagogy courses to identify opportunities to modify curricular expectations that allow preservice teachers’ hands-on experiences to build their efficacy in regard to teaching mathematics” (p. 332). In their study article, Huang et al. (2014) reference multiple studies that identified that the number of courses in mathematics study as well as mathematics education that were completed proved to be significantly indicative of teacher’s knowledge for teaching mathematics.
Mathematics College Courses

Past experiences with math, including college courses, have proven to affect math anxiety levels, which subsequently affect personal teaching self-efficacy and outcome expectancy (Bates, et al., 2011; Finlayson, 2014; LeSage, 2012). Math anxiety, levels ranging from tension and uneasiness to an actual fear of math, is a struggle many preservice teachers have to try to overcome by finding strategies that are effective for reducing their anxiety levels, which can lead to blatant avoidance of math tasks if no effective strategies are uncovered (Finlayson, 2014). According to Epstein and Miller (2011), on average, students who are beginning teacher preparation programs in the United States demonstrate lower math abilities upon entering the program than their international peers from other successful countries. Bates et al. (2012) and Finlayson (2014) indicate that there is substantial research proving that most preservice teachers have a high level of anxiety in math and overall negative attitude towards mathematics. This is a problem because research supports that students reporting high math anxiety also report low teaching efficacy in math (Bates et al., 2011). The more anxiety and negative feelings a person holds towards math makes that person less likely to be confident in teaching math. In a study of preservice teachers, it was found that these high levels of anxiety are directly related to past experiences, often dating back to primary grade levels (Finlayson, 2014). It was uncovered that most often, as young students, these future teachers had elementary teachers, who had used traditional teaching methods in math; this style is one in which the greatest focuses are on finding the correct answer by using only the correct method, speed and competition, and memorization/recitation practices (Finlayson, 2014). Also important to note, Finlayson (2014) revealed that many students reported their math anxiety stemmed from being in a classroom whose teacher demonstrated a clear dislike and discomfort with math. Epstein and Miller (2011)
refer to this phenomenon as “math-phobic” and indicate that many elementary teachers possess this fear of math. These results are significant because they display the importance of ensuring that elementary teachers feel well-equipped for the math they are teaching so they do not pass on any levels of anxiety to their students who, if in a classroom with a less anxious, more confident teacher, may have actually been able to face math with confidence themselves.

Positive experiences with math college courses, alternatively, have potential to increase efficacy levels. Bandura (2012) directly connects improved self-efficacy with a reduction in anxiety. The less anxious a person is about performing a specific task, the more likely she is to feel efficacious about her ability to perform such task, which in turn will affect the amount of effort placed on performance. Students who demonstrate a stronger self-concept in their mathematic abilities have also shown a tendency to perform better on math tasks, unlike their less confident peers (Friedrich, Flunger, Nagengast, Jonkmann, & Trautwein, 2014). Bates et al. (2011) revealed a negative correlation between math anxiety and math self-efficacy. Additionally, the study determined a direct positive correlation between higher-level math course enrollment and higher math self-efficacy (Bates et al., 2011). In other words, the preservice teachers in the study who were taking higher-level math courses had a greater level of confidence in their personal ability to perform math tasks; this could potentially be because the future teachers were able to gain a greater understanding of math skills and concepts in their higher-level courses than their peers who were taking lower-level courses. Finlayson (2014) discovered that preservice teachers felt less anxiety in higher-level math courses when they had received the proper pre-requisite training as well as courses that were smaller in size with instructors who were comfortable answering questions and keeping at a moderate pace. This information could be valuable to teacher preparation courses as the anxiety levels affect the
efficacy in performing math and subsequently teaching math as well (Bates et al., 2011; Finlayson, 2014)

Personal mathematics efficacy has also proven to be related to math teaching efficacy in pre-service teachers, indicating that the more confidence teachers have in their ability to perform math tasks themselves, the more confidence they will have in their ability to teach math (Bates et al., 2011). Finlayson (2014) claims that when students and teachers are able to build their self-confidence regarding their abilities, they are able to overcome their anxieties, hesitations, and fears. These results are significant in understanding the importance of successful college math courses attended by educator hopefuls as they relate to teacher efficacy and content knowledge, which inadvertently relate to teacher productivity and student achievement (Gibson & Dembo, 1984; Newton et al., 2012; Mohamadi & Asadzadeh, 2012). College courses in mathematics ought to provide teachers-in-training with the opportunity to improve content knowledge and pedagogy to best prepare them to teach math in their future. Huang et al. (2014) also identified that the greater number of courses completed in mathematics is positively related with performance in math skills on a basic school level as well as advanced. Perhaps the reason so many preservice teachers find themselves fearful of performing and teaching math (Bates et al., 2011; Finlayson, 2014) is related to the number of college courses they confidently completed in the subject of mathematics. In addition to college courses and teacher preparation, teachers’ backgrounds also include the in-service training teachers receive throughout their career.

**Professional Development**

Professional development, also referred to as in-service training, is an ongoing program that provides in-service teachers with new strategies, curriculum training, best practices, and other required topics to ensure teachers are up-to-date in their ever-changing field (Bautista &
Bautista and Ortega-Ruiz (2015) describe traditional professional development as sporadic and brief teacher education developed for in-service teachers and provided throughout teachers’ careers with the potential to impact both the personal and professional lives of those attending. Professional development courses are also provided to teachers to build on and improve teacher competencies which teachers were unable to learn and achieve in teacher preparation programs due to lack of experience in the actual teaching profession during preparation (Bautista & Ortega-Ruiz, 2015). In Florida, professional development training is most often provided by the school district within which the teacher is employed. According to the Florida Department of Education (FLDOE), the Florida’s Professional Development System Evaluation Protocol serves to assess local district-level professional development planning and implementation as they meet established professional development standards (FLDOE, 2015b). Florida school districts have committed to provide teachers with the necessary training needed in order to face the transition and successfully implement the newly developed standards based on the CCSS in addition to the training that Florida teachers have received over the past three years following the original adoption of the CCSS, though districts are permitted to develop their own district-level training, making the trainings unique to each individual district (FLDOE, 2015a). Vadahi and Lesha (2015) express that school leaders should prepare for transformational changes within the school and facilitate proper training courses geared to improve teacher efficacy and ability in the face of educational changes. Concerns over local development are expressed by Bautista and Ortega-Ruiz (2015), who claim that international trends of local school districts developing their own professional development courses tend to lack extensive research-based focus, though research on
professional development has been ongoing for about 30 years, and also tend to be short-lived with a lack of depth and comprehensiveness.

As with college course credits, there is conflicting research on the effectiveness of professional development and in-service training. Unfortunately, though it has the potential to do great things, many studies in the area of professional development research often reveal its ineffectiveness on teachers and student learning (Bautista & Ortega-Ruiz, 2015). Varghese, Garwood, Bratsch-Hines, and Vernon-Feagans (2016) refer to multiple studies that have revealed positive relationships between various forms of professional development and teacher efficacy; the Varghese et al. research agreed with other study results and found a significant relationship between utilizing coaching methods for professional development and teacher efficacy in classroom management. A vital component of effective professional development is the aspect of follow-through and support for teachers to ensure that information was successfully transmitted to the teachers through the course and that teachers have someone to collaborate with regarding strategies and information (Bautista & Ortega-Ruiz, 2015). Utilizing long-term professional development programs can improve the teacher’s levels of self-efficacy when they encourage teachers to think critically about their classroom structures and environments as well as provide teachers with the opportunities to learn and actively improve their instruction (Vadahi & Lesha, 2015). According to Lieberman and Mace (2008), most teachers find traditional professional development to be uninteresting and irrelevant to their position, therefore a waste of time; the authors use research to support the use of professional learning communities as a successful and meaningful method of professional development, demonstrating that teachers learn best from this method as opposed to attending a one-size-fits-all in-service training.
Experts claim that utilizing training topics and ideas that are relevant to teachers’ everyday is an essential aspect of a successful professional development process (Bautista & Ortega-Ruiz, 2015) to ensure that teachers actually gain knowledge and are willing to apply new techniques and information to their teaching practices. Training in areas of pedagogy can improve not only the approaches that teachers use in teaching but also their self-efficacy beliefs about their abilities to teach (Vadahi & Lesha, 2015). Bautista and Ortega-Ruiz (2015) also identify that traditional methods of professional development have repeatedly proven unsuccessful in having an impact on teachers, indicating a need for a change in the traditional presentational system. Few trainings teachers undergo focus on developing and improving self-efficacy, even though it has proven to be such a vital aspect of educational success (Vadahi & Lesha, 2015). Lieberman and Mace (2008), as well as Bautista and Ortega-Ruiz, iterate that successful professional development is instrumental in ensuring reform success. As new reform, such as NCLB or CCSS, is introduced to the world, it is essential for the teachers to be informed about the methods and implications that guide the reform so they are able to successfully implement and support. Without teacher support, education reform is likely to fail (Bautista & Ortega-Ruiz, 2015; Cerit, 2013).

