ABSTRACT

MATTINGLY, AMY WADE. The Effects of Response to Intervention on Elementary School Academic Achievement and Learning Disability Identification. (Under the direction of Dr. Matthew Militello).

The Response to Intervention (RTI) framework evolved from the Individuals with Disabilities Education Act (2004). The framework is generally a three or four-tiered model to guide instruction, intervention, and assessment. RTI has the potential to increase student achievement. RTI has also been proposed as an alternative to the IQ-achievement discrepancy method to determine if a student has a specific learning disability (SLD) or to provide more data to couple with the discrepancy method to make a special education determination. This study investigated the effect of RTI on students in third, fourth, and fifth grades in North Carolina public elementary schools. The research questions were: (1) How does RTI affect student achievement? (2) What is the effect of RTI implementation on the proportion of elementary school students identified as learning disabled? I utilized the propensity score matching (PSM) technique to match schools that implemented RTI with a control group of schools that did not use RTI. Following PSM, I employed ordinary least squares (OLS) regression to predict the effect of RTI on student achievement and SLD identification. The results indicate an increase in reading achievement for RTI schools, but no effect on math. In addition, RTI had no effect on the proportion of students identified with a SLD. The findings suggest that RTI can increase student achievement when instruction and interventions target students’ areas of need. Also, schools may benefit from more explicit guidance about how to use RTI data to determine if a student has a SLD.
The Effects of Response to Intervention on Elementary School Academic Achievement and Learning Disability Identification

by

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DEDICATION

I dedicate this dissertation to my husband, Erik, and to my children, Bellamy and Dalton.

Thank you for your encouragement, patience, and humor throughout the process.
BIOGRAPHY

Amy Mattingly grew up in Haw River, North Carolina. She received the North Carolina Teaching Fellows Scholarship during her senior year at Graham High School. She attended the University of North Carolina at Wilmington where she obtained a bachelor’s degree in Elementary Education and a master’s degree in Language and Literacy.

Following graduation, she moved to Raleigh, North Carolina and taught in the Wake County Public School System. During her eight year teaching career she was a fourth grade classroom teacher, a Title 1 literacy specialist for kindergarten through fifth grade, and served as the Response to Intervention Coordinator at the two schools where she taught.

Amy left the teaching profession to pursue a PhD in the Educational Research and Policy Analysis program at North Carolina State University. Her research interests include Response to Intervention, elementary school literacy instruction and intervention, and K–12 education policy.
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I want to thank my dad for being a constant example of service to others. I am in awe of the daily sacrifices he makes to comfort and care for those in need. I want to thank my mom for being an unceasing model of faith. Her grace and strength in dealing with cancer has provided perspective during the journey and reminded me of the truly important things in life.

I am honored to be the mom to two amazing children, Bellamy and Dalton. I appreciate the laughter we share daily. Their innocence forced me numerous times to get over my doctoral student woes and refocus my energy where it was needed.

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CHAPTER 1
INTRODUCTION

RTI is a hot topic. There is increasing pressures from states and districts to implement the framework, while education vendors promote curriculum materials as RTI friendly. The IQ-achievement discrepancy method is falling out of favor for determining special education eligibility and as a result, it is important to study the outcomes of RTI.

The task of defining what constitutes a learning disability, how to measure it, and identifying who has one has been debated in the education conversation for over thirty years. Parental advocacy groups developed after the Civil Rights Movement were active in influencing the development of the Individuals with Disabilities Education Act (IDEA), passed in 1975 (Eskay, Onu, Ugwuany, Obiyo, & Udaya, 2012). The goal of IDEA was access to free and appropriate public education for all students by providing federal funds to public schools to provide support for students with disabilities (National Dissemination Center for Children with Disabilities, 2012). The law did not only pertain to students with physical disabilities, but also to those identified with specific learning disabilities (SLD). When IDEA was passed, states adopted the LD identification method of using a learning discrepancy formula to determine aptitude, or IQ, and achievement. The method was a controversial decision and the use of the test for diagnosing SLD continues to be intensely debated (Reynolds, Livingston, Willson, 2009). Since a learning disability is considered a soft disability that often lacks physical attributes, determining its existence continues to be a subjective process (Fuchs, Fuchs, & Speece, 2002). This subjectivity may also contribute to
why the method for determining the existence of a learning disability is contentious. Mellard, Deschler, and Barth (2004) note that since IDEA:

…researchers have been trying to build a better mousetrap –one that will perform in a superior fashion compared to those currently in use. The dimensions of our mousetraps that determine how effective they are vary from the number of false negatives or false positives they produce to the age at which they can effectively be used to make identification decisions. In each instance, researchers and practitioners labor under that assumption that a superior ‘mousetrap’ can be built, believing it is simply a matter of having the right conceptual framework upon which to design the model and the right combination of factors built into the model to gather the right kinds of data under the right conditions (p. 231).

In 2004, IDEA was reauthorized and the “mousetrap” evolved introducing the tenets of RTI. This evolution of the policy mandated ruling out underlying reasons students struggle before they could be identified as having a SLD. These included education difficulties due to

(1) English as a second language

(2) poverty

(3) a lack of research-based teaching

(4) a visual, hearing, or motor disability

(5) mental retardation
The policy also removed the requirement of an IQ-achievement discrepancy test (U.S. Department of Education, 2006). In addition, SLD could be identified for the following areas: (1) oral expression; (2) listening comprehension; (3) written expression; (4) basic reading skills; (5) reading fluency skills; (6) reading comprehension; (7) mathematics calculation; and (8) mathematics problem solving (U.S. Department of Education, 2006). Including the lack of research-based teaching as an exclusionary factor connected IDEA 2004 to the reform movement for teacher accountability that was part of the No Child Left Behind Act.

Following the reauthorization, schools could choose between the IQ-achievement discrepancy test or using a method called Response to Intervention (RTI). RTI involved using data that monitored how students progressed when given interventions to diminish academic weaknesses (U.S. Department of Education, 2006). Students considered non-responders to interventions could then be identified as having a learning disability. The policy did not mandate a particular type of data or any required metrics to be used. Following IDEA 2004, districts and schools across the United States began to adopt a model of tiered instruction and assessment. RTI, the tiered instruction and assessment, usually had three or four tiers, with increasing levels of intervention and assessment as students required more support to meet behavioral and academic goals. As students required additional support with tiered instruction, assessments were given frequently to monitor whether students were moving towards meeting the goals. If the student’s trajectory of learning did not increase and move towards meeting their goal within a specified time frame, the documentation of non-
response was used to determine the existence of a learning disability. Then, theory of action stipulated that if the data showed the child was responding to interventions, the data could be used to disprove the presence of a learning disability (Fuchs et al., 2002). The RTI method placed less emphasis on characteristics within the student and more on environmental variables (Barnes & Harlacher, 2008).

The RTI framework considers all students, first and foremost, as regular education students. Even those students receiving special education continue to receive research-based instruction when they are in the regular education classroom in addition to the research-based special education instruction. RTI is not a program; rather it is a framework that encourages the school to consider whether there is a problem with teaching or the learning environment before investigating a problem within the learner. Whereas RTI can be used to identify students with a learning disability, its focus is also on student achievement for the entire school population (Barnes & Harlacher, 2008; Fletcher, Coulter, Reschler, & Vaughn, 2004; Fuchs et al., 2012; Wixson, 2011). Schools use RTI as an instructional model to align assessments, instruction, and intervention and progress monitor students. Schools may also use it as a diagnostic model using data from progress monitoring to determine special education eligibility (Torgesen, 2009).

Another area of contention within the literature, policy, and practice is the overrepresentation of minorities identified and served in special education (Beratan 2008; Hosp & Reschly, 2003; Hosp & Reschly, 2004). One perspective of special education is that it is a service that provides help for students (Mellard et al., 2004), whereas another view is
that special education is a legalized way to segregate minority students from the mainstream classroom (Beratan, 2008). A recent example of the relevance of this topic occurred in Pennsylvania where a mother sued a school district for mistakenly identifying her daughter as learning disabled. An IQ-achievement discrepancy model was used to determine the specific learning disability of an African American girl when she was in fifth grade. The student received special education until she was in tenth grade. An independent evaluation was conducted and concluded that the girl was not disabled and never had a disability. The case, *S.H. v. Lower Merion School District* 2013, emphasized the perceived problem of students receiving special education and missing out on mainstream educational opportunities. The family argued that the assessments used to determine eligibility were defective and they sought monetary compensation. Although The U. S. Court of Appeals for the Third Circuit ruled in favor of the school system on September 5, 2013, (*S.H. v. Lower Merion School District*, 2013) it reiterated the need to accurately identify students with a LD and the repercussions on families, students, and school districts if the process and assessments are viewed as unreliable.

One of the anticipations with RTI is that it will provide a more equitable way to meet students’ needs instead of waiting for children to fail and then pulling them out of the mainstream classroom to treat them in special education (Fletcher et al., 2004). Some researchers, policymakers, and practitioners are hopeful, yet others are still skeptical of the validity of RTI and argue that being nonresponsive to interventions is not synonymous with having a learning disability (Kavale & Spaulding, 2008).
The LD identification process has both short and long term consequences. The education system must ensure the practices are equitable and effective before students receive a label and begin a process that influences their academic path. The infancy of the RTI initiative opens the door to a variety of research topics. One possible research opportunity is to investigate who is implementing RTI in North Carolina at both the district and school level and how these schools manage progress-monitoring data. Another research area is to explore effective RTI implementation practices. Additionally, research could focus on the policy actors and how they interact to generate the paradigm shift to adopt RTI. The current study will focus on student outcomes of RTI implementation.

**Purpose of the Study**

Schools in the United States are increasing implementation of RTI, however, it is difficult to monitor and the practice is highly idiosyncratic. The intent of RTI is also twofold-improve student achievement and identify students with learning disabilities in a manner that is equitable and reliable. The purpose of this study is to investigate the effect of RTI on academic achievement as measured by overall student proficiency on reading and math end of grade test scores for elementary school students. In addition, I will explore the effect of RTI implementation on students identified with a specific learning disability. It is imperative to measure the outcomes of the framework to ascertain whether the evolved mousetrap has actually improved outcomes for students.
Significance of the Study

Empirical literature regarding RTI is growing, yet there is still confusion as to whether RTI has an effect on students and if so, what the effect is. A focus within the research literature is often on determining stakeholder perspectives and conducting case studies of schools to investigate how they implement the framework. Most of the current quantitative studies in the literature depend on descriptive statistics or basic inferential statistics to analyze trends and these analyses cannot be used to make causal conclusions or provide data that can isolate the impact of RTI.

A deficiency in the literature is also the emphasis on one piece of the framework, such as a particular Tier 2 intervention. RTI is not a program; rather it is a framework where all elements work congruently to create an environment conducive to learning for the entire student population. I seek to fill that deficit with this study by using the entire RTI framework as one variable in the model and seeing how it affects student academic achievement and the proportion of students identified with a specific learning disability. I will use a quasi-experimental research design to make a better case for causal inferences regarding the effect of RTI.

The study has implications for research, policy, and practice. The results will add to the body of literature on RTI by measuring both the effect of RTI on student achievement and on identification of specific LD in one state. Decreasing the number of students who rely on special education is one expectation of RTI that has been documented in the literature. RTI also focuses on effective instruction and interventions that improve student achievement.
The methods in the study, a quasi-experimental design of propensity score matching and linear regression, will allow the research community to better determine if RTI does affect academic achievement and specific LD identification. As Lindstrom and Sayeski (2013) point out, “despite widespread implementation of RTI, empirical evidence supporting the link between RTI and decreasing SLD [specific learning disability] does not yet exist” (p. 15).

The current study is also significant to policy. RTI implementation has resulted from the federal law IDEA 2004. Although RTI it is not mandated at the federal level, states and districts are left to create their own policies that guide schools with RTI implementation. The outcomes and analysis will give states and school districts information to guide their decision-making by determining whether RTI is positively affecting student achievement and whether the proportion of students identified as LD have decreased as some anticipate.

The study will be significant to practice for states and districts implementing RTI and those who are considering adopting the framework. The data can be used to better understand if and how implementation is affecting students and the information can guide the type of professional development that is offered and better equip RTI coaches who support schools. It could also help states in their decision of whether to mandate RTI or allow schools to continue with the tradition model of instruction, assessment, and intervention.

**Overview of Approach**

I addressed the research questions using a quasi-experimental design. The sample for the study consisted of third through fifth grade students enrolled in K-5 public schools in
North Carolina during the 2012-2013 academic year. I used the preprocessing strategy of propensity score matching because it allowed for the analysis of RTI when compared to schools in the same state not implementing RTI. Propensity score matching (PSM) gives the advantage of being able to analyze participants who received a treatment, in this case RTI, and compare them to a control group similar in regards to observable characteristics to determine if their outcome is different with the treatment. I ran OLS models before and after PSM to compare the results and ensure the findings were doubly robust (Ho, Imai, King, & Stuart, 2007).