In a study by Harris and Sass (2011), in-service training did not generally influence the teachers’ ability to improve their students’ achievement. Vadahi and Lesha (2015) refer to research that shows that professional development has the ability to improve teacher efficacy in regards to classroom behavior management, indicating the potential influence of professional development and in-service trainings. Intensive coaching and support professional development has shown success in studies of teachers of various subjects (Bautista & Ortega-Ruiz, 2015; Varghese et al., 2016). Bautista and Ortega-Ruiz (2015) note the irony that even though research
repeatedly reveals that traditional professional development is ineffective, there is an international phenomenon of school systems continually investing significant funds into the programs regardless of the extensive research. Due to ambiguous research results, it is essential to continue studying professional development and how it can potentially relate to and affect teacher efficacy as they enter into the implementation of a new reform initiative, especially the CCSS in mathematics, as they demonstrate dramatic changes to the prior standard implementation (Faulkner, 2013; Wurman & Wilson, 2012).

Providing people with sufficient and appropriate information about upcoming changes, events, and expectations directly affects self-efficacy, which impacts motivation and performance (Bandura, 2012); therefore, if teachers are adequately trained and instructed in in-service trainings focused on new curriculums, research-based strategies, and upcoming changes, their self-efficacy could be improved. The professional development Chinese teachers partake in includes extensive textbook studies and activities; those teachers who have attended a myriad of these courses have a greater understanding of school mathematics as well as skills in teaching math to their students (Huang et al., 2014). Guo et al. (2012) imply that professional development programs need to place more emphasis on improving teacher efficacy in order to improve student performance. In addition to professional development, it is also imperative to research how experience in the field of math education can impact teacher efficacy, which can significantly increase teacher performance (Bates, Kim, & Latham, 2011; Olayiwola, 2011), as well as student math performance (Bates et al., 2011; Mohamadi & Asadzadeh, 2012).

**Teaching Experience**

The third aspect of teacher background is years of teaching experience. Harris and Sass (2011) describe accumulated years of teaching experience as informal on-the-job training for
educators. Each year that is spent teaching adds to the teachers’ experiences and repertoire of knowledge and ability. Total years of teaching experience can indicate the level of human capital in teachers as they continue to invest in further experience and learning (Van Maele & Van Houtte, 2012). In regards to classroom behavior management teaching efficacy, teachers have demonstrated stronger levels correspondent with more years of teaching experience as opposed to new teachers who maintain lower self-efficacy levels (Vadahi & Lesha, 2015). Teachers at both elementary and middle school levels demonstrated an increased level of productivity as years of experience increased (Harris & Sass, 2011). Though teacher efficacy beliefs have repeatedly proven to be at an ultimate high in preservice teachers and average low in the first years of teaching, Vadahi and Lesha (2015) discuss that research has revealed that self-efficacy beliefs in teachers show a continual growth over subsequent years, though they never fully return to the preservice high. Ünal and Ünal (2012) posit that teachers do not reach full competency development until after gaining anywhere from four to seven years of teaching experience. Describing the methods of advancement and ranking of teachers in Chinese schools, Huang et al. (2014) specify that as teachers gain years of experience and display responsibility and capabilities of required responsibilities, teachers are ranked in different categories; teachers who fall into the senior rank perform better with school mathematics and skills in teaching math than teachers of less experience. Ironically, the teachers of that senior ranking involved in the Huang et al. study reported completing fewer courses in math and math education.

Understanding the effects of years of teaching experience is essential because experience has proven to be a predictor of student achievement (Van Maele & Van Houtte, 2012). Harris and Sass (2011) remind their readers that it is important to consider attrition level when reviewing years of experience and effectiveness, however, as less effective teachers may be more
likely to leave the profession. There is a great amount of concern regarding teacher turnover with those who have less experience and lower mastery levels (Van Maele & Van Houtte, 2012). Little research could be found specifically regarding the effect of years of teaching experience and teacher performance on teacher efficacy, though Vadahi and Lesha (2015) specify that as teachers gain more experience, teacher self-efficacy beliefs can be more resistant to change without the proper support and development opportunities. Van Maele and Van Houtte (2012) describe that there is a need to understand the sources that can potentially build self-efficacy in less experienced teachers until they are able to achieve greater mastery through experience. If, as Harris and Sass imply, years of experience could be considered a form of training, then it should be considered in greater detail as a possible source of efficacy and performance improvement. Years of teaching experience, in combination with in-service professional development and college math courses, work together to create a background upon which teachers are able to build and grow professionally and independently. Quite possibly, these specific areas of background may also work to improve teacher efficacy and outcome expectancy as well.

**Summary**

Education as a whole has witnessed numerous changes and reform throughout its existence. In the last three decades alone, there have been changes proposed from President Reagan’s Commission (Kubiszyn & Borich, 2013; National Commission on Excellence in Education, 1983), the British Secretary of state for Education (Parker-Rees, 2011; Secretary of State for Education and Employment, 1997), and President George W. Bush (Kubiszyn & Borich, 2013; NCLB, 2002). Additionally, the reform initiatives known as the Race to the Top (R2T) federal grant program (McGuinn, 2014; U.S. Department of Education, 2010) and
Common Core State Standards (CCSS) initiative (CCSS, 2015a) have once more changed the face of education. The most recent reform, CCSS, has dramatically changed the way in which elementary mathematics skills are presented and assessed (Barrett, 2014; Faulkner, 2013; Porter, McMaken, Hwang, & Yang, 2011; Wurman & Wilson, 2012) and Florida was just one of 48 states who initially agreed to adopt the CCSS (CCSS, 2015a; McGuinn, 2014), leaving Florida elementary math teachers with the great task of adapting their instructional methods, curriculum instruction, and pedagogy.

Due to the intense changes in elementary math brought about by CCSS, the study of teacher personal self-efficacy and outcome expectancy, referred to as teacher efficacy (Tschannen-Moran, Hoy, & Hoy, 1998), throughout this reform change is imperative to understanding the relationship between teacher efficacy and the teacher background. When Rotter (1966) coined the term locus of control, he was referencing the amount of control a person perceives to have over events taking place in her life. Bandura’s (1977) theory of self-efficacy expands this concept and looks at the how one perceives his own ability to perform a specific task and achieve a desired outcome (Bandura, 1977). As teacher efficacy continued to be studied and understood, it became clear that teacher efficacy could impact teacher performance as well as potentially improve student performance (Bandura, 1977; Epstein & Miller, 2011; Gibson & Dembo, 1984; Guo, Connor, Yang, Roehrig, & Morrison, 2012; Mohamadi & Asadzadeh, 2012; Varghese et al., 2016). Though teacher efficacy has been studied for decades, as of yet, there is still difficulty in determining the origin of teaching efficacy as well as what causes it to improve (Mohamadi & Asadzadeh, 2012). Understanding the relationship between teacher efficacy and teacher background would bring to light a possible impact of background on teacher efficacy.
If teacher background for elementary math teachers, including college credit hours in mathematics, professional development in CCSS mathematics, and years of teaching experience, could affect teacher efficacy, it in turn could affect student performance in the critical subject of elementary mathematics as teacher efficacy can directly impact student performance (Bandura, 1997; Guo, Connor, Yang, Roehrig, & Morrison, 2012; Mohamadi & Asadzadeh, 2012; Varghese et al., 2016). Elementary teachers often do not have an extensive background in mathematics (Epstein & Miller, 2011), yet understanding how their past math experiences could potentially affect their personal math anxiety levels could consequently impact their teacher efficacy and performance (Bandura, 1977; Bates, Kim, & Latham, 2011; Finlayson, 2014; LeSage, 2012). Though college credit hours in math cannot necessarily be changed for current teachers, understanding the impact of college courses on math teacher efficacy could affect the number of required hours in teacher preparation programs to ensure that educators are more efficacious in their own math abilities prior to teaching students in math. Obtained content knowledge in mathematics from math methods courses in teacher preparation programs can directly impact the math teacher efficacy of educators (Newton et al, 2012).

State-required professional development programs regarding reform initiatives (FLDOE, 2015a) may also be impacted by a significant relationship between hours in professional development in CCSS math and teacher efficacy. As school systems are faced with reform changes, they also are given the great responsibility to guide teachers and sufficiently prepare them for how those changes are going to impact what will be expected of teachers regarding “how and what they are to teach to students” (Bautista & Ortega-Ruiz, 2015, p. 242). Continued research supports the need for teachers to be given thorough direction and leadership when taking on the tasks of teaching new and innovative concepts (Bautista & Ortega-Ruiz, 2015).
Additionally, Guo et al. (2012) charge pre-service teacher preparation programs and in-service professional development programs to consider focusing “on assessing and increasing self-efficacy, which could prove fruitful in improving teachers’ classroom practices and, in turn, student academic achievement” (p. 20). Teacher years of experience accounts for actual years teaching in the classroom, an on-the-job training, as described by Harris and Sass (2011). Teachers who have been teaching for many years have witnessed many different reforms, which could potentially impact their efficacy in teaching through reform initiatives and build or break down their efficacy in teaching math standards that drastically differ from the traditional math instruction (Barrett, 2014; Faulkner, 2013; Wurman & Wilson, 2012). Van Maele and Van Houtte (2012), however, describe research that discovered a negative association with years of teaching experience and teaching satisfaction as well as difficulty with changes guided by individual schools and reform initiatives. College credit hours in math, professional development hours in CCSS math training, and years of experience teaching math work together to create a teacher’s background in math, which could potentially impact the teacher’s personal self-efficacy in math teaching abilities as well as outcome expectancy in student performance.

Providing students with a positive, successful math education experience is vital to the success of the education system and subsequently the national economy and society as a whole. Math performance in elementary school is one predictor of success in careers related to Science, Technology, Engineering, and Mathematics (STEM) (Epstein & Miller, 2011), a career area that is lacking in the United States as compared with other countries internationally (Rice, Barth, Guadagno, Smith, and McCallum, 2012). Students across the United States are continually performing below average in international studies (Epstein & Miller, 2011), a disheartening fact considering the amount of work that is put into the educational system on a daily basis across the
country. In order to compete internationally as an economy, it is essential that the United States provides the best possible education in mathematics as it possibly can; this responsibility rests on the shoulders of elementary teachers throughout the nation who are working daily to ensure their students are instructed following the required standards. As the CCSS have changed the face of elementary math, there must be an understanding of the relationship between teacher background and teacher efficacy to ensure that teacher preparation programs and professional development leaders are providing their teachers with what they need to implement this reform and return the United States to the top of the international competition.
CHAPTER THREE: METHODS

Overview

In an effort to determine the possible existence of a relationship between elementary teachers’ background in mathematics and teaching efficacy levels while teaching math under the Common Core State Standards (CCSS), the researcher conducted a correlation analysis utilizing data collected from teacher survey responses to the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) (Enochs, Smith, & Huinker, 2000). The following section describes in further detail the design of the study, as well as the research questions and null hypotheses related to the study. Following these, one can find information regarding the participants and setting of the study, instrumentation used, procedures of the study, and data analysis.

Design

For this study, a correlation design was used to investigate the relationship between elementary teacher background and teacher efficacy. The purpose of a correlation study is to determine the strength of the relationship between variables (Gall, Gall, & Borg, 2007). This design was found appropriate because it sought to determine a relationship between two quantitative variables (Gall et al., 2007). Reported teacher efficacy was the criterion variable, and teacher background was the predictor variable used in this study. Additionally, the variables within the study were of ratio nature, which has a clearly defined 0; ratio variables are appropriate when measuring correlations (Gall et al., 2007). Specifically, the study calculated the teachers’ background as measured in years of teaching experience, completed college credit hours in mathematics, and hours spent in in-service professional development focused on Common Core State Standards (CCSS) math and sought to determine how that background was related to the teacher efficacy represented by teacher self-efficacy levels and outcome
expectancy levels. The researcher had no opportunity to manipulate the variables within the study as would be appropriate in an experimental design, but instead, the study will be based strictly on results of a self-reported survey (Gall et al., 2008). Though Creswell (2013) indicates that most studies grounded on survey data are of a qualitative nature, the survey used for the present study reported strictly Likert scale ratios and did not contain any non-quantitative data.

**Research Question(s)**

**RQ1:** Is there a relationship between elementary teachers’ background training in mathematics and teaching self-efficacy while implementing instruction of Common Core State Standards for Mathematics?

**RQ2:** Is there a relationship between elementary teachers’ background training in mathematics and teaching outcome expectancy while implementing instruction of Common Core State Standards for Mathematics?

**RQ3:** Is there a relationship between elementary teachers’ self-efficacy and teacher outcome expectancy while implementing instruction of Common Core State Standards for Mathematics?

**Null Hypotheses**

**H₀1:** There is no significant relationship between number of college credit hours in mathematics completed and teacher self-efficacy as measured in the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

**H₀2:** There is no significant relationship between the number of district-provided training days focused on Common Core Mathematics Standards and teacher self-efficacy as measured in
the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

**H₀3:** There is no significant relationship between the amount of years spent teaching elementary mathematics and teacher self-efficacy as measured in the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

**H₀4:** There is no significant relationship between number of college credit hours in mathematics completed and teaching outcome expectancy as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

**H₀5:** There is no significant relationship between the number of district-provided professional development hours focused on Common Core Mathematics Standards and teaching outcome expectancy as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

**H₀6:** There is no significant relationship between the amount of years spent teaching elementary mathematics and teaching outcome expectancy as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

**H₀7:** There is no significant relationship between elementary teachers’ teaching self-efficacy as measured by the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and teacher outcome expectancy as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the
Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) while implementing instruction of Common Core State Standards for Mathematics.

**Participants and Setting**

The participants for this study were drawn from a convenience sample of elementary teachers located in a central Florida school district who taught throughout the 2016-2017 school year. The school district consists of 32 elementary schools; 31 of these schools are considered low socio-economic and receive Title One funding. The median estimated household income of residents of the county within which this study was conducted is $39,035, which is $7,341 less than the state average (City-Data.com, 2012). The most common industry in the county is health care and social assistance, followed by retail trade, then accommodation and food service as well as educational services (City-Data.com, 2012). The majority of county residents (70%) are private wage or salary workers, and 24% of workers are self-employed in unincorporated businesses (City-Data.com, 2012). The county within which the study was conducted is a primarily White population (74%), with a nearly 12% African American population, nearly 11% Hispanic population, and less than 2% population of Asian and Multiracial categories (City-Data.com, 2012). Specific demographics for the teachers within the county were not available at this time. The convenience sample was chosen due to the geographic location of the district and the researcher.

For this study, a minimum of 200 teachers was used, which exceeds the required minimum for a medium effect size. Gall, Gall, and Borg (2007) recommend a minimum of 66 participants for a medium effect size with statistical power of .7 at the .05 alpha level. In order to avoid bias in participant selection, the researcher invited all elementary teachers of math working at the 32 elementary schools within the school district.
**Instrumentation**

The instrument used in this study was the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI), developed by Enochs, Smith, and Huinker (2000). The MTEBI is a modification of the original Science Teaching Efficacy Beliefs Instrument (STEBI-A), developed by Riggs and Enochs (1990). Analysis of reliability produced an internal consistency alpha coefficient of 0.88 for the Personal Mathematics Teaching Efficacy (PMTE) subscale, and 0.77 for the Mathematics Teaching Outcome Expectancy (MTOE) subscale (Enochs, Smith, & Huinker). Validity analysis produced a chi-square of 346.70, with a degree of freedom of 184, indicating a reasonably good model fit (Enochs, Smith, & Huinker). This instrument has been used in multiple studies reviewing teacher efficacy (Brown, 2012; Gresham, 2009; Isiksal, 2010; Swars, Daane, & Giesen, 2006). Information regarding specific details on the survey and scoring procedures provided by Enochs, Smith, & Huinker (2000) can be found in Appendix A.

Table 1

*Final Corrected Item-Total Scale Correlations and Factor Loadings*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Item</th>
<th>Positive/Negative Wording</th>
<th>Item-Total Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMTE (SE)</td>
<td>I 12</td>
<td>P</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td>I 13</td>
<td>N</td>
<td>0.62</td>
</tr>
<tr>
<td></td>
<td>I 15</td>
<td>P</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td>I 16</td>
<td>N</td>
<td>0.56</td>
</tr>
<tr>
<td></td>
<td>I 18</td>
<td>N</td>
<td>0.55</td>
</tr>
<tr>
<td></td>
<td>I 11</td>
<td>P</td>
<td>0.59</td>
</tr>
<tr>
<td></td>
<td>I 15</td>
<td>N</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td>I 16</td>
<td>P</td>
<td>0.62</td>
</tr>
<tr>
<td></td>
<td>I 17</td>
<td>N</td>
<td>0.62</td>
</tr>
<tr>
<td></td>
<td>I 18</td>
<td>N</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td>I 19</td>
<td>N</td>
<td>0.65</td>
</tr>
<tr>
<td></td>
<td>I 20</td>
<td>P</td>
<td>0.47</td>
</tr>
<tr>
<td></td>
<td>I 21</td>
<td>N</td>
<td>0.61</td>
</tr>
</tbody>
</table>

Total SE Scale Alpha = 0.88

| MTOE (OE)   | I 11 | P | 0.49 |
The MTEBI is a self-reported survey developed to measure teaching efficacy in mathematics on two subscales, utilizing 13 items in the PMTE subscale, and eight items in the MTOE, totaling 21 items (Enochs, Smith, & Huinker, 2000). The survey should take no more than 20 minutes for teachers to complete. The MTOE measuring outcome expectancy items are: Items 1, 4, 7, 9, 10, 12, 13, and 14. Scores on the 13 items of the PMTE scale may range from 13 to 65, while possible scores on the MTOE scale may range from 8 to 40. On the PMTE subscale, higher scores indicate higher levels of self-efficacy, and likewise for outcome expectancy on the MTOE subscale. All 21 questions are reported on a five-point Likert scale that ranges from Strongly Agree to Strongly Disagree. Responses are as follows: Strongly Agree = 5 points, Agree = 4 points, Uncertain = 3 points, Disagree = 2 points, and Strongly Disagree = 1 point. Eight of the items are negatively worded and call for recoding at time of scoring and analysis; these items are Items 3, 6, 8, 15, 17, 18, 19, and 21. Permission of use of this instrument was granted from Dr. Deann Huinker, co-developer of the MTEBI. A copy of the permission email is provided in Appendix B.