The observed covariates used for matching treated to non-treated schools include: prior achievement, percentage of students who are male, percentage of students who are minority, percent of students who are economically disadvantaged, percent of students with limited English proficiency, the size of the school measured in total number of students, urbanicity of the school, magnet school status, traditional schedule compared to year-round schedules, Title 1 school status, Reading First status, number of books per student, instructional learning devices per student, teaching experience, teacher turnover rate, and number of teachers with national board certification.

The hypothesis was that RTI schools would have a higher percentage of students proficient on the reading end of grade test, but not in math. The second hypothesis was that RTI schools will have a statistically significant decrease in the proportion of students labeled SLD than students in the control schools. The rationale behind the hypothesis was because the focus of RTI is generally in literacy; therefore the math achievement proficiency may be
similar in RTI and non-RTI schools. If the findings revealed that math scores were similar for RTI and non-RTI schools, it was more likely that the increase in the literacy achievement proficiency was due to RTI and not some other variable since math achievement would probably increase.

Summary

The naming of a learning disability for a child has serious consequences that may be viewed as positive, negative, or somewhere on a continuum. Special education services can provide individualized instruction that accelerates the learning for students or pull students out of the mainstream classroom causing them to feel ostracized and not reach their behavioral and academic goals. The policy, practice, and learning stake are high, therefore outcomes of the process must be studied and analyzed.

The IQ-achievement discrepancy model that has historically been used to identify students with learning disabilities has come under criticism as to whether it is a valid measure to identify all struggling students with learning disabilities (Hoover, 2010; Proctor, Graves & Esch, 2012). The overrepresentation of males and minority students within special education classrooms is worrisome and has led to the hunt for an alternative method within schools that could possibly decrease the number of struggling students while providing a more equitable way to determine if students have a specific learning disability (Orosco, 2010).

RTI emerged as the alternative to the IQ-achievement discrepancy model. Whereas it can be an instructional model and/or a diagnostic approach (Torgesen, 2009), theoretically
the preventative nature of the framework with early assessments and intervention as well as
the focus of quality instruction will improve academic achievement and eliminate the need
for special education for the majority of students. For those students who still need additional
support, RTI data can be the diagnostic measure to determine the presence of a learning
disability. If education leaders and policymakers are looking to RTI as a remedy for a
traditionally underserved population of students, the effects of the model on students must be
rigorously investigated.

I utilized propensity score matching and OLS to investigate the effect of RTI on
student achievement and elementary school students identified with a specific learning
disability in North Carolina. The study will allow for conclusions to be made as to whether
RTI is improving achievement and decreasing the need for special education for the majority
of the student population.

In the following chapter I will provide an argument for why the study is needed. I will
also detail the history of IQ discrepancy and RTI as well as pros and cons of both models. In
addition, I will also outline studies that have been conducted previously to investigate RTI
and the strengths and limitations of those studies. Finally, I will describe the RTI model used
in North Carolina.

In chapter three I will describe the PSM and OLS models and the covariates used for
matching, while in chapter four I will outline the findings of the effect of RTI on
achievement and SLD identification. In chapter five I will provide an analysis of the findings
and implications for policy, practice, and research.
CHAPTER 2

LITERATURE REVIEW

Introduction

In the eighteenth century, the term *handicapped* described people with afflictions who needed support (Sailor, 2009). The term’s roots originated in London where people began standing on the street corner seeking donations. According to Sailor (2009) there were feelings of sympathy for those who were deemed handicapped. The frame began to change in the 1970s as public policy shifted. It moved from the sympathetic view to an industrial view of providing services to people in need and giving them opportunities to accomplish goals.

The special education law passed in 1975 introduced the concept of educating the handicapped and was called the Education of the Handicapped Amendment of 1975, which is the original version of the Individuals with Disabilities Education Act or IDEA (Sailor, 2009). Although the word changed over time from *handicap* to *disability* in the 1991 reauthorization of IDEA (Simeonsson, 2006), the new term was not viewed as much of an improvement and those with the label were not satisfied with the connotation (Sailor, 2009). Additionally, the disability frame was based on a medical model (Kaplan, 2000; Marks, 1997) where problems are diagnosed and treatment prescribed to address the perceived problem within the person (Sailor, 2009).

In October 2001, President George W. Bush created the President’s Commission on Excellence in Special Education to report findings and recommendation for improving
special education. The recommendations were given in hopes of improving the process that developed from IDEA 1975. The commission noted that:

Four decades ago, Congress began to lend the resources of the federal government to the task of educating children with disabilities. Since then, special education has become one of the most important symbols of American compassion, inclusion and educational opportunity (President’s Commission on Excellence in Special Education, 2002, p.3).

The report was commissioned on the heels of No Child Left Behind because “…children with disabilities remain the most at risk of being left behind” (President’s Commission Excellence in Special Education, 2002 p.4). The Commission found that implementation of IDEA had become focused on the process and ensuring that local education agencies were in compliance of federal law. They urged the focus should instead be on results of student achievement and recommended a preventative model that relied on response to intervention.

In 2004 when IDEA was reauthorized it included language that introduced RTI to the public discourse. Once again, the frame was changed and shifted from assessing difficulties within the student to assessing how the student interacted with their environment in an effort to prevent education difficulties. The notion of learning depending upon interactions within the learner’s context is aligned with socio-cultural theory where “achievement is largely a function of the opportunities and support that students receive for learning, rather than a function of their inherent ability” (Au, 1997, p. 187). IDEA 2004 also changed the original
funding structure of IDEA to provide money to assist with the learners’ needs, even if students were not identified as having a learning disability (Sailor, 2009).

This chapter will provide details regarding the models used to identify students with a specific learning disability and the controversies that surround them. It will also provide details about response to intervention (RTI) as an alternative framework. It will conclude with the research questions for the current study and how the design will address limitations of studies within the literature or build upon current findings.

**IQ-Achievement Discrepancy Method for Identifying Learning Disabilities**

The federal definition of learning disabilities (LD) that was adopted in the 1970s stated that LD was the cause of an intrinsic factor within the student and LD identification must prove that the difficulty was part of a neurological condition (Fletcher et al., 2004). States adopted the LD identification method of IQ-achievement discrepancy model (Mellard et al., 2004). The IQ-achievement discrepancy model, also called aptitude-achievement discrepancy, compares a student’s performance on an aptitude (intelligence) test to their performance on an achievement test. The aptitude test is designed to measure knowledge that results from life experiences, whereas achievement tests are designed to assess knowledge in content where a student has received instruction. If the achievement score is significantly lower than the aptitude score students may be considered LD (Reynolds et al., 2009).

The first intelligence test was the Binet-Simon scale created in the 1900s in France. The test was standardized for use in the United States and resulted in the Stanford-Binet Intelligence Test. Since then, other intelligence tests have been designed. An intelligence test
may focus on verbal or quantitative abilities, as well as visual-spatial and abstract problem solving. The Stanford-Binet Intelligence Test, Fifth Edition has subtests including Fluid Reasoning, Knowledge, Quantitative Reasoning, Visual-Spatial Processing, and Working Memory (Reynolds et al., 2009). In contrast, an achievement test is meant to assess knowledge or skills in a content area in which the student received instruction. According to Reynolds and colleagues (2009) there are many versions of achievement tests available (i.e. California Achievement Test, Fifth Edition; TerraNova CTBS; Iowa Test of Basic Skills).

The validity of the IQ-achievement discrepancy model that determines specific learning disabilities was controversial from the onset (Mellard et al., 2004), and still incites debate. Fletcher et al. (2004) contend that giving students one norm-referenced test to determine LD and interpreting IQ as a measure of the student’s aptitude is damaging to students. The “milk and jug thinking” (Fletcher et al., p. 477) assumes that there is a limit on the capacity for a person to learn based on their IQ and that idea is being challenged. Other critics of the IQ-achievement discrepancy model argue that the discrepancy may actually be caused by other factors that are not related to an intrinsic cognitive condition such as measurement error, variation in instructional content, and differences in student attitudes and motivation (Reynolds et al., 2009).

In addition, the history of the test and its uses to segregate African Americans and prove their inferiority to white races has been raised to support the notion that the test is biased against minority students (Proctor et al., 2012). This argument was used in the 1979 California court case Larry P. v. Riles that resulted in a moratorium on the use of IQ tests to
place African American students in programs for the educable mentally retarded (Proctor et al., 2012). The question of the validity of the IQ-achievement discrepancy model with minority populations could give insight as to why there is an overrepresentation of minority students receiving special education services. African American students are 1.5 times more likely to be served in special education under the specific learning disability category than other racial and ethnic groups (Proctor et al., 2012). The increase in special education placement becomes a problem when it is the result of deficit thinking (Valencia, 1997) and special education is used as a way to segregate minority students from general education classrooms. Additionally, there is the negative perception of special education that instruction is ineffective and focuses on lower level skills (Hosp & Reschly, 2003; Veves, 1989).

Finally, the IQ discrepancy method is based on a wait-to-fail model (Fletcher et al., 2004). Students who are in need of support may not receive it because they have a low IQ, which is consistent with their low academic performance. Schools then wait for the gap to widen so that a discrepancy is detected and the child qualifies for special education services, which is often viewed as the help these struggling students need (Mellard et al., 2004). The student continues to fall further and further behind while the process of waiting for a discrepancy takes place.

Identifying students for special education has become an enigma of providing support for struggling students or squelching opportunities for success. Whereas some view the service as an educational right, others see it as an oppressive tracking system. The discourse
of school accountability and monitoring all students has made it unacceptable to postpone specialized instruction until a test determines it appropriate. Federal policy began to emphasize a shift away from IQ-achievement discrepancy and determining services to a greater focus on providing interventions for student learning (President’s Commission on Excellence in Special Education, 2002).

**Alternative Method of LD Identification**

Since the inception of IDEA 1975, the numbers of students with learning disabilities is on the rise; in fact, students with LD make up more than half of the population of students with disabilities (Fuchs et al., 2002). Additionally, the overrepresentation of minority students in special education is a concern and has led to consideration of bias in special education placement (Fuchs et al., 2002). The National Education Association (2007) reports that school districts with a smaller population of English Language Learners tend to see a higher representation of those students in special education at about 16%. When compared to whites, black students are labeled emotionally disturbed at twice the rate of whites and three times the rate of whites for mental retardation. When compared to other culturally and linguistically diverse students, black students are also twice as likely to be labeled with a serious emotional disturbance (National Education Association, 2007).

Special education services are more expensive than general education instruction and whether students receiving special education are having their instructional needs met is questionable (Fuchs et al., 2002; Hosp & Reschly, 2003). Fuchs et al. (2002) outlined an alternative method for determining LD where special education is considered when a student
performs below the level of their peers, in addition to demonstrating a lower learning rate. The coupling of inadequate performance and growth is called dual discrepancy. The assessments used to determine whether a dual discrepancy exists are curriculum-based measures or CBMs (Fuchs et al., 2002). The CBM differs from the aptitude-achievement test in that it assesses skills present in the school curriculum. With dual discrepancy, a learning disability is framed as a failure to thrive and non-responders to education interventions may be considered to have a LD (Fuchs et al., 2002). Response to Intervention (RTI) became the name that encompassed dual discrepancy with CBMs as a viable alternative to the discrepancy model. If a new method of LD identification is adopted, it is reasonable to expect that it will be superior to the previous method in accurately and equitably identifying students in need of specialized instruction.

**Response to Intervention**

RTI is framed around issues of equality by putting measures in place to ensure all students receive core instruction prior to additional interventions and services. RTI is a framework that includes assessment, instruction, and LD identification and it is not a specific program.

In 2010 the National Center on RTI gathered information from 48 states to determine implementation of RTI in the United States. Kansas and Oklahoma were not included, although the database does not indicate why. Out of the 48 states, 39 had a website about RTI and 32 had a RTI guidance document. The database looked at the methods of specific learning disability determination in each state. The three methods used at that time were IQ-
achievement discrepancy, RTI, or other. No explanation for ‘other’ was provided. A combination of the three methods was used in nine states; RTI and IQ-achievement discrepancy were used in 27 states; RTI and other were in five states; and RTI only was used in seven states (National Center on RTI, 2010). By 2012, 70% of elementary schools implemented RTI as the instructional or diagnostic model (Robbins & Antrim, 2012).

Most schools that use the RTI method utilize a three or four tier model, where level of intervention increases with each tier. Tier 1 consists of general education instruction that is differentiated and research-based. All students receive tier 1 instruction and it should meet the needs of approximately 80% of the school population (Berkeley, Bender, Peaster, & Saunders, 2009). Tier 2 intervention is reserved for students who need supplemental support in addition to the Tier 1 instruction. The intervention may be in a small group and could be provided by the classroom teacher or a specialist in the targeted area of need. Tier 2 should meet the needs of an additional 15% of the school population (Berkeley et al., 2009). An example of a Tier 2 intervention is a group of four to six students receiving comprehension strategy instruction from the school literacy specialist. For students who still are not responding to the Tier 2 interventions, they receive Tier 3. At some schools, this is special education instruction, and at others it is more intensive intervention that is most likely one-on-one. For example, a student may meet individually with the special education teacher to address a specific skill in reading. Tier 3 should meet the needs of an additional 5% of the school population, resulting in 100% of the students in a school receiving instruction and interventions that are meeting their specific needs (Berkeley et al., 2009). For those schools
operating at a four-tier model, tier four is special education services instead of Tier 3.

Additionally, with special education services, students go to the special education teacher to work on academic or behavioral goals outlined in their Personalized Education Plan (PEP). Figure 1 illustrates the tiered instruction and assessment that occurs within the three-tiered RTI framework. The three-tiered model is presented because North Carolina utilizes three tiers.

Figure 1. Tiered instruction and assessment in the response to intervention instructional model.

The reauthorization of IDEA 2004 officially introduced the RTI framework into the policy discourse (U.S. Department of Education, 2006). The IDEA 2004 regulations did not
use the term RTI, but instead gave a description of factors that needed to be included and excluded when making the determination of eligibility for services under the specific LD category (U.S. Department of Education, 2006). The use of descriptors instead of mandates is most likely due to the recommendation by the President’s Commission on Excellence in Special Education that “the regulation heavy special education system should be focused less on procedures and more on achieving student results” (p. 12). The policy made it acceptable to use data based on how a child responded to “scientific research-based interventions” (U.S. Department of Education, 2006, p. 1) to determine eligibility and mandated the exclusion criteria that the lack of academic progress was not due to “a visual, hearing, or motor disability; mental retardation; emotional disturbance; cultural factors; environmental or economic disadvantage; or limited English proficiency” (U.S. Department of Education, 2006, p. 2). As a result of these changes, the LD identification process was not streamlined, but instead added additional variation to the process. Schools now had a choice between using IQ-achievement discrepancy tests, RTI, or a combination of the two for determining specific LD identification.

**Three Methods Currently Used for Identification of Specific LD**

**IQ-achievement discrepancy.** IDEA 2004 does not eliminate the use of IQ-achievement discrepancy to identify learning disabilities; it just does not require its use any longer (U.S. Department of Education, 2006). Reschly and Hosp (2004) noted that the majority of states were still using the discrepancy model in addition to ruling out other factors in the exclusion portion of IDEA 2004. Wanzek and Vaughn (2010) found that the
school district in their study continued to use the discrepancy model in addition to a standard regression procedure for LD identification. The popularity of RTI has increased, however some groups are uncomfortable moving away from a discrepancy model and feel it should still be a part of the process to identify specific LD (e.g., Kavale & Spaulding, 2008; Reynolds et al., 2009). Kavale and Spaulding (2008) argue that the problems surrounding the use of the discrepancy model are not psychometric, rather implementation of the criteria are not followed appropriately. They claim the predictive validity of the discrepancy model is still valid and the use of the IQ-achievement discrepancy should continue (Kavale & Spaulding, 2008). In Figure 2, I illustrate factors that influenced the use of IQ-achievement discrepancy and how it framed specific learning disabilities for students.
**Figure 2.** Framework of the IQ-achievement discrepancy model used for diagnosing specific learning disabilities prior to IDEA 2004.

**RTI as an identification tool.** Schools that use RTI to identify students with a specific LD collect data using CBMs throughout the intervention process. The frequent data collection is called *progress monitoring* and is used to determine if a student is responding to the intervention in a timely manner (e.g., Dexter, Hughes, & Farmer, 2008). States are at various levels of RTI implementation, however of 41 states, 1/3 of them planned to use RTI for eligibility or as a supplement to the discrepancy model (Hoover, Baca, Wexler-Love, & Saenz, 2008). In Figure 3, I illustrate factors that influence the use of the RTI model and how it framed specific learning disability for students.
**Figure 3.** Framework of the response to intervention instructional model and diagnostic approach used to determine specific learning disabilities following IDEA 2004.

**RTI plus IQ-achievement discrepancy.** The last method that is used for specific LD identification is a hybrid model that uses both RTI and IQ-achievement discrepancy. The hybrid method implements the RTI instructional model and the data is used as part of the pre-referral process (Kavale & Spaulding, 2008) where the analysis of intervention data is used to determine if a student should be referred for further evaluation. If the student is non-responsive to interventions during Tier 1 and 2 instruction, the evaluation is administered and includes the aptitude-achievement test (see Orosco, 2010; Shepherd & Salembier, 2011; Sullivan & Long, 2010; VanDerHeyden, Witt, & Gilbertson, 2007).
Methods of Intervention for Tiers 2 and 3

For those schools implementing RTI, two approaches are used as methods of intervention for students who require Tier 2 or 3 intervention. They are the standard-protocol and the problem solving approach.

Proponents of an early interventionist frame of RTI generally support the standard-protocol model (Fuchs, Mock, Morgan, & Young, 2003) that requires the use of empirically validated interventions with all students who have similar problems. With standard-protocol, all students struggling to decode text in reading are instructed with the same intervention, regardless of the particular nuances of the individual child’s reading problem. Advocates of standard-protocol have been characterized as aligning with the ideals of IDEA and embracing the goal of promoting early intervention and a valid manner to identify students with special education. The standard-protocol advocates desire instruction that can be replicated across schools (Fuchs, Fuchs, & Stecker, 2010).

The problem solving approach employs a team of specialists and teachers at the school who follow a collaborative problem solving process. The team uses assessment data to make decisions regarding instruction and assessment of struggling students (Fuchs et al., 2003). Advocates of the problem solving approach are characterized as aligning with the ideology of the No Child Left Behind Act with the focus of effective classroom instruction that should eliminate high-incidence disabilities (Fuchs et al., 2010). It has been argued that proponents of the problem solving approach view special education as ineffective and prefer to have special education and general education combined (Fuchs et al., 2003).
Some researchers from the field of literacy promote the problem solving approach due to its focus on productive collaboration and flexible assessment, instruction, and interventions that are responsive to the individual needs and abilities of the student (IRA, 2010; Wixson, 2011). The International Reading Association outlined its guiding principles for RTI implementation to improve language and literacy learning noting that instruction and interventions should be tailored to the particular student (IRA, 2010).

The disability research literature promotes the standard-protocol approach because of the claims that it is more valid than the problem solving method (Berkeley et al., 2009) and enables quality control (Fuchs et al., 2003). However, more schools implement the problem solving method (Berkeley et al., 2009; Dexter et al., 2008) because it better aligns with current school practices of problem solving teams meeting to discuss student needs (Berkeley et al., 2009). In addition, there is the reality that currently there is an inadequate number of protocols (Fuchs et al., 2010) to use for the standard-protocol approach.

**Federal Policy and Learning Disability**

Education reform discussions have pervaded the discipline for the past 30 years and students with disabilities were included in the reform rhetoric. The National Commission on Excellence in Education issued a report in 1983 titled *A Nation at Risk*. It outlined the urgency of reform in America’s schools to reach a level of excellence that was required if schools were going to resist falling into the trap of mediocrity. The report contained the premise of high expectations of all students, meeting individual student needs, and using standardized achievement tests to evaluate student progress. It also utilized language from
the IQ-discrepancy model as an indicator of students who were at-risk. The report noted that over half of gifted students did not have a match between comparable ability and achievement; therefore more time should be devoted to meeting individual needs of the gifted as well as slow learners. The Commission called for the use of standardized tests to evaluate student progress and recommended grouping students by instructional needs and academic progress instead of by age. *A Nation at Risk* specifically spoke to the expectation that “the Federal Government, in cooperation with States and localities, should help meet the needs of key groups of students such as the gifted and talented, the socioeconomically disadvantaged, minority and language minority students, and the handicapped” (Commission of Excellence in Education, 1983, p. 40).

In 2001, the No Child Left Behind Act (NCLB) was included with the reauthorization of the Elementary and Secondary Education Act. NCLB echoed similar themes of *A Nation at Risk* (Commission of Excellence in Education, 1983) with language that touted high expectations for all students and accountability using standardized achievement tests to measure progress towards academic goals. Part of NCLB mandated all students be proficient readers by third grade and allotted additional federal funding to support certain research-based reading programs. Students with disabilities were included in the accountability procedures and data were mandated to determine whether schools were meeting the needs of this population (U.S. Department of Education, 2004). Shortly after NCLB, the President’s Commission on Excellence in Special Education (2002) made recommendations to improve
special education. The recommendations for improvements for IDEA share common goals of NCLB and is evidenced by the following statement in the report:

We believe and we know we can do better by applying many of the same principles of *No Child Left Behind* to IDEA: accountability of results; flexibility; local solutions for local challenges; scientifically based programs and teaching methods; and full information and options for parents (p. 5).

The IDEA was reauthorized in 2004 and changed the frame for how students with learning disabilities were identified. Schools were no longer mandated to use the IQ-achievement discrepancy model, but instead could use data determining whether a student responded to research-based interventions targeting areas of weakness. In addition, certain environmental factors needed to be ruled out for possible explanations why the student was struggling before a determination could be made that the child had a specific learning disability. The focus changed from a within-child deficit to ensuring the school environment was conducive to learning. IDEA 2004 mandated a process that held schools accountable for proving that lack of instruction or other contextual factors were not the cause of the students’ learning problems. Whereas IQ-achievement tests were not banned from the process, it was not required for eligibility. In Table 1, I summarize the key federal policies that influenced the identification of specific learning disability and how testing was framed within each policy.
Table 1

*Timeline of federal policies and reports that influenced specific learning disability identification*

<table>
<thead>
<tr>
<th>Year</th>
<th>Document</th>
<th>Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>Education for all Handicapped Children Act (PL94-142) IDEA</td>
<td>LD identification became aligned with a discrepancy between IQ and achievement although no particular test was mandated.</td>
</tr>
<tr>
<td>1983</td>
<td>A Nation at Risk Report</td>
<td>Recommended the use of standardized achievement tests to evaluate academic progress of all students.</td>
</tr>
<tr>
<td>2001</td>
<td>No Child Left Behind (NCLB)</td>
<td>Required all students, including students with disabilities, take standardized achievement tests to monitor progress on state standards.</td>
</tr>
<tr>
<td>2004</td>
<td>Reauthorization of IDEA</td>
<td>States can still use IQ-discrepancy or use RTI data to qualify students for special education services. The policy outlined exclusion criteria that must be ruled out before a student is considered to have a learning disability.</td>
</tr>
</tbody>
</table>
Social Theory of Learning Disabilities

Prior to RTI, discourse of specific learning disability was situated as problems within the child. The construct of learning disability began to be questioned as the research acknowledged the increasing percentage of students served in special education from 1993 to 2003 (Simeonsson, 2006) and the overrepresentation of males and African Americans in special education. Specific learning disability was perceived by some as a “soft disability” (Fuchs et al., 2002) that was subjective and somewhat socially constructed (Fuchs et al., 2010; Proctor et al., 2012; Shiffer, Muller, & Callahan, 2010). The social model of disability recognized that many factors, including attitudes and inadequate support can define whether someone is considered to have a disability or not. In addition, social factors often help define a disability (Kaplan, 2000).

When using the social model of disability, each aspect of defining the disability is important to analyze. The special education referral process for evaluation is initiated when a teacher is concerned about a student. The process may involve bias that disadvantages certain populations of students over others, and could possibly explain the overrepresentation of males and African Americans. The referral process is an important stage because most students who are referred for an evaluation are determined to be LD (Harris-Murri, King, & Rostenberg, 2006). If referrals are initiated without data and prior attempts to intervene to assist students with academic or behavioral problems, the likelihood of SLD identification may be higher.
RTI is a framework that accounts for the learning environment of the child and attempts to make the instruction and LD identification process equitable (Proctor et al., 2012). The framework acknowledges that all students must receive effective instruction within the general education classroom. The general education instruction may remove the opportunity for cultural bias and acknowledges the possibility that the problem may lie in problems with the teaching instead of a problem inherent in the child (Sailor, 2009). The focus of meeting the majority of students’ needs in the general education classroom also holds the school accountable for students’ learning. This aligns the practices within the classroom with the mandates of education reform outlined in federal education policy.

As students require more targeted interventions, the environment changes to accommodate instructional needs whether it is academic or behavioral (e.g. Benner, Nelson, Sanders, & Ralston, 2012). Because of the focus of instructional context, there is a necessity to consider school factors when conducting research on RTI (Mellard et al., 2004; Wixson, 2011). One disconnect between the research and practice is the habit of breaking RTI into pieces and looking at the effectiveness of individual components or tiers on academic achievement (Hill, King, Lemons, & Partanen, 2012).

The disconnect was evident in a literature review of studies conducted with elementary school participants between 2004 and 2011 by Hill et al. (2012). When studies investigated the effectiveness of tier 2 interventions, there was no mention of Tier 1. Out of twenty-two articles, only eleven indicated a connection between Tiers 1 and 2, whereas four explicitly stated the connection (Hill et al., 2012). Researchers evaluating RTI using the
social theory of LD need to consider the effect of the entire framework to fully understand the ramifications of the education reform.