**Procedures**
In order to conduct this research study, the researcher first sought to obtain permission from the Institutional Review Board (IRB) at Liberty University. A copy of the Liberty University IRB approval for exemption letter is included in Appendix C. After obtaining IRB approval, the researcher contacted the Director of Guidance and Attendance for the school district, who also is in charge of research approval, and obtained permission from the school district to conduct research via the district email system. The permission request and approval letter are provided in Appendix D. Following district permission and IRB approval, an email invitation was sent to all teachers at all 32 elementary schools (K-5) in the school district. Teachers were informed that the survey is completely voluntary and they have a right to withdraw at any time without risk of repercussion. The teachers were asked to complete the survey via SurveyMonkey® within a three-week time period. Appendix E contains the participation request email including survey directions and consent information. The researcher chose three weeks to allow ample time for survey participants to research college credit hours completed in mathematics as well as the number of in-service training hours focused on Common Core State Standards in Mathematics. Teachers were able to locate the amount of professional development hours specifically focused on CCSS Math following the adoption of the standards in 2010 through the district portal tracking service. Two weeks following the initial email, a reminder email was sent out to all teachers requesting participation. The reminder email was the same email sent again two weeks after the initial email will be sent and one day prior to the deadline. Following the set deadline for completion, data was exported from SurveyMonkey® into Microsoft Excel®. The information was then used to complete bivariate correlation analyses in the Statistical Package for the Social Sciences (SPSS) program.

**Data Analysis**
The researcher selected bivariate correlation as the statistical procedure by which to analyze the collected data. Due to the nature of the study, there were seven bivariate correlations conducted, one for each null hypothesis. The purpose of a correlation study is to identify a relationship between variables (Gall, Gall, & Borg, 2007). The present study sought to determine the existence of a possible relationship between the two variables of teacher background and teaching efficacy. Gall et al. (2007) specify that while pursuing a relationship between two variables, bivariate correlational statistics must be reported. A Pearson product-moment coefficient $r$ was the original chosen statistic because both variables are of continuous nature (Gall et al., 2007). In studies related to education, Pearson’s $r$ is the most common statistic used due to its small standard of error and the use of continuous scores (Gall et al., 2007). However, following initial assumptions testing, it was found that the assumptions for Pearson’s $r$ were not viable. After considering other non-parametric correlation options, the Kendall’s Tau B was chosen as a sustainable alternative due to its ability to withstand the need for assumption testing. For the seven hypotheses in the present study, each looked at a specific identifier of each variable as it relates to an identifier of the other main variable, qualifying each hypothesis for a bivariate correlation analysis.

Often with correlation analyses, researchers utilize $\alpha < .05$, which ensures that there is less than 5% chance that a significant relationship be reported when it is actually not significant. In this present study, however, due to the number of hypotheses tested, seven, there presents a need to utilize the Bonferonni correction to minimize the likelihood of a Type I error, which is when a false hypothesis tests positive (Warner, 2013). The Bonferonni procedure is preferred for its versatility in analyses (Warner, 2013). Following the Bonferonni correction, the researcher divided the overall $\alpha$, typically set at .05 and divided by the number of hypothesis tests (7),
resulting in $\alpha < 0.007 $. For each analysis, the researcher reported all assumption testing, descriptive statistics ($M$, $SD$), number ($N$), degrees of freedom ($df$), observed $r$ value ($r$), significance level ($p$), and power (Rockinson-Szapkiw, 2013; Warner, 2013). Gall, Gall, and Borg (2013) recommend a minimum number of 66 participants to achieve the optimal power of 0.7 with a medium effect size, $\alpha = 0.05$. 
CHAPTER FOUR: FINDINGS

Overview

The purpose of this correlation study was to identify a relationship between teacher background training in mathematics and teacher efficacy in teaching mathematics for elementary teachers presently teaching the Common Core State Standards (CCSS, 2015). The predictor variable, teacher background training, was divided into three aspects of background training: number of college credit hours completed in mathematics, number of district-provided training hours in CCSS mathematics, and years of teaching experience. The criterion variable, teaching self-efficacy, was represented by two subscales of efficacy: Personal Mathematics Teaching Efficacy (PMTE), and Mathematics Teaching Outcome Expectancy (MTOE), and were measured using the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) (Enochs et al., 2000). In accordance with the validity testing of the MTEBI, analyses of the subscales were completed separately. Analyses were conducted using the IBM Statistical Package for the Social Sciences (SPSS), version 21. This chapter includes the research questions and null hypotheses of the study, descriptive statistics of the data collected, as well as the research results as they relate to each null hypothesis.

Research Question(s)

RQ1: Is there a relationship between elementary teachers’ background training in mathematics and teaching self-efficacy while implementing instruction of Common Core State Standards for Mathematics?

RQ2: Is there a relationship between elementary teachers’ background training in mathematics and teaching outcome expectancy while implementing instruction of Common Core State Standards for Mathematics?
**RQ3:** Is there a relationship between elementary teachers’ self-efficacy and teacher outcome expectancy while implementing instruction of Common Core State Standards for Mathematics?

**Null Hypotheses**

**H₀₁:** There is no significant relationship between number of college credit hours in mathematics completed and teacher self-efficacy as measured in the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

**H₀₂:** There is no significant relationship between the number of district-provided training hours focused on Common Core Mathematics Standards and teacher self-efficacy as measured in the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

**H₀₃:** There is no significant relationship between the amount of years spent teaching elementary mathematics and teacher self-efficacy as measured in the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

**H₀₄:** There is no significant relationship between number of college credit hours in mathematics completed and teaching outcome expectancy as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

**H₀₅:** There is no significant relationship between the number of district-provided professional development hours focused on Common Core Mathematics Standards and teaching
outcome expectancy as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

**H₀₆:** There is no significant relationship between the amount of years spent teaching elementary mathematics and teaching outcome expectancy as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

**H₀₇:** There is no significant relationship between elementary teachers’ teaching self-efficacy as measured by the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and teacher outcome expectancy as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) while implementing instruction of Common Core State Standards for Mathematics.

**Descriptive Statistics**

All elementary teachers within the school district were given the opportunity to complete the survey via SurveyMonkey®. A total of 73 surveys were submitted; two of these surveys had to be removed due to missing data and two more were removed from analysis because those two participants were prekindergarten teachers and the study was designed to assess grades kindergarten through fifth. The number of complete and usable surveys brought the sample size to 69.

Of the 69 participants, 23.2% taught Kindergarten (16 teachers), 23.2% taught first grade (16 teachers), 24.6% taught second grade (17 teachers), 23.2% taught third grade (16 teachers), 15.9% taught fourth grade (10 teachers), and 14.5% taught fifth grade (10 teachers). Because some of the participants taught multiple grade levels, the total percentage of grade level taught
resulted in over 100 (124.6%). The frequency distribution of grade level taught is found in Table 2.

Table 2

*Frequency Distribution of Grade Level Taught by Teacher Participants*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kindergarten</td>
<td>16</td>
<td>23.2</td>
</tr>
<tr>
<td>First</td>
<td>16</td>
<td>23.2</td>
</tr>
<tr>
<td>Second</td>
<td>17</td>
<td>24.6</td>
</tr>
<tr>
<td>Third</td>
<td>16</td>
<td>23.2</td>
</tr>
<tr>
<td>Fourth</td>
<td>11</td>
<td>15.9</td>
</tr>
<tr>
<td>Fifth</td>
<td>10</td>
<td>14.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>86</strong></td>
<td><strong>124.6</strong></td>
</tr>
</tbody>
</table>

Elementary Education Grades K-6 was the most common form of teacher certification held by participants. Due to dual certifications, the percentage of certifications held by participants also exceeds 100 (112.9%). The frequency distribution according to teaching certification held is shown in Table 3.

Table 3

*Frequency Distribution of Teacher Certification of Teacher Participants*

<table>
<thead>
<tr>
<th>Certificate</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary Education (grades K-6)</td>
<td>56</td>
<td>81.2</td>
</tr>
<tr>
<td>Prekindergarten/Primary Elementary (age 3 through grade 3)</td>
<td>13</td>
<td>18.8</td>
</tr>
<tr>
<td>Temporary Certificate</td>
<td>3</td>
<td>4.3</td>
</tr>
<tr>
<td>Alternative Certificate</td>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td>Exceptional Student Education (grades K-12)</td>
<td>4</td>
<td>5.8</td>
</tr>
<tr>
<td>Art Education (grades K-12)</td>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>78</strong></td>
<td><strong>112.9</strong></td>
</tr>
</tbody>
</table>
As a part of teacher background, participants were asked to note the number of years of math teaching experience. Experience ranged from 1 to 45 years, with a mean of 10.96 years. The majority of participants (62%) had 10 years or less of math teaching experience. The frequency distribution for years of teaching experience is shown in Table 4.

Table 4

*Frequency Distribution of Teaching Experience of Teacher Participants*

<table>
<thead>
<tr>
<th>Years</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>28</td>
<td>40.6</td>
</tr>
<tr>
<td>6-10</td>
<td>15</td>
<td>21.7</td>
</tr>
<tr>
<td>11-15</td>
<td>10</td>
<td>14.5</td>
</tr>
<tr>
<td>16-20</td>
<td>7</td>
<td>10.1</td>
</tr>
<tr>
<td>21-25</td>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td>26-30</td>
<td>5</td>
<td>7.2</td>
</tr>
<tr>
<td>31-35</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>36-40</td>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td>41-45</td>
<td>2</td>
<td>2.9</td>
</tr>
<tr>
<td>Total</td>
<td>69</td>
<td>100</td>
</tr>
</tbody>
</table>

In addition to years of teaching experience, participants reported the number of college credit hours they had completed in mathematics. Teachers reported from 3 to 96 credit hours, with a mean of 11.71 hours. The frequency for completed math college credit hours is shown in Table 5.