**Theories of Action Supporting RTI**

RTI is an education reform framework that holds promise of leveling the playing field for all students and assuring equality of instruction, according to its advocates. Tier 1 instruction when implemented with fidelity uses research-based methods along with differentiation to meet student needs and provides access to all students, regardless of their background. Students who need additional assistance in meeting academic or behavioral objectives receive support tailored to their goals with Tier 2 interventions. The instructional decisions are based on data and assessments are used to document whether a student is successful. The curriculum-based measurements (CBM) are based on skills that are being taught instead of national norms on achievement tests that may not match what has been covered in instruction. The rate of growth is measured so students who are behind due to other environmental factors such as poverty will not be assumed to be disabled (Fuchs et al., 2002); rather it can be determined whether students are learning skills at an expected rate when those skills are explicitly taught. For those students who continue to struggle, the intensity of interventions increase and progress is monitored. All the while, students receiving Tier 3 instruction continue to receive the general education instruction as well as targeted interventions. With RTI, students first receive quality core instruction, and then receive assistance as soon as the teacher is aware of a problem. Time is not lost waiting for testing from the school psychologist or as teachers wait for a service to become available that
they view as help. Immediate teaching and interventions based on data are the help. Constant collaboration takes place with general education teachers, special education teachers, and specialists within the school to make data-based decisions. A portion of special education funds can be used to meet the needs of general education students reducing the need to wait-and-fail (Shepherd & Salembier, 2011). The emphasis on ensuring Tier 1 instruction is meeting the majority of students’ needs emphasizes the role of the school environment and shifts the paradigm away from specifying a particular problem within the student (Barnes & Harlacher, 2008). Whereas implementation of the framework may vary according to the school context, Barnes and Harlacher (2008) identified a set of RTI principles that should not change with implementation:

1. a proactive and preventative approach to education, 
2. ensuring an instructional match between student skills, curriculum, and instruction, 
3. a problem-solving orientation and data-based decision making, 
4. use of effective practices, and 
5. a systems-level approach (p. 419)

**Theories of Action Against RTI**

The research community does not wholeheartedly accept RTI as an adequate alternative to IQ-achievement discrepancy. Kavale and Spaulding (2008) argue that the problem with IQ-achievement discrepancy does not lie in its validity, but rather the manner in which the criteria are followed. Another concern with RTI is that it does not distinguish between struggling students and students with a learning disability (Kavale & Spaulding, 2008). The fear is that the learning disability construct will become a catchall for any student
who is not meeting expectations. Not only would this increase the number of special education students, but also nondisabled students would receive the service. The program evaluation of a problem-solving model of RTI found that the numbers of students determined to be LD did not increase. More students received Tier 2 intervention, however special education identification remained constant (Marston, Muyskens, Lau, & Canter, 2003) offering some evidence that this particular fear may not be realized.

Additionally, RTI is implemented inconsistently in much the same way that the discrepancy model varied among states prior to RTI (Berkeley et al., 2009). States are at various levels of implementation and the flexibility of the framework allows for schools to incorporate the basic principles of RTI, yet adapt it to fit the needs of the school (Wixson, 2011). There are no clear parameters that specify how long students should receive interventions before moving to the next tier or before special education eligibility is determined (Fuchs, Fuchs, & Compton, 2012). Instead of “wait to fail” RTI may be a model of “watch them fail” (Lindstrom & Sayeski, 2013).

**Studies Regarding RTI**

RTI can encompass literacy, math, and behavioral needs, although most of the research focuses on literacy. In a literature review of studies examining fully integrated models of RTI, Dexter et al. (2008) found four studies that focused on reading outcomes, one study examining math outcomes, and one study that investigated academic behaviors.

Research on RTI is complicated by the fact that it is a framework and not a specific program (Wixson, 2011). The research designs and emphasis on particular aspects of the
framework obfuscates the findings even more. It seems the majority of RTI research emphasizes eight themes (1) literacy (2) math (3) behavior (4) state implementation of RTI (5) criteria and demographics of special education referral (6) Implication of RTI on minority students (7) stakeholder perceptions (8) program evaluation. The following section will highlight the studies, their methods, and findings.

**Literacy.** Much of the literature underpinning the value of RTI rests on a single study. This study (Vellutino et al., 1996), commonly cited in the RTI literature (e.g. Dexter et al., 2008; Wanzek & Vaughn, 2010; O’Connor, Harty & Fulmer, 2005) demonstrated how to reduce literacy struggles for first grade students through early intervention. After receiving daily tutoring for one to two semesters of school, 67.1% of students considered to be disabled in reading scored in the average or above average range for reading achievement on standardized reading assessments (Vellutino et al., 1996). The findings are interpreted as evidence that response to early intervention can distinguish between students who struggle with reading due to a cognitive reason and others who have experiential deficits that can be ameliorated with targeted instruction.

Effective Tier 1 instruction may not prevent all students from needing additional interventions, however. Tier 1 instruction is the component of RTI that should meet the majority of students’ needs (Berkeley et al., 2009) and diminish the numbers of students who require special education (Wanzek & Vaughn, 2010). But, in a longitudinal study of seven elementary schools with effective kindergarten Tier 1 instruction, students who made the most growth in kindergarten were still disadvantaged in first grade when measured by oral
reading fluency and comprehension tests. Therefore, in the sample, kindergarten response to Tier 1 instruction did not predict how students performed in literacy when they were in first grade (Al Otaiba et al., 2011).

Tier 2 interventions have shown some promise in raising student achievement. Five elementary schools implementing Leveled Literacy Instruction every day for 18 weeks found a statically significant increase of achievement on literacy assessments (Ransford-Kaldon, Flynt, & Ross, 2011). Results are promising in rural schools as well. A qualitative cross-case analysis of three rural schools found a trend of increased reading achievement with the implementation of RTI (Shepherd & Salembier, 2011).

A recent longitudinal study of students from five schools investigated the reading proficiency of LD students with an RTI framework compared to a historical control of students in the same schools the year prior to RTI implementation (O’Connor, Bocian, Beach, Sanchez, & Flynn, 2013). Due to the sample size of LD students -13 students in the control group and 19 in the comparison group- the researchers were unable to do statistical tests due to the small sample and analyzed descriptive statistics only. They concluded that LD students in the RTI schools had lower student achievement as measured by oral reading fluency and standardized reading assessments than LD students in non-RTI schools. The results support the possibility that using the RTI framework assisted the schools with identifying students who are the least responsive to intervention and ruled out placing students in special education whose reading difficulties were more likely due to environmental factors.
Vellutino, Scanlon, Zhang, and Schatschneider (2008) randomly assigned at-risk kindergartners to a school-based control group or a project-based intervention group. The project-based intervention group was a multi-tiered system of support where the at-risk students received several tiers of instruction early in their academic career. The findings indicated that 84% of the students who received early intervention met grade level reading expectations by the end of kindergarten, whereas only 16% of the control group students met expectations. The authors concluded that targeted interventions should begin as early as kindergarten and students should receive multiple tiers before a disability conclusion is made (Vellutino et al., 2008).

**Math.** The literature is much sparser for the use of RTI to address math goals. Gresham and Little (2012) highlighted a model of RTI for math within an elementary classroom. They described many of the same components of math RTI as studies focused on implementation of RTI with literacy—universal screening, targeting specific skills, and progress monitoring using CBMs—but the focus of instruction is tailored for the mathematics concepts. A case study examining RTI with 3rd grade math students found that using a scripted program that utilized direct instruction pedagogy, drill and practice with cumulative review, and providing motivators showed promise with the struggling math students (Pool, Carter, Johnson, & Carter, 2012). In addition Fuchs, Fuchs, and Compton (2012) reviewed four randomized control studies with struggling math students. The treated group in each study received Tier 2 math interventions. Whereas struggling math students receiving the intervention performed better on achievement tests than struggling students who did not
receive the intervention, the treatment group still scored lower than students who were not considered struggling and did not receive an intervention. The findings also indicated that at-risk students do not make the necessary gains in math when they only receive classroom instruction or intervention. Both classroom instruction and targeted interventions were needed to support at-risk learners (Fuchs et al., 2012). The finding supports the tiered framework where students receiving core instruction with supplemental support.

**Behavior.** Not only has academic achievement been documented with RTI, but positive results with behavioral goals have been found as well. Benner et al. (2012) found students who received high implementation of RTI for behavioral goals demonstrated an improvement with time-on-task, task completion, and task comprehension. The standard-protocol method of interventions with behavior found students receiving treatment showed a decrease in problem behavior, although students with lower poverty levels showed larger effects. Another study found improvement with behavior when using RTI; however those improvements did not translate to an improvement with academic skills (Benner et al., 2012).

**Implementation.** Because RTI is a framework and not a program, there is no mandate that lays out exactly how RTI must be implemented. Buffum, Mattos, and Weber (2010) find the mindset of “implementing” RTI as problematic because it insinuates that RTI is reduced to actions to be completed instead of processes of improvement. IDEA 2004 purposely framed RTI conceptually instead of procedurally to give states and schools latitude to adapt it to the context (Wixson, 2011). The flexibility leads to variability in both the adoption time frame as well as the processes. In 2007 the U. S. Department of Education
website noted that 15 states had adopted RTI at either a large or small scale, 22 states were in the development phase and three had not developed a model. Whereas states differed in how RTI was applied, there were also differences in the timeframe for when special education referral was initiated (Berkeley et al., 2009). In 2008, 41 states were represented in a survey of special education state department directors (Hoover et al., 2008). All of those 41 states were emphasizing RTI at either the development or implementation stage. One third planned to use RTI data in special education decisions either as a replacement to the IQ-achievement discrepancy or as supplemental data. Participants’ responses reflected the idea that culturally-responsive RTI and roles of educators implementing RTI received the least amount of training time during professional development opportunities (Hoover et al., 2008). The National Center on RTI reported in 2010 that seven states were using RTI only to identify students for special education, whereas 27 states used both the RTI and the IQ-achievement discrepancy model.

Professional development is an area with inconsistencies. In one case study, both teachers and administrators received professional development prior to RTI implementation (White, Polly, & Audette, 2012). Another case study found two of the three principals in a rural school district implementing RTI were unaware of how to access special education funds to support the RTI initiatives (Shepherd & Salembier, 2011). The finding illustrates the complexity of the initiative and the need for continuous support for stakeholders involved at all levels of implementation.
Implementation of RTI is most often found in elementary schools; however some secondary schools are attempting the framework. Dulaney (2010) examined a problem-solving approach employed at a middle school. The dissertation outlined each tier of the model, where Tier 3 intervention used a computer-based program. A drawback of RTI in the middle school was that scheduling the interventions required students to miss electives. Descriptive statistics illustrated the increase of students in Tier 1 as the year progressed, as well as a decrease in students needing both Tier 2 and tier 3 interventions. Consequently, as RTI implementation proceeded, more students were having their academic needs met in Tier 1 core instruction and less students required Tiers 2 and 3.

All implementation studies did not report positive findings. One rural school claimed to implement the RTI framework, but a variety of progress monitoring assessments were used throughout the school with no common documentation or data analysis system. There was no set procedure for how students received tiered interventions, instead each teacher attempted to handle the needs within their own classroom. If students received a service from another teacher, such as Title 1 or English as a Second Language (ESL), the intervention depended upon the preference of the teacher. It was noted that time for documentation, training, and lack of interventions were barriers for the school (Hamilton, 2011). The findings reiterate the presence of variability in implementation and how this variability can sometimes be in conflict with the principles of RTI.
Implications for Minority Populations

The literature focuses specifically on how RTI impacts achievement of minority students. Eversole (2010) examined literacy performance of elementary Latino students by comparing students who received full implementation of RTI with those who only received partial or no implementation in their school. There was a statistically significant increase on post achievement tests when compared to pre-tests for those receiving RTI. Also, as stages of implementation increased, the number of students eligible for special education decreased. Whereas the methodology did not support causation, the findings are promising that RTI could increase literacy achievement with Latino students and decrease their chances of needing special education. An important consideration is the type of instruction and interventions used with minority students. Tier 1 instruction that is culturally responsive may remedy the problem of overrepresentation of English Language Learners in special education (Orosco, 2010), but should include using interventions that have been proven effective with English Language Learners (Orosco & Klingner, 2010).

By analyzing trends of descriptive statistics, Marston et al. (2003) noted a positive effect on the disproportionate identification of African American students in a district when RTI was utilized, although the same was not true for Native Americans. The small sample size of Native Americans in the study could be responsible for this finding (Marston et al., 2003). In addition, the Marston et al. (2003) study lacked a comparison group, randomization, or statistical tests to determine significance. The schools in the study used the...
problem solving method of RTI and trends of raw data from eleven years were analyzed. The numbers of students referred to special education stayed constant and did not increase.

Another variable to consider is that the overrepresentation of minorities could be influenced by socioeconomic status (Shifrer et al., 2010). When a multilevel model was employed, the race and ethnicity overrepresentation was explained with the addition of socioeconomic status (Shifrer et al., 2010).

**Evaluations of RTI**

In addition to racial and ethnic minorities, males are also more likely to be identified with a learning disability (Shifrer et al., 2010). A program evaluation using a chi-square method found that RTI resulted in comparable rates of special education identification along gender and racial factors compared to the rates at the same schools prior to RTI (VanDerHeyden et al., 2007).

With the RTI framework it may be helpful to consider as Shifrer et al. (2010) suggest:

… identification of learning problems may reflect social differences rather than learning differences, and the solution to some “biological” issues may lie in addressing social problems, such as socioeconomic inequality or the way that socioeconomic inequality is reproduced in schools (p. 254).

The rise of students labeled as learning disabled within the disability frame is concerning. One anticipated effect of RTI is that students who are identified as having a learning disability will be a small percentage of the school population (Fuchs et al., 2010; Shapiro & Clemens, 2009; Wanzek & Vaughn, 2010). Two elementary schools
implementing RTI over a four-year span showed promising results. Tier 1 instruction was enhanced with professional development and Tier 2 interventions consisted of individual or small groups of two students three times a week. Special education placement decreased from 15% to 8% using a historical control group and analyzing descriptive statistics (O'Connor, Harty, & Fulmer, 2005). Ransford-Kaldon et al. (2011) randomly assigned students in five elementary schools to a treatment or control group and used Leveled Literacy Instruction (Fountas & Pinnell, 2008). They found that the number of students identified for special education decreased with each year of implementation, although it was only practically significant and not statistically significant. A qualitative case study investigated a co-teaching model between a general education teacher and special education teacher for Tier 1 instruction. The co-teaching was coupled with instructional modeling by reading coaches and fidelity checks. Teachers gave positive feedback on the process and reported declining referral rates (Bianco, 2010). Whereas the anecdotal findings of teachers are important, it cannot be concluded that it was statistically significant or that the declining rates were due to RTI.

The rise in students labeled LD may be partially explained by findings of a study conducted with multiple special education stakeholders. Conversations with principals, psychologists, general education, and special education teachers highlighted the notion that teachers viewed special education as help for struggling learners with little regard for whether students were actually learning disabled. Teachers expressed the need for help via special education services was more important than if the student qualified as learning
disabled (Mellard et al., 2004). This view is supported by the findings of the President’s Commission on Excellence in Special Education (2002) that “the disorder is always a matter of degree on a dimension, not a disorder that you either have or do not have, and identification is ultimately a judgment based on the need for services” (p. 22). This phenomenon may explain why half of students labeled LD with the IQ-achievement discrepancy model did not actually meet the criteria as noted by Kavale and Spaulding (2008). Within the RTI framework, the classroom teacher is viewed as the help that most students should require to be successful and waiting for an additional service as the intervention is discouraged.

Although IDEA advocates for maximum access to the general education classroom, African Americans are more segregated from the general education class than any other group. Bias could impact referral in that expectations of teachers are different than the expectations enforced by the culture of the student. Students expressing certain characteristics that are different from the teacher may be perceived as a problem (Dunn, Cole, & Estrada, 2009).

A quantitative meta-analysis of studies analyzed referral rates by racial subgroups using a regression model (Hosp & Reschly, 2003). When predicting special education representation of minorities using district-level data as the independent variables – academic, demographic, and economic variables- there was a statistically significant increase in referral rates for African Americans when compared to whites. However the referral rates for Hispanics were not statistically significant (Hosp & Reschly, 2003). The authors argued that
the model shows a relationship between overrepresentation of minorities and achievement. Teachers are in a better position to directly affect achievement than current economic variables so the authors advocated for early intervention as a way to address the overrepresentation issue. The recommendation is consistent with the focus of RTI as an early intervention measure that may prevent students from needing further special education services.

Whereas students’ cultural differences may impact referral to special education, other student characteristics may as well, such as the perception of students as inattentive or exhibiting behavior inconsistent with the teachers’ expectations (Dunn et al., 2009). The teaching practices and expectations of teachers, as well as school demographics, lower socioeconomic status of the students, and demographics of the surrounding community have all been shown to impact referral to special education (Dunn et al., 2009).

**Critique of Research Methods**

The ideological differences about the purpose of RTI and the most effective approach in implementation are debated. The methods used to make claims about RTI also calls into question whether it is meeting the anticipated expectations of the initiative to increase student achievement and decrease the number of students requiring special education. Implementation studies are generally qualitative and highlight details of the particular assessments and interventions within each tier, as well as the process used for data-based decision making. These studies are necessary and can expand the conversation about RTI implementation, but do not evaluate student outcomes. Descriptive statistics enhance the
understanding of the process, but the conclusions one can draw are limited (e.g. Dulaney, 2010; O'Connor et al., 2005). Quantitative methods have shown the potential of RTI to reduce overrepresentation of minorities in special education (e.g. Eversole, 2010; Marston et al., 2003; VanDerHeyden et al., 2007), whereas stressing the importance of other variables that impact referral (Dunn, et al., 2009b; Hosp & Reschly, 2003; Hosp & Reschly, 2004; Orosco, 2010). The use of t-tests and chi-squares conclude a statistically significant difference in achievement and referrals to special education with implementation of RTI (e.g. Eversole, 2010; Kreider, 2010), but are not able to attribute the positive results to RTI. Mellard et al. (2004) note that it is not enough to determine if there is a better mousetrap that will be more effective in catching the right students for special education. Models are needed that include relevant student variables that impact referral, as well as contextual school variables. Considering student and school factors in the research model is compatible with the theory behind RTI because of the distinction that it is a framework that is adapted to focus on outcomes with the unique population of a school or district. A thorough description of the studies described in the literature review as well as other research consulted for the project that was not discussed in chapter two is included in Table 9 of Appendix B.

The purpose of the current study is to investigate the effects of RTI on student achievement and the identification of students with a learning disability when using the entire RTI framework as the treatment in a school. The framework requires intensive professional development, commitment, and a paradigm shift to create educational reform and it is imperative to see if implementation is bringing about the anticipated outcomes. The research
questions are: (1) How does RTI affect student achievement? (2) What is the effect of RTI implementation on the proportion of elementary school students identified as learning disabled?

Using a quasi-experimental design will allow for comparison of treated and control schools with similar observable characteristics so that some causal conclusions can be drawn from the results. This type of analysis will complement the conversation of the effectiveness of RTI in research, policy, and practice.

**RTI in North Carolina**

In North Carolina, RTI is called Responsiveness to Instruction (NCRtI). The NCRtI Subcommittee (2011) detailed the critical components of NCRtI as (1) shared responsibility; (2) curriculum and instruction; (3) assessment; (4) family and community partnerships; (5) sustainability and leadership. The philosophy of beliefs is defined as:

- Shared responsibility by all stakeholders including educators, families, students, and community partners.
- Developmentally appropriate academic and behavioral growth for all students.
- Continuous reflection on and improvement of instructional practices and learning environments.
- Intentional partnerships with families, community members, and stakeholders.
- Comprehensive implementation through systematic and purposeful approaches and leadership (NCRtI Subcommittee, 2011).
In 2000, the exceptional children’s department of the Department of Public Instruction led the effort to bring the RTI process to North Carolina. Ten pilot schools were selected in 2004 and training commenced for those schools. In 2007, the term Response to Intervention was changed to Responsiveness to Instruction to reflect the idea that the focus was on all students. In 2009, regular education personnel were added to the leadership team at the Department of Public Instruction so that the team did not just consist of leaders in the exceptional children’s program (NC DPI, 2011). In the summer of 2012, training evolved to transition North Carolina from a four-tier model to a three-tier model (NC DPI, 2012). RTI is not mandated by the state and in an online RTI educator video, Mary Watson with the NC DPI Exceptional Children’s Division stated:

“Over the ten years, it’s the schools that are buying into the training. We’re not doing it to them. They see the success of other schools of students. They want to be a part of that. They want their students to be successful. It’s a good example of staying the course and truly making a difference (NC DPI, 2008).

Summary

The construct of learning disability has elements that have been contentious from the beginning, including the definition of LD as well as how to identify it. The IQ-achievement discrepancy model originally recommended for identification of LD by IDEA has encountered questions of its validity for use with all students. RTI has emerged as an alternative method of LD identification as well as a way to prevent students from needing special education services through the use of data-based decision making.
As RTI gains in popularity, effects of the education reform need to be closely monitored. The entire RTI framework also needs to be included in research models to measure the effects. The practice of breaking the framework into pieces can be misleading and may lead to inadequate conclusions. Advanced statistical methods that account for the whole framework and the effect on achievement of the school population are needed to provide more advanced insights into the outcomes of RTI. In the next chapter I describe the research study designed to answer the study’s research questions. The current study and methodology have the potential to advance the field with implications on practice, research, and policy.
CHAPTER 3

METHOD

The current study examined the effect of RTI implementation on academic achievement and identification of students with learning disabilities in North Carolina elementary schools. In chapter three I detail the method, participants, and data analysis procedures.

Research Questions

When a school replaces the traditional model of instruction with RTI, there is an assumption that the tiered instruction, early intervention, and progress monitoring will yield positive results. The intent of RTI is to meet the needs of more students in the general education classroom and eliminate false positives of students referred for special education services. Therefore, this study addressed the following research questions:

- How does RTI affect student achievement?
- What is the effect of RTI implementation on the proportion of elementary school students identified as learning disabled?

Hypotheses

The first hypothesis was that RTI implementation would increase the percentage of students proficient in reading. In addition, a second hypothesis was that RTI would decrease the proportion of students who are identified with a specific learning disability. There is no hypothesis related to increased student achievement in math because reading is generally the focus of most schools utilizing the RTI framework. If more students are proficient in reading
but not math, the findings will further support the likelihood that the results were due to RTI and not another variable at the school.

Sample

Elementary schools that served third, fourth, and fifth grade students in North Carolina during the 2012-2013 academic year were eligible for the study. The focus is on elementary school students because the literature has shown that elementary schools are more likely to implement RTI than secondary schools. Elementary schools that only served primary grades were excluded because they lacked achievement and demographic data due to the fact that North Carolina only collects data for students in third grade and above because these schools participate in state testing. RTI is more likely to be implemented within public schools; therefore private and charter schools were also excluded from the sample. In addition, special education schools were excluded because all students at the school would be in special education and the learning disability outcome could not be investigated.

Although the IDEA was reauthorized in 2004, schools are at various places in RTI adoption and implementation. The use of data from the year 2012-2013 was optimal for analysis because it allowed for schools that most recently adopted the framework to be included, increasing sample size and power and is the most recent year with available testing data. Data are collected for 3-12th grade students at each school in North Carolina and are stored at the North Carolina Educational Research Data Center (NCERDC). Student information is coded by NCERDC with an anonymous identifier prior to access by researchers so students and families do not need to be contacted to gain permission for the
data. The dataset does include a school and district name, making it possible to assign schools to the treatment or control group.

Research Design

Random assignment is the gold standard in quantitative research for determining causal effects (Rossi, Lipsey, & Freeman, 2004). However, it is impossible to randomly assign students to RTI or non-RTI schools due to the ethical constraints (Shadish, Clark, & Steiner, 2008), such as sending children to schools further away from their home for the sake of research. The preprocessing strategy of propensity score matching (PSM) is an appropriate technique to compare schools that have undergone treatment to schools that have not. In the current study, treatment is RTI implementation and the control group is schools that did not implement RTI and continue to use the IQ-achievement discrepancy model for LD identification. A propensity score is a calculated probability of participating in a treatment based on observable characteristics that are not influenced by program participation. Therefore, the propensity score in the current study is the probability that a school would participate in RTI based on observable characteristics that are unaffected by RTI (Khandker, Koolwal, & Samad, 2010). The propensity score was then used to match RTI schools to control schools that had similar observable characteristics. Once schools were matched with similar characteristics, the outcomes were compared to determine the treatment effect of the treated.

PSM has two main assumptions. The first is the assumption of conditional independence which “states that given a set of observable covariates X that are not affected
by treatment, potential outcomes $Y$ are independent of treatment assignment $T^*$ (Khandker et al., 2010 p. 55), therefore the observable covariates in the model were variables that were not affected by RTI. For instance, the fact that a school implemented RTI did not change the school’s demographics. In addition, observable covariates were included that predicted the adoption of RTI. The second assumption is the assumption of common support. Common support means that the treatment and control groups were matched based on similar propensity scores to ensure that the schools were comparable in regards to observable characteristics and any differences in the outcome were most likely due to the treatment. When the two assumptions hold, the treatment effect on the treated is specified as:

$$\text{TOT}_{\text{PSM}} = \text{E}_{P(X)} \left( \text{E}[Y \mid T=1, P(X)] - \text{E}[Y \mid T=0, P(X)] \right)$$

I analyzed multiple matching strategies to determine the optimal balance of covariates. First, I tried nearest neighbor matching to assign treatment and control schools that had the closest propensity score. I assigned $n=5$ as recommended by Khandker et al. (2010) and imposed a caliper of .01 to ensure that propensity scores were matched within 1% of one another (Gasper, Deluca, & Estacion, 2011). I used matching with replacement so that schools could be used as a control more than once if it was a good match for several treatment schools. In addition, I wanted to account for the fact that there were more treatment than control schools. Prior to matching, nine variables had significant differences between the treatment and control group. Matching with replacement still had one variable, National Board Certification, which was not balanced according to the t-test. The inability to balance all covariates was an indication that matching with no replacement was not the best
option because the treatment and control group was different preceding analysis. The advantage of PSM is to reduce the differences prior to analysis so that one can conclude the effects noted are from the treatment.