Table 5

*Frequency Distribution of Completed Math College Credit Hours by Teacher Participants*

<table>
<thead>
<tr>
<th>Hours</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>10</td>
<td>14.5</td>
</tr>
<tr>
<td>6</td>
<td>14</td>
<td>20.3</td>
</tr>
</tbody>
</table>
The third aspect of teacher background was described as hours of district-provided in-service training based on the Math portion of the CCSS. Reported hours ranged from 0 to 230 with a mean of 32 hours. A frequency distribution reporting the number of these training hours is shown in Table 6.

Table 6

Frequency Distribution of Hours of District-provided Training for CCSS Math

<table>
<thead>
<tr>
<th>Hours</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>7</td>
<td>10.1</td>
</tr>
<tr>
<td>1-10</td>
<td>13</td>
<td>18.8</td>
</tr>
<tr>
<td>11-20</td>
<td>11</td>
<td>15.9</td>
</tr>
<tr>
<td>21-30</td>
<td>14</td>
<td>20.3</td>
</tr>
<tr>
<td>31-40</td>
<td>7</td>
<td>10.1</td>
</tr>
<tr>
<td>41-50</td>
<td>5</td>
<td>7.2</td>
</tr>
<tr>
<td>51-60</td>
<td>7</td>
<td>10.1</td>
</tr>
<tr>
<td>61-70</td>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td>71-80</td>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td>80-100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>101-150</td>
<td>2</td>
<td>2.9</td>
</tr>
<tr>
<td>151-200</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>69</td>
<td>100</td>
</tr>
</tbody>
</table>
The two subscales of the MTEBI, personal teacher efficacy belief (PTEB) and mathematic teaching outcome expectancy (MTOE), were analyzed separately, in accordance to the validity testing of the instrument. Participants completing the MTEBI were expected to respond to each of the 21 items using a 5-point Likert scale ranging from “Strongly Agree” to “Strongly Disagree” (Enochs et al., 2000). The first subscale, PTEB, contained 13 items, with possible scores ranging from 13 to 65; the higher the score, the greater the confidence one has in his/her ability to teach math (Enochs et al., 2000). The second subscale, MTOE, contained 8 items with possible scores ranging from 8 to 40; the closer to 40, the more the teachers believe their students’ “learning can be influenced by effective teaching” (Enochs et al., 2000, p. 195). Descriptive statistics were assessed and are shown in Table 7.

Table 7

<table>
<thead>
<tr>
<th>Subscale</th>
<th>n</th>
<th>Range</th>
<th>Min.</th>
<th>Max.</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Efficacy</td>
<td>69</td>
<td>28</td>
<td>37</td>
<td>65</td>
<td>53.9</td>
<td>6.69</td>
</tr>
<tr>
<td>Outcome Expectancy</td>
<td>69</td>
<td>25</td>
<td>15</td>
<td>40</td>
<td>28.9</td>
<td>5.12</td>
</tr>
</tbody>
</table>

Assumption Tests

Following the standard procedure in correlation analysis, the researcher utilized SPSS to conduct the required assumption tests to move forward with a parametric Pearson’s $r$ correlation analysis. Each aspect from both the criterion and predictor variables were presented in
continuous nature, satisfying the first assumption for Pearson’s $r$ (Warner, 2013). The researcher then used SPSS to create scatter plots between each aspect of the criterion variable, teacher efficacy, and the three different aspects of the predictor variable, teacher background, in order to meet the second assumption of linearity between the two variables (Warner, 2013). The researcher was unable to identify a linear relationship between any of the variables, violating this assumption as well as the assumption of homoscedasticity, both of which are required for a Pearson’s $r$ correlation to be performed (Warner, 2013). There were also violations to the assumption of extreme outliers, as was identified using a box-and-whisker plot for each of the predictor variables. Viewing a histogram of the predictor variables, the researcher confirmed that the assumption of normal distribution was strongly violated, though the criterion variables were both found tenable.

The three areas of background training were all skewed left on the histogram assessing normality. The researcher speculates that perhaps the fact that the data regarding years of teaching experience is significantly skewed left and 40% ($N=28$) of the participants reported being within their first through fifth year of teaching and the percentage tapers down as the years increase; perhaps newer teachers are more likely to complete optional research surveys than those who are more experienced. From the hours of college credits in math, 84% ($N=61$) of participants reported taking between three and twelve credit hours, also skewing the data left, perhaps because preservice teachers are not required to take many math credit hours. The data from the reported professional development hours show that 65.1% ($N=45$) participants reported zero to thirty hours of training in CCSS Math, with 10.1% ($N=7$) of those participants reporting having received no training specifically in CCSS Math. The researcher speculates that because so many teachers reported being in their early years of teaching that the newer teachers have not
attended the trainings because perhaps the school district had limited specific trainings in CCSS Math in the most recent years when the majority of the participants began teaching.

Due to repeated violations in assumptions required for Pearson’s $r$, the researcher concluded that the data would be better assessed by a Kendall’s Tau B correlation procedure. In order to conduct a non-parametric Kendall’s Tau B analysis, it is required that both variables be measured on an ordinal or continuous scale. The researcher transformed the data in SPSS into ordinal ranks prior to completing analysis.

Results

Null Hypothesis One

There is no significant relationship between number of college credit hours in mathematics completed and teacher self-efficacy as measured in the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

A Kendall’s Tau B correlation analysis was conducted in SPSS to determine the existence of a relationship between the variables ($\tau_b = .004, p = .962, \alpha = .007$). In standard practice, a $p$-value less than .05 is considered significant, however, due to the need for Bonferonni correction, alpha was set at .007, leaving a chance for 0.7% chance of Type I error. Due to this information, the researcher failed to reject the null hypothesis. The Kendall’s Tau B statistic is listed below in Table 8.

Table 8

*Kendall’s Tau B Correlation between College Credit Hours in Mathematics and PMTE Scores*

<table>
<thead>
<tr>
<th></th>
<th>$n$</th>
<th>$\tau_b$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math College Credit Hours</td>
<td>69</td>
<td>.004</td>
<td>.962</td>
</tr>
</tbody>
</table>
Null Hypothesis Two

There is no significant relationship between the number of district-provided training hours focused on Common Core Mathematics Standards and teacher self-efficacy as measured in the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

A Kendall’s Tau B correlation analysis was conducted in SPSS to determine the existence of a relationship between the variables ($\tau_b = .002, p = .979, \alpha = .007$). The correlation coefficient $\tau_b$ was .002 with a significance $p$-level of .979. Thus, the researcher failed to reject the null hypothesis. The Kendall’s Tau B statistic is listed below in Table 9.

Table 9

<table>
<thead>
<tr>
<th>$n$</th>
<th>$\tau_b$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math District Training Hours</td>
<td>69</td>
<td>.002</td>
</tr>
</tbody>
</table>

Null Hypothesis Three: There is no significant relationship between the amount of years spent teaching elementary mathematics and teacher self-efficacy as measured in the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

A Kendall’s Tau B correlation analysis identified a significant relationship between the variables. Results of the analysis ($\tau_b = .276, p = .001, \alpha = .007$) indicate a small positive relationship between years of teaching experience and teacher self-efficacy. Thus, the researcher rejected the null hypothesis. The Kendall’s Tau B statistic is listed below in Table 10.

Table 10
Kendall’s Tau B Correlation between Years of Teaching Experience and PMTE Scores

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>τb</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years Teaching Experience</td>
<td>69</td>
<td>.276</td>
<td>.001</td>
</tr>
</tbody>
</table>

Null Hypothesis Four

There is no significant relationship between number of college credit hours in mathematics completed and teaching outcome expectancy as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

A Kendall’s Tau B correlation analysis did not indicate a significant relationship between college credit hours in math and teaching outcome expectancy (τb = -.109, p = .239, α = .007). Thus, the researcher failed to reject the null hypothesis. The Kendall’s Tau B statistic is listed below in Table 11.

Table 11

Kendall’s Tau B Correlation between College Credit Hours in Mathematics and MTOE Scores

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>τb</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math College Credit Hours</td>
<td>69</td>
<td>-.109</td>
<td>.239</td>
</tr>
</tbody>
</table>

Null Hypothesis Five

There is no significant relationship between the number of district-provided professional development hours focused on Common Core Mathematics Standards and teaching outcome expectancy as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).
A Kendall’s Tau B correlation analysis did not indicate a significant relationship between district training hours in math and teaching outcome expectancy ($\tau_b = .094, p = .284, \alpha = .007$). The researcher, therefore, failed to reject the null hypothesis. The Kendall’s Tau B statistic is listed below in Table 12.

Table 12

*Kendall’s Tau B Correlation between District Training Hours in CCSS Math and MTOE Scores*

<table>
<thead>
<tr>
<th>$n$</th>
<th>$\tau_b$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math District Training Hours</td>
<td>69</td>
<td>.094</td>
</tr>
</tbody>
</table>

**Null Hypothesis Six**

There is no significant relationship between the amount of years spent teaching elementary mathematics and teaching outcome expectancy as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

The results of the Kendall’s Tau B correlation analysis did not indicate a significant relationship between years of teaching experience and teaching outcome expectancy ($\tau_b = .227, p = .009, \alpha = .007$). Thus, the researcher failed to reject the null hypothesis. The Kendall’s Tau B statistic is listed below in Table 13.

Table 13

*Kendall’s Tau B Correlation between Years of Teaching Experience and MTOE scores*

<table>
<thead>
<tr>
<th>$n$</th>
<th>$\tau_b$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years Teaching Experience</td>
<td>69</td>
<td>.227</td>
</tr>
</tbody>
</table>

**Null Hypothesis Seven**
There is no significant relationship between elementary teachers’ teaching self-efficacy as measured by the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and teacher outcome expectancy as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) while implementing instruction of Common Core State Standards for Mathematics.