Finally, I used the nearest neighbor with no replacement technique with a caliper of .044, which was .25 the standard deviation of the propensity score. This matching strategy resulted in no significant differences between the two groups. The no replacement technique reduced the sample size to 300, however all the variables were balanced thereby resulting in the conclusion that nearest neighbor without replacement was the best matching technique for the sample.

In PSM, covariates should be included that predict being assigned to treatment and the outcomes. Therefore, I included covariates that predicted RTI implementation and also predicted student achievement and the likelihood that a student was identified as having a specific learning disability. The current literature includes research that identify variables that predict student achievement and the likelihood of being identified with a learning disability, however, the current literature addressing why schools choose to adopt RTI is thin. “Many schools are adopting RTI models in order to prevent reading difficulties among students, identify those at-risk for academic failure early on, and to create a better instructional match for students” (Barnes & Harlacher, 2008 p. 418). Whereas Barnes and Harlacher (2008) explain the theoretical basis for adoption, it does not explain why other schools choose not to adopt the framework. To overcome the gap in the literature, I used the theory and assumptions of RTI to identify the variables that predicted adoption.
Covariates. Specific learning disability (SLD) identification is influenced by many variables. Factors other than academic ability affect how students are perceived and what actions are taken by school professionals to define and assist struggling learners. Common variables within the literature that predict SLD identification are race/ethnicity, gender, achievement, (e.g. Harris-Murri et al., 2006; Hosp & Reschly, 2003; Dunn et al., 2009) and having a background that is culturally and linguistically diverse (Orosco, 2010). The percentage of students at each school with the identified characteristics was included in the models.

Schools with a high percentage of economically disadvantaged students are eligible for additional federal funds under the Title 1 Act (U.S. Department of Education, 2009). The percentage of students who are economically disadvantaged at a school is a factor associated with achievement (Benner et al., 2012; Hosp & Reschly, 2004). I included the percentage of students who were economically disadvantaged as a covariate to predict achievement, whereas I included the Title 1 status of a school to account for the selection into treatment. If schools receive federal funds to assist students they may be more likely to adopt RTI because RTI is mentioned in the federal legislation and schools that accept federal money are encouraged, although not mandated to implement RTI.

I included the books per student variable as a proxy for the resources each school spent on materials for students. RTI adoption usually necessitates intervention materials that were above and beyond what was used for regular instruction in Tier 1. Schools that had access to more books per student may be more likely to adopt RTI. In addition, I controlled
for Instructional Resources per Student to predict selection into RTI. The RTI blueprint of implementation authored by the National Associate of State Directors of Special Education (2008) recommend that schools and districts use technology and data management systems to document progress of students at an individual level, school level, and district level. Schools that had adequate access to technology, as measured by the Instructional Resources per Student variable, may have been more likely to adopt RTI because they already had the data management capacity at the school and RTI was not be an additional expense.

Variation in school characteristics due to community attributes is captured by the Urbanicity (city, suburb, town, rural) covariate of the school and size of the school measured by Total Number of Students. Dunn et al. (2009) found that the contextual variables of a school such as whether a school has a large population and the demographics of the community surrounding the school can impact referral into special education. They found significant differences in how teachers rated students on an attention scale based on whether the teachers taught at a rural, suburban, or inner-city school. The rural teachers rated students with a lower score than the other teachers.

In addition to the demographics of the school population, another influential component of both achievement and the SLD identification process is the teacher. Teachers are the implementers responsible for delivering instruction, as well as making the referral for special education services. Teacher data is also an integral part of the pre-referral and identification process. Therefore, teacher characteristics that are associated with student achievement (percentage of teachers with National Board Certification and Number of Years
of Teaching Experience) were covariates (Clotfelter, Ladd, & Vidgdr, 2007). Clotfelter and colleagues (2007) found no evidence that teachers with an advanced degree had an effect on achievement. This finding is the rationale for not including advanced degree in the model. In addition, Teacher Turnover Rate was a variable that predicted selection into treatment. Schools with a high degree of teacher turnover may have been less likely to adopt RTI because of the difficulties of trying to embed RTI in the school culture when teachers are leaving the school and new teachers are joining.

Teacher quality is often noted as being important to student achievement, but how teacher quality is measured is debatable. I included the percentage of teachers who held National Board Certification (Vandevoort, Amrein-Beardsley, & Berliner 2004), as well as Number of Years of Teaching Experience to capture a component of achievement. Previous studies have noted that teacher experience affects student achievement most in the early years of teaching (Clotfelter, 2007; TNTP, 2012). The schools in the sample were matched based on the percentage of teachers with 0-3 and 4-10 years of experience. I used these ranges because that is how teacher experience was reported on the North Carolina Report Card.

In 2002, federal legislation was passed that funded formula grants for schools to focus on K-3 reading achievement with the adoption of research-based reading programs and diagnostic reading assessments (U.S. Department of Education, 2002). The initiative was named Reading First. Some of the goals of Reading First were consistent with RTI- a focus on early intervention and an emphasis on the core curriculum. If a school received Reading
First support, it may have made the transition to RTI easier (Detgen, Yamashita, Davis, & Wraight, 2011). I added a dummy variable to the dataset to identify Reading First schools. I used Reading First as a matching covariate and it remained in the OLS model due to the lasting effects the policy may have had on achievement in the schools even after funding was eliminated.

I included two covariates to control for additional differences in North Carolina schools that may impact achievement. Magnet Status was one of these variables. Schools designated as magnet schools implemented the state curriculum like other public schools, but also enhanced instruction with an additional program that pertained to the designated theme of the school. The Type of Schedule of the school was the next variable. Some schools in North Carolina follow the traditional schedule with a summer vacation, whereas others run on a year-round schedule. The year-round schools offer additional support to struggling students during intermittent breaks throughout the year. These covariates were important to include to control for any effect on student achievement that occurred due to the additional magnet program or scheduling.

The anticipated outcomes of RTI implementation is increased student achievement and aligns with the most noted reason schools are implementing RTI (REL, 2011). It was important to include an achievement measure in the model to match schools with similar achievement levels so that the effect of RTI could be isolated. The Achievement variable may have also captured schools that adopted RTI in an effort to increase student achievement. In order to meet the assumption of conditional independence, achievement
scores during the timeframe that a school implemented RTI could not be included as covariates because it was a downstream variable, meaning that those scores may have been influenced by the treatment. North Carolina began piloting RTI in five schools beginning with the 2004 academic year (NC DPI, 2012). I used third through fifth grade reading and math end of grade test scores from 2003 to capture achievement scores prior to implementation. Since 2003, there have been changes to state testing and curriculum, but these changes would occur at all schools throughout the state. I recognize that some schools may have experienced changes in student achievement since 2003, but 2003 is the only achievement test available where RTI was not responsible for the outcome.

I included covariates in the model that predicted student achievement, the likelihood of being diagnosed with SLD, and adoption of the RTI framework. I preprocessed the data using PSM so that the relationship between treatment and the covariates was reduced and model dependence was in turn reduced (Ho et al., 2007). I did not choose variables for the PSM and OLS models based on their statistical significance, but instead included them based on theory as to how the covariates related to the two outcomes and adoption of treatment.

Preprocessing the data with PSM and analyzing the differences in means could be the extent of the analysis, however, to ensure the findings were doubly robust I conducted analyses that followed the advice of Ho et al. (2007) and applied a parametric model to the preprocessed data. Specifically, I conducted an ordinary least squares (OLS) regression model with the preprocessed data. I used the formula for the OLS model to control for the
same variables used for matching with PSM to reduce omitted variable bias. The OLS is specified as:

\[ Y = \beta_0 + \beta_1 \text{RTI} + \beta_2 \text{2003 Reading} + \beta_3 \text{2003 Math} + \beta_4 \text{Male} + \beta_5 \text{Black} + \beta_6 \text{Hispanic} + \beta_7 \text{Economically Disadvantaged} + \beta_8 \text{LEP} + \beta_9 \text{Total Student Pop.} + \beta_{10} \text{Urbanicity} + \beta_{11} \text{Magnet} + \beta_{12} \text{Traditional Schedule} + \beta_{13} \text{Title I} + \beta_{14} \text{Reading First} + \beta_{15} \text{Books per Student} + \beta_{16} \text{Instructional Learning Device per student} + \beta_{17} \text{0-3 Yrs. Experience} + \beta_{18} \text{4-10 Yrs. Experience} + \beta_{19} \text{Teacher Turnover} + \beta_{20} \text{National Board Cert.} + \mu. \]

The percentage of students at a school who had a specific learning disability was positively skewed in the sample so I used the natural logarithm for the OLS outcome of specific learning disability. I then analyzed the output of the PSM differences in means and the OLS model to determine the effect of RTI.

I obtained the outcome variables related to the percentage of students at each school proficient in reading and math from aggregated data reported to the public in the 2012-2013 North Carolina School Report Card. Jacob, Goddard, and Kim (2014) concluded that “although it is possible that better estimates of program impact could be obtained using student-level data, previous research also suggests that aggregate data are likely to be sufficient to provide program impact that are comparable with those achieved in RCT’s [randomized control trials] (p.60). It was further noted that OLS models with school-level data “provide unbiased estimates of program impact” (Jacob, et al., 2014 p. 62). I calculated the outcome variable related to the number of students at each school identified with a SLD using a restricted-use dataset from the NCERDC called the Masterbuild dataset. The
aggregate NC School Report Card only reports the percentage of students with disabilities. The percentage from the Report Card included all disabilities, such as deafness, blindness, autism, etc. For this study, it was imperative to look at only students with SLD since that is consistent with the theory behind RTI. In the Masterbuild dataset each student in grades three and beyond is listed with an exceptionality code that specified if the student had a disability and the type of disability. I used the exceptionality code to calculate the percentage of students considered SLD at each school for the 2012-2013 academic year.

**Data Collection**

I collected data for the study from four sources: (1) Datasets from the North Carolina Education Research Data Center located at Duke University (2) the 2012-2013 NC Public School Report Card on the NC Department of Public Instruction website (3) the NC Principal Survey of RTI Implementation conducted by NC Department of Public Instruction (4) district administrators in NC school districts. The variables and data source for each are displayed in Table 2.

<table>
<thead>
<tr>
<th>Variables included in the models with each data source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Covariates and Outcome Variables</strong></td>
</tr>
<tr>
<td>2003 Reading and Math Achievement Proficiency</td>
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<tr>
<td>2013 Reading and Math Achievement Proficiency</td>
</tr>
</tbody>
</table>
Table 2 (continued)

<table>
<thead>
<tr>
<th>Reading First Competitive Grant Recipients</th>
<th>Table in Master’s Thesis taken from DPI website (Cartrette, 2006)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTI Implementation</td>
<td>NC Principal Survey of RTI Implementation (NC DPI)</td>
</tr>
<tr>
<td></td>
<td>Email Correspondence from School District Administrators</td>
</tr>
<tr>
<td></td>
<td>School and District Websites</td>
</tr>
<tr>
<td>School Demographics:</td>
<td>2012-2013 NC School Report Card (NC DPI website)</td>
</tr>
<tr>
<td>- Books and Instructional Devices</td>
<td></td>
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<tr>
<td>per Student</td>
<td></td>
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<tr>
<td>- Magnet</td>
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<tr>
<td>- National Board Certification</td>
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<tr>
<td>- Teacher Experience</td>
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<tr>
<td>- Teacher Turnover Rate</td>
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<tr>
<td>- Title 1 Status</td>
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<tr>
<td>- Total School Population</td>
<td></td>
</tr>
<tr>
<td>- Traditional Schedule</td>
<td></td>
</tr>
<tr>
<td>Specific Learning Disability Identification for Students at Each School</td>
<td>2012-2013 Masterbuild Dataset (NCERDC)</td>
</tr>
<tr>
<td>Student Demographics:</td>
<td>2012-2013 NC School Report Card (NC DPI website)</td>
</tr>
<tr>
<td>- Economically Disadvantaged</td>
<td></td>
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<tr>
<td>- Gender</td>
<td></td>
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<tr>
<td>- Limited English Proficiency</td>
<td></td>
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<tr>
<td>- Race/Ethnicity</td>
<td></td>
</tr>
<tr>
<td>Urbanicity</td>
<td>2011 Public School Universe (NCERDC)</td>
</tr>
</tbody>
</table>
I used a secure server to store all data from the NCERDC at North Carolina State University that was accessible only to the North Carolina State University College of Education Instructional Technology Team (IT) and myself. The College of Education IT Department at the university maintained the secure server access. Following the project, I deleted all data on the server (per request of NCERDC).

The NCERDC uses the statistical program SAS to report all data. I employed Stata12 and Stata13 (StataCorp LP, 2012, 2013) for my analysis. Once I received the datasets from NCERDC, I transferred each file from a SAS data format to a Stata file. Then I merged the three NCERDC datasets to create one large dataset with the variables of interest. I deleted all student information for students in grades pre-kindergarten through second grade and sixth through twelfth grades, as well as variables that did not predict selection into treatment or outcomes.

**Treatment and Control Groups**

I contacted the North Carolina Department of Instruction (DPI) Responsiveness to Instruction department for the NC Principal Survey of RTI Implementation. The survey identified 131 schools that provided information about whether or not they implemented RTI during the 2012-2013 academic year. Of those 131 schools, 97 of them were elementary. For schools not included in the survey, I collected information from district and school websites to determine if they used the RTI framework. When schools did not have the needed information on their district or school website an email was sent to an administrator in the district (e.g., Special Education Coordinator, Director of Student Support Service, Director of
Elementary Education) to determine if: (1) the district used the RTI framework in any elementary schools and (2) if so, which elementary schools used the RTI framework in 2012-2013.

After identifying elementary schools in NC as RTI or control schools for the 2012-2013 academic year, I added a dummy variable to the dataset to assign schools to treatment and control groups. RTI schools were identified with a 1 and control schools a 0.

North Carolina had 117 school districts (NC Department of Public Instruction, 2013) and 65 of them were represented in the full sample (56%). Of these schools in the full sample, 48% were located in a rural area, 25% were in a city, 16% were in a town, and 12% were in the suburbs. I used census definitions for the locale type code that defines urbanicity. It classified rural schools as being outside an urban cluster. City schools were inside an urbanized area and inside a principal city. A town is considered to be inside an urban cluster, but 10-35+ miles from an urbanized area, while rural schools are outside an urban cluster.

The NCERDC dataset also divided each locale type into three subtypes for cities and suburbs (large, midsize, and small) and three subtypes for towns and rural locations (fringe, distant, and remote). I did not include these subtypes in the model.

**Preprocessing the Data**

In order to compare the findings of treatment and control schools, it was imperative for the two groups to be balanced prior to analysis on observable characteristics that predict RTI implementation, student achievement and SLD identification. First, I ran a logistic regression to predict the likelihood of each school implementing RTI based on the observable
characteristics described previously. Propensity scores are only calculated for schools that contain no missing data on all the covariates. In the sample 553 schools had all the information needed to determine a propensity score.

Next, I employed the minima and maxima comparison strategy. “The basic criterion of this approach is to delete all observations whose propensity score is smaller than the minimum and larger than the maximum in the opposite group” (Caliendo & Kopeinig, 2008 p. 45). Propensity scores were kept if they were >.17852 and <.9728377. Seven observations were deleted by using the minima and maxima comparison strategy. The data were in alphabetical order by district name so I sorted the database randomly using the set seed function in Stata 12 with the random number being 318. Finally, the treatment and control groups were matched based on the observable characteristics using the nearest neighbor no replacement technique and a caliper of .044.

Data Analysis

I examined the pseudo $R^2$ and t-tests after matching to ensure there were no differences between the treated and control schools. There was a low pseudo $R^2$ of .023 and the t-test showed no significant difference for all variables between the treatment and control group. In Table 3, I describe the means before and after matching for each variable as well as the reduction in bias that occurred following PSM.
Table 3

*Difference in means between the treatment and control groups for each covariate*

<table>
<thead>
<tr>
<th>Variable Names</th>
<th>Before PSM</th>
<th></th>
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<th>After PSM</th>
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</thead>
<tbody>
<tr>
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<td>Difference in Means</td>
<td>% Bias</td>
<td>Difference in Means</td>
<td>% Bias</td>
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<tr>
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<td>0.006</td>
<td>11.5</td>
<td>0.001</td>
<td>2.4</td>
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<tr>
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<td>-0.002</td>
<td>-5.4</td>
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<tr>
<td>Black</td>
<td>0.003</td>
<td>1.4</td>
<td>-0.027</td>
<td>-11.6</td>
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<tr>
<td>Hispanic</td>
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<td>7.5</td>
<td>0.001</td>
<td>1.2</td>
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<tr>
<td>Econ. Disadv.</td>
<td>-0.038</td>
<td>-11.1</td>
<td>-0.004</td>
<td>-1.3</td>
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<td>Limited English</td>
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<td>17.5</td>
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<tr>
<td>School Population</td>
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<td>53.3</td>
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<tr>
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<td>-58.9</td>
<td>1.97</td>
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<tr>
<td>Magnet</td>
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<td>-5.9</td>
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Table 3 (continued)

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<table>
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<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Traditional Sched.</td>
<td>-.033</td>
<td>-12.7</td>
<td>.026</td>
<td>10.3</td>
</tr>
<tr>
<td>Title 1</td>
<td>-.075</td>
<td>-19.7</td>
<td>.02</td>
<td>5.2</td>
</tr>
<tr>
<td>Reading First</td>
<td>-.066</td>
<td>-25.9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Books/Student</td>
<td>-2.58</td>
<td>-23.6</td>
<td>.152</td>
<td>1.4</td>
</tr>
<tr>
<td>Inst. Learning/Student</td>
<td>.257</td>
<td>23.1</td>
<td>-.056</td>
<td>-5</td>
</tr>
<tr>
<td>0-3 yrs. Teaching Exp.</td>
<td>.004</td>
<td>4.6</td>
<td>-.001</td>
<td>-.7</td>
</tr>
<tr>
<td>4-10 yrs. Teaching Exp.</td>
<td>.013</td>
<td>12</td>
<td>-.001</td>
<td>-4.2</td>
</tr>
<tr>
<td>Teacher Turnover Rate</td>
<td>-.005</td>
<td>-7</td>
<td>-.002</td>
<td>-2.4</td>
</tr>
<tr>
<td>National Board Cert.</td>
<td>1.2</td>
<td>33.3</td>
<td>-.225</td>
<td>-6.2</td>
</tr>
</tbody>
</table>

Following the PSM process, I employed Stata12 to run OLS models on the full and matched data. I estimated three OLS models to determine: (1) the effect of RTI on reading achievement as measured by the percent of students proficient on the 3-5 end of grade.
reading test (2) the effect of RTI on math achievement as measured by the percent of students proficient on the 3-5 end of grade math test (3) the effect of RTI on the proportion of students identified with a specific learning. Then, I employed Stata13 software to determine the effect size, eta squared, for each variable.

**Research Validity and Reliability**

I used the preprocessing strategy of propensity score matching to promote internal validity of the study. One can only conclude that RTI is the cause of the differences in student achievement and LD identification if the schools that are being compared are balanced on observable characteristics prior to the analysis. I utilized multiple matching techniques to find a balance where the treatment and control group had no significant differences prior to analysis.

One assumption of PSM is that the observable characteristics used in the model are identified for variables that predict adoption of the treatment and outcomes of treatment. I chose the variables in the model using findings of previous studies that influenced student achievement and LD identification. The literature is not as focused on documenting variables that investigate why schools choose to adopt RTI implementation; therefore I used the theory and assumptions behind RTI to determine selection variables.

Because I used covariates from the literature and theories of RTI, as well as preprocessed the data prior to the OLS models, it is less likely that the outcomes are due to model dependency or researcher manipulation.
Ethical Considerations

There are no students identified by name in the database; however, each student had an anonymous identifier assigned by the NCERDC. The database consisted of information that assigned each student to his or her corresponding local education agency (LEA) and school, however the LEA and school name were not identified in any publication that resulted from the study. The original NCERDC data file and any temporary data files were stored on a secure server at North Carolina State University where only the researcher and members of the instructional technology team could access it. The computer used to contact the server was protected by a password and access was restricted to the researcher.

Summary

The research questions for this study were: (1) how does RTI affect student achievement? (2) what is the effect of RTI implementation on the proportion of elementary school students identified with a learning disability? I used the quantitative research methods or PSM and OLS to investigate the research questions.

The sample consisted of third, fourth, and fifth grade students due to the data collection procedures of North Carolina. Students begin taking the state standardized tests in third grade and demographic and achievement data are only collected by state agencies for those students.

I gathered data from multiple sources and analyzed it using Stata12 and Stata13 output to determine if there was a statistically significant difference in achievement and the
proportion of students identified as learning disabled in RTI schools when compared to non-RTI schools. I will report the findings of the study in the following chapter.
CHAPTER 4

RESULTS

Introduction

In this chapter, I present the findings from the propensity scores matching (PSM) technique and ordinary least squares regression (OLS) models I used to answer the two research questions related to the effect of RTI on achievement and students identified with a specific learning disability in elementary schools. I will detail the difference in means between the full sample and matched sample, in addition to outlining the OLS regression models of both the full and matched samples.

General Description of Data

During the 2012-2012 academic year, there were 1,834 elementary schools in North Carolina (ncpublicschool.org). Elementary schools were defined as schools that included prekindergarten students through eighth grade. The current study only included elementary school students in third, fourth, and fifth grade. Initially, RTI implementation data were collected for 743 schools. This was 40.51% of the elementary school population. I deleted schools that taught students in the middle grades (sixth, seventh, eighth), which led to the exclusion of 75 schools. Second, I deleted special education and alternative schools and lost two schools, reducing the sample to 666 schools in the sample. Next, I dropped 113 schools because they were missing data on one or more variables. Information for all covariates is required to calculate a propensity score. The data was missing because some schools did not have 2003 achievement data or because the school did not serve students in third, fourth, and
fifth grades. For instance, there were schools that served students in K-2, K-3, or K-4. The sample size reduced to 553 schools. Finally, once a propensity score was calculated, I employed the min and max strategy and schools remained in the sample if they had a propensity score that was >.17852 and <.9728377. Seven schools were deleted because the propensity score fell outside of the min and max range. Now, the sample included 546 schools. In the following analysis, the 546 schools are referred to as the full sample because they are the schools that contain a propensity score prior to matching. The full sample contained information for 546 elementary schools or 29.77% of the North Carolina public elementary school population. The descriptive statistics for the full sample are detailed in Table 4.

Table 4

*Descriptive statistics of full sample (N= 546)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003 Reading Proficiency</td>
<td>.851</td>
<td>.075</td>
</tr>
<tr>
<td>2003 Math Proficiency</td>
<td>.918</td>
<td>.054</td>
</tr>
<tr>
<td>Male</td>
<td>.515</td>
<td>.041</td>
</tr>
<tr>
<td>Black</td>
<td>.249</td>
<td>.230</td>
</tr>
<tr>
<td>Hispanic</td>
<td>.146</td>
<td>.123</td>
</tr>
<tr>
<td>Economically Disadvantaged</td>
<td>.613</td>
<td>.386</td>
</tr>
<tr>
<td>Limited English Proficiency</td>
<td>.077</td>
<td>.083</td>
</tr>
<tr>
<td>School Population</td>
<td>480.931</td>
<td>179.014</td>
</tr>
<tr>
<td>Urbanicity</td>
<td>29.757</td>
<td>12.518</td>
</tr>
<tr>
<td>Magnet</td>
<td>.069</td>
<td>.254</td>
</tr>
</tbody>
</table>
Table 4 (continued)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional Schedule</td>
<td>.923</td>
<td>.266</td>
</tr>
<tr>
<td>Title 1 School</td>
<td>.808</td>
<td>.394</td>
</tr>
<tr>
<td>Reading First</td>
<td>.057</td>
<td>.231</td>
</tr>
<tr>
<td>Books/Student</td>
<td>26.314</td>
<td>10.628</td>
</tr>
<tr>
<td>Inst. Learning Device/ Student</td>
<td>2.077</td>
<td>1.226</td>
</tr>
<tr>
<td>0-3 yrs. Teaching Experience</td>
<td>.177</td>
<td>.095</td>
</tr>
<tr>
<td>4-11 yrs. Teaching Experience</td>
<td>.309</td>
<td>.106</td>
</tr>
<tr>
<td>Teacher Turnover Rate</td>
<td>.122</td>
<td>.072</td>
</tr>
<tr>
<td>National Board Certification</td>
<td>5.525</td>
<td>3.765</td>
</tr>
</tbody>
</table>

All 2,526 public schools in North Carolina were asked by the Department of Public Instruction to complete a Principal’s Survey that detailed the schools’ efforts of RTI implementation in the 2012-2013 academic year. DPI received information from 131 schools, where 97 of those were elementary schools. This was a response rate of 5.19% for all schools in the state. After contacting each school district via email to gather information about elementary schools, the sample increased to include information from 29.41% of all schools. However, because the focus of the current study was elementary students, the response rate for elementary schools was 40.51%.