Following assumption testing, a Kendall’s Tau B correlation analysis was performed to determine a relationship between scores on the two subscales of the MTEBI. This analysis displayed a non-significant relationship between the two subscales ($\tau_b = .234, p = .007, \alpha = .007$). At this significance level, results indicate a statistically non-significant positive relationship between teachers’ personal self-efficacy levels and outcome expectancy levels. Thus, the researcher rejected the null hypothesis; however, the researcher suggests the need for further research regarding these variables considering the significance comes extraordinarily near the alpha level set due to Bonferroni. The Kendall’s Tau B statistic is listed below in Table 14.

Table 14

<table>
<thead>
<tr>
<th></th>
<th>$n$</th>
<th>$\tau_b$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTEBI Subscales</td>
<td>69</td>
<td>.234</td>
<td>.007</td>
</tr>
</tbody>
</table>

In an effort to compile all of the information from the present study’s results, the following table provides all Kendall’s Tau B correlation analyses results as well as the significance $p$-levels as arranged according to the seven null hypotheses stated above.

Table 15

*Kendall’s Tau B Correlation Results as Organized by Null Hypotheses*
<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>$n$</th>
<th>$\tau_b$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null Hypothesis 1</td>
<td>69</td>
<td>.004</td>
<td>.962</td>
</tr>
<tr>
<td>Null Hypothesis 2</td>
<td>69</td>
<td>.002</td>
<td>.979</td>
</tr>
<tr>
<td>Null Hypothesis 3</td>
<td>69</td>
<td>.276</td>
<td>.001</td>
</tr>
<tr>
<td>Null Hypothesis 4</td>
<td>69</td>
<td>-.109</td>
<td>.239</td>
</tr>
<tr>
<td>Null Hypothesis 5</td>
<td>69</td>
<td>.094</td>
<td>.284</td>
</tr>
<tr>
<td>Null Hypothesis 6</td>
<td>69</td>
<td>.227</td>
<td>.009</td>
</tr>
<tr>
<td>Null Hypothesis 7</td>
<td>69</td>
<td>.234</td>
<td>.007</td>
</tr>
</tbody>
</table>
CHAPTER FIVE: CONCLUSIONS

Overview

In an effort to better understand the relationship between teacher background and overall teaching efficacy levels, elementary teachers in a southern school district were asked to report three aspects of background training in mathematics and complete an online version of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI), which measures both personal levels of math teaching efficacy and math teaching outcome expectancy level (Enochs et al., 2000). Data from this survey was inputted into the IBM Statistical Package for Social Sciences (SPSS) software and used to analyze the results using nonparametric Kendall’s Tau B correlation analyses. The following chapter includes a discussion of the purpose and brief overview of the study, implications of the study, limitations, and possible recommendations for future research.

Discussion

As the foundation of every child’s academic mathematics career, elementary school math courses have proven to be vital to students’ success not only in school but also in their future career choices (Epstein & Miller, 2011; Rice, Barth, Guadagno, Smith, & McCallum, 2012). Epstein and Miller (2011) challenge that elementary teachers may not have the necessary extensive training in math needed to provide the strong foundation their students need. Newton, Evans, Leonard, and Eastburn (2012) state that teachers’ history of math experiences have proven to impact their self-efficacy levels in teaching math; in turn, teacher efficacy levels have proven to directly impact student performance in the classroom (Mohamadi & Asadzadeh, 2012; Varghese, Garwood, Bratsch-Hines, & Vernon-Feagans, 2016). The purpose of this correlation study was to determine if there is a relationship between elementary teachers’ background training and their self-efficacy in teaching Common Core State Standards.
Research Question One

Is there a relationship between elementary teachers’ background training in mathematics and teaching self-efficacy while implementing instruction of Common Core State Standards for Mathematics?

Null Hypothesis One

There is no significant relationship between number of college credit hours in mathematics completed and teacher self-efficacy as measured in the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

A Kendall’s Tau B correlation was performed in an attempt to reject the null hypothesis, but alternately resulted in an insignificant relationship between the two variables ($\tau_b = .004$, $p = .962$, $\alpha = .007$). Thus, the researcher failed to reject the null hypothesis. This finding was surprising because research has shown that math anxiety levels are lowered by the number and level of college math courses (Bates, Kim, & Latham, 2011; Finlayson, 2014; LeSage, 2012) and anxiety levels in math have proven to impact math teaching efficacy levels (Bates et al., 2011). Additionally, personal math efficacy, how people feel they are able to perform their own math tasks, has been known to impact math teaching efficacy (Bates et al., 2011). The researcher felt it was safe to assume that the number of math college courses teachers had taken would, in turn, affect their self-efficacy levels, but that proved to not be the case in the present study. Perhaps this is due to the distance in time since the courses were completed; if a teacher with 10 years of teaching experience went immediately from graduating college into his teaching career, there would likely be a minimum of 10 years since he took his last college math course, unless that teacher had chosen to continue his education on a scholarly level after entering into his career.
Of the participants’ years of teaching experience, results show a mean of 11 years, possibly explaining the unexplained results in the present study. With this in consideration, it should also be noted that the CCSS were not in use when majority of the participants began teaching, which would make it difficult for them to have attended preservice college courses in mathematics that would have prepared them for CCSS; this could also explain why teacher efficacy levels while teaching CCSS were not affected by the number of math college courses.

**Null Hypothesis Two**

There is no significant relationship between the number of district-provided training hours focused on Common Core Mathematics Standards and teacher self-efficacy as measured in the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

A second Kendall’s Tau B correlation was performed to analyze the relationship between professional development hours and math teaching efficacy. The results of this analysis proved to be insignificant ($\tau_b = .002, p = .979, \alpha = .007$), indicating a failure to reject the null hypothesis. These results suggest that math teaching efficacy levels do not have a relationship with hours spent in professional development regarding the newest standards in mathematics, however it is important to note that 10.1% (N=7) of participants reporting not receiving any professional development hours in CCSS. The researcher found the non-significant results to be extremely surprising due to the frequency in which inservice is used in the educational profession. However, the research supports concerns voiced by Bautista and Ortega-Ruiz (2015) who warn against dependency on locally developed trainings that tend to be ineffective and non-research based. Varghese, Garwood, Bratsch-Hines, and Vernon-Feagans (2016) suggest that specific methods of professional development prove to be more effective in improving teacher efficacy,
but it seems apparent that this is not the situation with the methods used for the district in which participants of the present study teach. These results appear to be consistent with prior research that uncovers the ineffectiveness of traditional professional development trainings (Bautista & Ortega-Ruiz, 2015; Varghese, Garwood, Bratsch-Hines, & Vernon-Feagans, 2016). Some educational leaders are steering away from traditional training and moving into extended trainings that include the opportunity for teachers to interact with one another over a course of time and also provides coaching, follow-through, and continued support for teachers (Bautista & Ortega-Ruiz, 2015; Varghese et al., 2016); this allows teachers the opportunity to put new concepts into practice and gain support regarding effectiveness and ineffectiveness of the concepts and strategies (Vadahi & Lesha, 2015). The researcher calls for further research in the area of current teachers’ outcome expectancy as it relates to extended, intensive research-based professional development as opposed to locally developed, traditional training courses.

**Null Hypothesis Three**

There is no significant relationship between the amount of years spent teaching elementary mathematics and teacher self-efficacy as measured in the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).  

For the final hypothesis from the first research question, the researcher again conducted a Kendall’s Tau B correlation. The analysis resulted in the identification of a statistically significant positive relationship ($\tau_b = .276, p = .001, \alpha = .007$), suggesting that the years of teaching elementary math could in fact have an impact on teacher efficacy. This was not a total surprise to the researcher as research has shown teaching experience to improve productivity
(Harris & Sass, 2011), desire to invest in extended learning (Van Maele & Van Houtte, 2012), and student achievement (Van Maele & Van Houtte, 2012). As teachers gain experience, the results of the present study indicate they also improve their teaching efficacy levels in mathematics; thus, the researcher rejected the null hypothesis. It should be noted, however, that results such as these may indicate an anomaly in regards to the likelihood of less efficacious teachers to leave the profession earlier, which could potentially skew the data that looks at years of teaching experience as an indicator of factors such as efficacy (Harris & Sass, 2011).

**Research Question Two**

Is there a relationship between elementary teachers’ background training in mathematics and teaching outcome expectancy while implementing instruction of Common Core State Standards for Mathematics?

**Null Hypothesis Four**

There is no significant relationship between number of college credit hours in mathematics completed and teaching outcome expectancy as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

In order to better understand the potential relationship between the number of college math courses a teacher has completed and their math teaching outcome expectancy, how well they believe their students will learn from their teaching (Newton, Evans, Leonard, & Eastburn, 2012), a nonparametric Kendall’s Tau B was performed using the data provided in the teacher survey. This correlation analysis failed to find a significant relationship between the two variables ($\tau_b = -.109, p = .239, \alpha = .007$), meaning that there was no relationship found between
college credit hours in math and outcome expectancy in teaching math. Thus, the researcher failed to reject the hypothesis. In previous studies, teachers have reported a sense of fear in both performing and teaching math (Bates et al., 2011; Finlayson, 2014). Bandura (1997) has explained that past successes and positive experiences tend to improve one’s beliefs in his or her abilities to perform in the future; as a teacher, this would mean that past successes in math, both in student performance and personal performance, could impact the teacher’s views on future success. The present study, however, shows that regardless the number of college math courses that teachers take, there is no difference in their outcome expectancy for their students’ performance. As previously stated, the lack of impact of college courses in mathematics may be unrelated to teacher efficacy and outcome expectancy due to the timeframe between which the courses were completed and the present study was conducted. Additionally, math related to the CCSS was not likely to be taught in college courses prior to the release of CCSS in 2013 (CCSS, 2015a). The results of the present study conflict with prior research that repeatedly shows that college math courses lower math anxieties which, in turn, increases efficacy levels in preservice teachers (Bates, Kim, & Latham, 2011; Finlayson, 2014). This discrepancy could, however, be due to the limited research available regarding inservice teachers and outcome expectancy since most studies the researcher found related to preservice teachers; perhaps once teachers enter their career, the impact of the college math courses decreases. Further research is needed to differentiate between the impact of college courses in mathematics for preservice and inservice teachers.

**Null Hypothesis Five**

There is no significant relationship between the number of district-provided professional development hours focused on Common Core Mathematics Standards and teaching outcome
expectancy as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

Various methods of in-service trainings are used to introduce new curriculum and standards, such as the CCSS, to classroom teachers as an ongoing way to further understanding and keep teachers up-to-date (Bautista & Ortega-Ruiz, 2015; Vadahi & Lesha, 2015). Interestingly, a substantial amount of research has proven professional development courses, especially locally-developed ones such as the ones that were presented to the participants of the present study, have little to no impact on teachers, thus identifying the courses to be essentially ineffective in their purpose (Bautista & Ortega-Ruis, 2015; Harris & Sass, 2011; Lieberman & Mace, 2008). The outcome of a Kendall’s Tau B correlation analysis within the present study revealed similar results ($\tau_b = .094, p = .284, \alpha = .007$). Presented with this insignificant result, the researcher failed to reject the null hypothesis regarding a relationship between inservice training and math teaching outcome expectancy. Some researchers have found that the methods in which professional development are presented could drastically affect the results of the training courses (Bautista & Ortega-Ruiz, 2015; Lieberman & Mace, 2008; Vadahi & Lesha, 2015; Varghese, Garwood, Bratsch-Hines, & Vernon-Feagans, 2016); this could perhaps indicate that the district referred to in the present study may need to adjust their training to find more successful methods of development. Additionally, not all participants had participated in professional development training regarding CCSS, possibly skewing the non-significant results.

**Null Hypothesis Six**

There is no significant relationship between the amount of years spent teaching elementary mathematics and teaching outcome expectancy as measured by the Mathematics Teaching
Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI).

As teachers gain more experience in teaching, they often prove to demonstrate advanced teaching skills and math performance (Huang et al., 2014). Years of experience has also proven to predict student academic achievement (Van Maele & Van Houtte, 2012), which according to Bandura’s (1997) theory of improved outcome expectancy with past successes would make one believe that a teacher’s outcome expectancy would improve with each passing year of experience. To the researcher’s surprise, this was not proved to be the situation in the present study. Results of a Kendall’s Tau B correlation demonstrated that teachers’ outcome expectancy was not impacted by the years of teaching experience ($\tau_b = .227, p = .009, \alpha = .007$). It is important to note that though results were nonsignificant, under a less stringent alpha, because the significance is at such a low value, there may be different results found in future studies. Because of this, there appears to be a need for further research regarding years of teaching experience and outcome expectancy. Vadahi and Lesha (2015) caution that without proper support and development, teachers’ beliefs about their teaching may be more difficult to change. Perhaps that has become the case in the present study. Other factors may also be involved in the impact of the teachers’ outcome expectancy, leaving room for more research to be done to better understand this anomaly.

**Research Question Three**

Is there a relationship between elementary teachers’ self-efficacy and teacher outcome expectancy while implementing instruction of Common Core State Standards for Mathematics?

**Null Hypothesis Seven**
There is no significant relationship between elementary teachers’ teaching self-efficacy as measured by the Personal Mathematics Teaching Efficacy (PMTE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) and teacher outcome expectancy as measured by the Mathematics Teaching Outcome Expectancy (MTOE) subscale of the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) while implementing instruction of Common Core State Standards for Mathematics.

Teacher efficacy, comprised of personal teaching efficacy and outcome expectancy, greatly impacts the overall dynamics of a classroom teacher’s teaching and motivation as well as student performance (Bandura, 1997, 2012; Vadahi & Lesha, 2015; Varghese et al., 2016). Using the participant responses on the MTEBI survey, a Kendall’s Tau B correlation was performed to determine a possible relationship between the two subscales, PMTE and MTOE. Results identified a nonsignificant relationship ($\tau_b = .234, p = .007, \alpha = .007$); thus, the researcher failed to reject the null hypothesis, but suggests the need for further study in this area since the significance level is extremely low but due to the Bonferonni correction, which lowered the alpha level to .007, was found nonsignificant. These results support Rotter’s (1966) theory of locus of control, suggesting that when people demonstrate positive beliefs in their abilities to perform, they will feel encouraged about the level of control they have on the situations around them. Varghese et al. (2016) also support this concept when they specify that when teachers maintain focus on outcomes in learning, they tend to also demonstrate a certain level of confidence in their abilities as well as levels of instructional effort and diligence.

**Implications**

The present study provides a myriad of valuable information regarding teacher efficacy beliefs and how they may or may not be impacted by teacher background, though the results of
the study revealed that background training had little to no effect on teacher efficacy levels as measured by the MTEBI. Knowing that college credit hours in mathematics had no significant effect on math teaching efficacy levels or outcome expectancy levels could possibly demonstrate that the math courses taken by the participants were ineffective in boosting efficacy. The researcher, however, finds it unreasonable to assume that all participants took the same level and type of course in their preservice training. The results more likely suggest that college math courses are unlikely to be an overall factor in teaching efficacy levels of teachers once they begin their careers in education.

The second area in teacher background training that was a part of the present study was that of inservice professional development hours in district-provided training focused on the Math portion of the CCSS. These training hours also proved to be unrelated to efficacy levels and outcome expectancy levels as tested with Kendall’s Tau B. This could be explained by a variety of reasons. One possible explanation was that the method of training was not developed appropriately according to research-based methods previously found to be successful in improving teacher efficacy (Bautista & Ortega-Ruiz, 2015). Another consideration could be related to the concerns presented by Bautista and Ortega-Ruiz (2015) of locally designed programs that are often lacking depth and extended comprehensive nature. Additionally, teacher efficacy may simply not depend or be affected by professional development training as a whole. The researcher feels it’s important to note again that the data from reported professional development hours was strongly skewed left, with 10.1% (N=7) of participants reporting zero hours of training in CCSS, possibly affecting a potential impact of inservice training hours on teaching efficacy levels. This area appears to need further research to help understand effects of professional development.
Another focus of background training assessed in the present study is years of teaching experience. Considered as on-the-job training by Harris and Sass (2011), this was the one area that produced significant results as to how it relates to math teaching efficacy, though no significant results were found with outcome expectancy as measured by the MTOE subscale of the MTEBI. These results indicate that as teachers gain experience, they also gain efficacy. With this knowledge, the researcher finds it vital to research further into how experienced teachers with greater efficacy levels could support and guide more inexperienced teachers so that efficacy levels could be raised in all areas of experience.

Bandura (1977) charges that surrounding environments can have a great impact on behavior motivation as well as self-efficacy. Interestingly, teacher background in math college courses or professional development, both forms of environment, did not deem to be statistically significant in the present study. However, environmental stressors, such as the curriculum turnover involved with reforms such as CCSS, have also proven to be damaging to self-efficacy levels instead of supportive (Bandura, 1977). The study did specifically refer to efficacy levels while teaching CCSS so there may have been different results under another set of math standards or possibly without the repeated reforms.

The researcher was surprised at the near-significant results of the correlation between self-efficacy and outcome expectancy scores on the MTEBI as these two concepts have proven to work together to comprise overall teaching efficacy (Enochs, Smith, & Huinker, 2007; Tschannen-Moran, Hoy, & Hoy, 1998). It seems fair to conclude that when teachers maintain beliefs that they are capable of teaching, they will also feel confident in their students gaining knowledge from their teaching (Newton, Evans, Leonard, & Eastburn, 2012). This near-significant relationship furthers the importance of continued research on what encourages
teachers to gain efficacy in their teaching abilities as increased levels of efficacy support increased outcome expectancy, both of which have proven to improve student performance in a Pygmalion effect (Friedrich, Flunger, Nagengast, Jonkmann, & Trautwein, 2012; Mohamadi & Asadzadeh, 2012; Varghese, Garwood, Bratsch-Hines, & Vernon-Feagans, 2016). With the decline of students entering STEM area careers following graduation and the increased need for positions to be filled in these areas due to the ever-changing technological fields (Epstein & Miller, 2011; Rice, Barth, Guadagno, Smith, & McCallum, 2012), there is no time to waste on learning what can be done to improve overall teacher efficacy levels in mathematics.

**Limitations**

The present study was conducted using anonymous self-report measures, which allows for possible inflation or deflation of responses. Additionally, one problem with surveys can be the temptation for participants to respond with what they feel is a “correct” answer as opposed to their true feelings regarding the questions (Gall, Gall, & Borg, 2007). Because the survey was optional to teachers, only a small percentage responded to the survey. This could potentially skew the data since there are a significant number of elementary teachers within the district who chose not to respond. Results may have been different had all teachers been required or inclined to complete the survey. There is also a potential inaccuracy in hours of training and college credit hours. If teachers chose not to look up these exact hours and provided an estimate, there is a limitation of accuracy in these reported hours.

Because the survey was given only to teachers within one semi-rural Florida school district, the study results cannot be generalized beyond the population studied. Additionally, the survey was sent out only to elementary teachers of grades kindergarten through fifth grade in a semi-rural Florida school district, leaving out teachers who teach outside of these grade levels,
either above or below. Yet another limitation could be that two of the areas of teacher background, years of experience and college credit hours, are not specifically focused on the CCSS that are being referred to in the study. Only the area of professional development was focused directly on CCSS. Because of this, the other areas of teacher background could possibly affect teachers in a different way if they were teaching towards different mathematics standards.

**Recommendations for Future Research**

Further research is required in order to expose even more information regarding teacher background and teacher efficacy. The researcher recommends the following considerations:

1. Collect data from participants at older school and grade levels teaching CCSS, including middle and high school ages.

2. Collect data from different school districts, which may have used another method of professional development aside from locally-based trainings.

3. Conduct research in states that have rejected CCSS to determine if the CCSS have impacted the efficacy levels of teachers.

4. Collect information from other similar populations in order to understand if the results from the present study were an anomaly or are consistent with different teachers in a similar setting.

5. Results of the impact of college math courses on teacher efficacy and outcome expectancy conflict with prior research of such impact on preservice teachers. Further research is needed to determine the difference in impact on preservice and inservice teachers.

6. The present study supports prior research regarding the ineffectiveness of traditional professional development courses (Bautista & Ortega-Ruiz, 2015;
Vadahi & Lesha, 2015). Research is needed in the areas of different methods of professional development as they relate to teacher efficacy and outcome expectancy.

7. Due to the significance level of the relationship between years spent teaching elementary math and teaching outcome expectancy resulting very closely to the extremely low alpha level in the study ($p=.009, \alpha=.007$), more research should be done looking at these two variables in similar populations as the results suggest a possible relationship may still be identified.

8. The significance level found between the Personal Mathematics Teaching Efficacy (PMTE) scores and Mathematics Teaching Outcome Expectancy (MTOE) scores was equal to that of the alpha level ($p=.007, \alpha=.007$), which was lowered due to the Bonferroni corrections. The researcher believes this indicates a need for further research of these two areas, as the results would have been found significant under a different alpha level.
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APPENDIX A
Mathematics Teaching Efficacy Belief Instrument Survey and Scoring Procedures


Part 1 of 2: Demographics
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 no more than 20 minutes to complete. Thank you for your time and participation.

1. Please select the best description of your certification:
   ____ Elementary Education (grades K-6)   ____ Prekindergarten/Primary Education (age 3-grade 3)
   ____ Temporary Certification    ____ Alternative Licensure
   ____ Other (please specify) ____________________________________________

2. At what grade level do you teach mathematics? ___________

3. Including this school year, how many years have you taught mathematics? ______________

4. How many mathematics credit hours did you complete in college? (The average course is 3 hours. If you cannot remember the exact number, please provide an estimate.) _____________

5. How many hours of in-service training have you received focused on Math following the adoption of the Common Core State Standards in 2010? (This information can easily be found on your True North Logic site) Please provide an answer in numeric form only. An average training day is approximately 6 hours. ______________

Part 2 of 2: Mathematics Teaching Efficacy Beliefs Instrument Survey


APPENDIX B

Permission Email to Use Mathematics Teaching Efficacy Beliefs Instrument

Jennifer,

The instrument was published in SSM as an article and is available:


Best regards,

DeAnn Huinker

On Sep 26, 2015, at 3:43 PM, "Stuart, Jennifer" <jstuart@liberty.edu> wrote:

Dr. Huinker,

Hello! My name is Jennifer Stuart. I am a candidate for the EdD program at Liberty University. I was writing to find if you know how I can obtain access to the Mathematics Teacher Efficacy Beliefs Instrument (MTEBI), which I believe you were a part of developing, in order to hopefully use it for my dissertation I am preparing to propose.
I tried to look online and found the instrument listed through STELAR, but could not actually find access to obtaining permission for use, only a link to the validation study.

If you have a moment, I would greatly appreciate any assistance you could provide in this area.

Thank you very much,

Jennifer Stuart
Liberty University EdD student
Jstuart@liberty.edu
352-304-0838

Dr. DeAnn Huinker
Professor, Mathematics Education, Department of Curriculum and Instruction
Director, Center for Mathematics and Science Education Research (CMSER)
University of Wisconsin-Milwaukee
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414-229-6646 ~ 414-229-4855 fax
APPENDIX C
IRB Exemption

LIBERTY UNIVERSITY
INSTITUTIONAL REVIEW BOARD

November 3, 2016

Jennifer Stuart
IRB Exemption 2673.110316: The Relationship Between Elementary Teachers’ Background in Mathematics, Teaching Self-Efficacy, and Teaching Outcome Expectancy When Implementing the Common Core State Standards

Dear Jennifer Stuart,

The Liberty University Institutional Review Board has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and no further IRB oversight is required.

Your study falls under exemption category 46.101(b)(2), which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:101(b):

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.
Please note that this exemption only applies to your current research application, and any changes to your protocol must be reported to the Liberty IRB for verification of continued exemption status. You may report these changes by submitting a change in protocol form or a new application to the IRB and referencing the above IRB Exemption number.

If you have any questions about this exemption or need assistance in determining whether possible changes to your protocol would change your exemption status, please email us at irb@liberty.edu.

Sincerely,

G. Michele Baker, MA, CIP

Administrative Chair of Institutional Research

The Graduate School

Liberty University | Training Champions for Christ since 1971
APPENDIX D

Permission Email for School District and Approval

Date: November 28, 2015

Ms. XXXXXXXX
Director of Guidance and Assessment
XXXXXXXXX School District

[Address 1]
[Address 2]

Dear Ms. XXXXXXXX:

As a graduate student in the School of Education at Liberty University, I am conducting research as part of the requirements for an Ed.D. in Educational Leadership. The title of my research project is The Relationship Between Teacher Background and Self-Efficacy in Elementary Teachers while Implementing Common Core Mathematics Standards and the purpose of my research is to determine if there is a relationship between teacher background, as measured by college credit hours completed in mathematics, years spent teaching mathematics, and hours of in-service training in Common Core Math, and teaching efficacy in math while implementing Common Core Math Standards. Teaching efficacy is comprised of personal math teaching efficacy (confidence in personal ability to teach math) and outcome expectancy (confidence that students will be able to learn from teaching) and I am writing to invite you to participate in my study.

I am writing to request your permission to contact all elementary math teachers in XXXXXXXXXX County Public Schools to invite them to participate in my research study.
Participants will be asked to go to SurveyMonkey ® and click on the link provided to conduct the survey. 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 provide a signed statement on approved letterhead indicating your approval and mail to: Jennifer Stuart at Address.

Sincerely,

Jennifer Stuart

Liberty University Doctoral Student
December 1, 2016

Reference: Research Project: The relationship between elementary teachers’ background in mathematics, teaching self-efficacy, and teaching outcome expectancy when implementing the common core standards; Jennifer Stuart, doctoral student, Liberty University

To Whom It May Concern:

Ms. Jennifer Stuart has proposed to conduct a research project within the County School District. I have reviewed this research proposal, and it appears that the applicant understands confidentiality requirements and ethical considerations associated with such a project. Based on the information received at this time, it is expected that this project will meet district criteria for approval of research projects.

Please consider this letter as approval for Ms. Stuart’s research project to be conducted within the County Public Schools as proposed.

Ms. Stuart has our best wishes for a successful project. Please contact me if you have questions or concerns.

Sincerely,

[Signature]
Director, School Counseling and Assessment
[Public Schools]
APPENDIX E

Email Request for Teacher Participation

Date: October 19, 2016

Dear Teacher:

As a graduate student in the School of Education at Liberty University, I am conducting research as part of the requirements for an Ed.D. in Educational Leadership. The purpose of my research is to determine if there is a relationship between teacher background, as measured by completed college credit hours in mathematics, years of experience teaching mathematics, and number of hours spent in inservice training focused on Common Core Math Standards, and teaching efficacy in math while implementing Common Core Math Standards. Teaching efficacy is comprised of personal math teaching efficacy (confidence in personal ability to teach math) and outcome expectancy (confidence that students will be able to learn from teaching) and I am writing to invite you to participate in my study.

Participants must be current teachers teaching math at an elementary (K-5) school within Marion County Public Schools. If you are willing to participate, you will be asked to complete an online survey through SurveyMonkey®. It should take approximately 10 minutes for you to complete the procedure listed. Your participation will be completely anonymous, and no personal, identifying information will be required.

To participate, I ask you to please go to https://www.surveymonkey.com/r/FL96NTJ, and complete the survey by November 11, 2016.

Please click on the survey link at the end of the consent information to indicate that you have read the consent information and would like to take part in the survey. Completion of the survey implies your consent to participate in the research study.

Compensation will not be provided for participation in the study.

Should you have any questions, you are encouraged to email the researcher, Jennifer Stuart, at jstuart@liberty.edu.

Thank you for your time and your consideration!
Sincerely,

Jennifer Stuart

Liberty University Doctoral Student