The 546 schools in the full sample were included because they met the criteria of the enrollment of third, fourth, and fifth grade students and had End of Grade (EOG) reading and math scores for the 2003 school year. It should be noted that fifth graders also takes a science end of grade test, however science EOG scores were not an outcome variable of interest for the study. I ran a logistic regression model to calculate the propensity score that estimated the
probability each school in the sample implemented RTI based on the observable characteristics. Figure 4 shows the distribution of the propensity scores for the treatment and control group where the treatment group was defined as schools using the RTI framework and the control group did not use RTI during the 2012-2013 academic year.

*Figure 4. Distribution of propensity scores for control and treated groups.*
It is evident from the figure that the treatment schools, those on the bottom of the figure, had a higher propensity towards implementing RTI, as one would expect.

After PSM, the sample size decreased from 546 to 300 schools because only the schools that had a match based on the propensity score were retained for the matched sample. There were 150 treated schools that implemented RTI and 150 control schools that were on support. The term on support refers to the treatment and control schools that had an overlap in propensity scores. Figure 5 depicts the propensity scores of treated and untreated matches, as well as those that were not on support.

Figure 5. Propensity scores of treated and untreated schools that are on and off support.
It is apparent from the figure that those scores that were not on support were in the middle and on the right tail of the distribution, with a high propensity score. All 166 untreated schools were on support and 150 of the treated schools were on-support. Descriptive statistics of the matched sample are highlighted in Table 5.

Table 5

*Descriptive Statistics of the Matched Sample (N=300).*

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003 Reading Proficiency</td>
<td>.844</td>
<td>.074</td>
</tr>
<tr>
<td>2003 Math Proficiency</td>
<td>.916</td>
<td>.051</td>
</tr>
<tr>
<td>Male</td>
<td>.516</td>
<td>.044</td>
</tr>
<tr>
<td>Black</td>
<td>.220</td>
<td>.230</td>
</tr>
<tr>
<td>Hispanic</td>
<td>.140</td>
<td>.125</td>
</tr>
<tr>
<td>Economically Disadvantaged</td>
<td>.628</td>
<td>.200</td>
</tr>
<tr>
<td>School Population</td>
<td>421.599</td>
<td>155.014</td>
</tr>
<tr>
<td>Urbanicity</td>
<td>34.84</td>
<td>9.738</td>
</tr>
<tr>
<td>Magnet</td>
<td>.013</td>
<td>.115</td>
</tr>
<tr>
<td>Traditional Schedule</td>
<td>.960</td>
<td>.196</td>
</tr>
<tr>
<td>Title 1 School</td>
<td>.864</td>
<td>.343</td>
</tr>
<tr>
<td>Reading First</td>
<td>.086</td>
<td>.281</td>
</tr>
<tr>
<td>Books per Student</td>
<td>27.65</td>
<td>11.755</td>
</tr>
<tr>
<td>Inst. Learning Device/Student</td>
<td>1.91</td>
<td>.840</td>
</tr>
<tr>
<td>0-3 yrs. Teaching Experience</td>
<td>.175</td>
<td>.094</td>
</tr>
<tr>
<td>4-11 yrs. Teaching Experience</td>
<td>.300</td>
<td>.110</td>
</tr>
<tr>
<td>Teacher Turnover Rate</td>
<td>.122</td>
<td>.079</td>
</tr>
<tr>
<td>National Board Certification</td>
<td>4.79</td>
<td>3.204</td>
</tr>
</tbody>
</table>

The urbanicity between the full and matched sample differed with a 15% decrease in schools located in a city, a 5% decrease in schools in a suburb, a 3% increase in schools in a
town, and a 16% increase in rural schools. In the matched sample, 51% of the school districts in North Carolina are represented by at least one school. Figure 6 illustrates the urbanicity of the two samples. It is apparent from the graph that the sample is most representative of rural schools.

![Figure 6. The urbanicity of the full and matched samples.](image)

The preprocessing strategy of PSM reduced the sample to only include schools that were similar on the observable characteristics specified in the model and removed those schools that were not similar.
Treatment Effect of RTI

I calculated the treatment effect on the treated using the psmatch2 command in Stata12. The treatment effect expresses the effect of RTI on the outcome variables for those schools that implemented RTI. Determining the difference in means between the treated and control groups is the method used to calculate the treatment effect on the treated (see Table 6).

Table 6

Treatment Effect of RTI on Reading and Math Achievement and Students Identified with a Specific Learning Disability.

<table>
<thead>
<tr>
<th></th>
<th>Percent-Treated</th>
<th>Percent-Controls</th>
<th>Difference</th>
<th>Standard Error</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unmatched</td>
<td>.425</td>
<td>.381</td>
<td>.044</td>
<td>.013</td>
<td>3.39*</td>
</tr>
<tr>
<td>Matched</td>
<td>.408</td>
<td>.387</td>
<td>.021</td>
<td>.014</td>
<td>1.49</td>
</tr>
<tr>
<td>Math</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unmatched</td>
<td>.472</td>
<td>.440</td>
<td>.033</td>
<td>.014</td>
<td>2.31*</td>
</tr>
<tr>
<td>Matched</td>
<td>.442</td>
<td>.448</td>
<td>-.005</td>
<td>.016</td>
<td>-0.34</td>
</tr>
<tr>
<td>% SLD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unmatched</td>
<td>.075</td>
<td>.075</td>
<td>.000</td>
<td>.003</td>
<td>0.21</td>
</tr>
<tr>
<td>Matched</td>
<td>.081</td>
<td>.075</td>
<td>.006</td>
<td>.004</td>
<td>1.40</td>
</tr>
</tbody>
</table>
RTI had a significant effect on the outcomes of reading and math for the full sample. The t-test did not reveal any significant differences in means for the matched data on any of the three outcomes. With the matched data, the reading outcomes were slightly higher for the RTI schools whereas math outcomes were slightly lower. RTI schools also had a marginally higher percentage of students identified as SLD, but these were not statistically significant for any of the outcomes for the matched sample. Ho et al. (2007) cautions against relying on a simple difference in means analysis for conclusions about the effect of the treatment because this technique assumes the treatment and the covariates are unrelated: “If the assumption is false, and it is false except in the rare case when exact matching is possible for all observations, then the result is the same for omitted variable bias that occurs whenever a potential confounding variable is ignored” (Ho et al., 2007, p. 223). PSM is a nonparametric process and is should be paired with another analysis method for causal effects to be estimated (Ho et al., 2007). I utilized the parametric analysis of OLS regression in the current study. The OLS findings for the matched sample are described next.

**RTI and Achievement**

**Reading.** Implementing RTI had a small, positive effect on reading achievement ($\beta=.018$, $p=.024$, $\eta^2=.018$), as predicted. Previous academic achievement on the 2003 EOG test also had a small effect on predicting 2013 reading achievement ($\eta^2=.030$). When the percent of students proficient on the 2003 EOG increased, the percentage of students proficient on the 2013 end of grade test increased ($\beta=.346$, $p=.004$). The other variable that has a small, positive effect on the number of students proficient on the reading EOG test was the number
of national board certified teachers at a school ($\eta^2 = .043$). As the number of national board certified teachers increased, the percentage of students proficient on the reading EOG increased ($\beta = .005, p < .01$). Variables that had a negative effect on the percentage of students proficient on the reading EOG were the percentage of students who were black ($\beta = -.094, p = .002$) and the percentage of students considered economically disadvantaged ($\beta = -.313, p < .01$). The percentage of students at a school who were black had a small effect on reading proficiency ($\eta^2 = .034$) while the percentage of students at a school who were economically disadvantaged had a moderate effect on reading proficiency ($\eta^2 = .199$).

**Math.** Implementing RTI had no effect on math achievement, as predicted. Prior math achievement on the 2003 end of grade test had a small effect on predicting the number of students proficient on the 2013 math EOG ($\eta^2 = .014$). When the percentage of students proficient on the 2003 test increased, the percentage of students proficient on the 2013 math test increased ($\beta = .437, p = .049$). The number of national board certified teachers at a school also had a small, positive effect on the number of students proficient on the math EOG ($\eta^2 = .024$). As the number of national board certified teachers increased, math proficiency also increased ($\beta = .005, p = .010$). Two variables had a significant negative effect on math proficiency. They are the percentage of students who were black ($\beta = -.125, p = .004$) and the number of students considered economically disadvantaged ($\beta = -.288, p < .01$). Both variables had a small effect on the number of students at a school proficient on the math EOG. The variable Black ($\eta^2 = .030$) had a smaller effect than the economically disadvantaged
variable ($\eta^2=.095$). I detailed the effect of each variable when conducting the OLS model on the matched sample in Table 7.
Table 7

Relationship of Overall Reading and Math Achievement and School Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Matched Sample</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reading</td>
<td>Math</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>β</td>
<td>η²</td>
<td>95% CI</td>
<td></td>
<td>η²</td>
<td>95% CI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RTI</td>
<td>.018* (0.008)</td>
<td>.018 (0.011)</td>
<td>.000</td>
<td>0.060</td>
<td>-.012</td>
<td>.004</td>
<td>.478</td>
</tr>
<tr>
<td>2003</td>
<td>.346** (.119)</td>
<td>.030 (.168)</td>
<td>.003</td>
<td>0.079</td>
<td>.018</td>
<td>.000</td>
<td>0</td>
</tr>
<tr>
<td>Reading</td>
<td>.123 (.156)</td>
<td>.002 (.221)</td>
<td>0</td>
<td>0.026</td>
<td>.437*</td>
<td>.014</td>
<td>0</td>
</tr>
<tr>
<td>2003</td>
<td>-.094** (.030)</td>
<td>.034 (.043)</td>
<td>.005</td>
<td>0.085</td>
<td>-.125**</td>
<td>.030</td>
<td>.003</td>
</tr>
<tr>
<td>Male</td>
<td>.022 (.089)</td>
<td>.000 (.126)</td>
<td>0</td>
<td>0.015</td>
<td>-.038</td>
<td>.000</td>
<td>0</td>
</tr>
<tr>
<td>Black</td>
<td>-.069 (.062)</td>
<td>.004 (.087)</td>
<td>0</td>
<td>0.033</td>
<td>-.042</td>
<td>.000</td>
<td>0</td>
</tr>
<tr>
<td>Hispanic</td>
<td>-.313** (.199)</td>
<td>.122 (.288)</td>
<td>.278</td>
<td>.288**</td>
<td>.095</td>
<td>.039</td>
<td>.164</td>
</tr>
<tr>
<td>Econ.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < 0.05, ** p < 0.01
<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
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<td>Disadv.</td>
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</tr>
<tr>
<td>LEP</td>
<td>0.042</td>
<td>0.001</td>
<td>0</td>
<td>0.020</td>
<td>0.107</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>(0.092)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>School</td>
<td>-0.000</td>
<td>0.009</td>
<td>0</td>
<td>0.043</td>
<td>-0.000</td>
<td>0.005</td>
</tr>
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<td></td>
<td>(0.000)</td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Pop.</td>
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Table 7 (continued)

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<td>-.027</td>
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<td>.000</td>
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<td>(.052)</td>
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*Note.* Standard errors are in parentheses. *=p<.05, **=p<.01.
Students Identified with a Specific Learning Disability. The implementation of RTI had no effect on the proportion of students who were identified with a SLD in a school, although three variables in the model did have an effect on the proportion of students identified with SLD. The number of students in the population of the school had a small effect (η²=.044) on the number of students identified with a specific learning disability. As the total number of students in the school increased, the percentage of students identified with a learning disability increased slightly (β=.00007, p=.000). Finally, the percentage of students at a school considered economically disadvantaged had a small effect (η²=.021) on the number of students identified with a specific learning disability. Specifically, as the number of students considered economically disadvantaged at a school increased, the percentage of students identified as learning disabled increased (β=.049, p=.015). I detailed each covariate and its effect on the age of students at a school identified with SLD in Table 8.

Table 8

Relationship of School Characteristics on Overall Percentage of Students Identified with a Specific Learning Disability.

<table>
<thead>
<tr>
<th>Variable Names</th>
<th>Matched Sample % SLD</th>
<th>β</th>
<th>η²</th>
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<th>UL</th>
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<td></td>
<td>(0.050)</td>
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<tr>
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<td>.055</td>
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<tr>
<td></td>
<td>(0.760)</td>
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<td>.008</td>
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Table 8 (continued)

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<th>Estimate (1.01)</th>
<th>SE</th>
<th>p-value</th>
<th>95% CI</th>
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<td>.194</td>
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<td>Hispanic</td>
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<td>.396</td>
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<td>Town</td>
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<td></td>
<td>.009</td>
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Table 8 (continued)

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Note. Standard errors are in parentheses. *$=p<.05$, **$=p<.01$. 

Summary

I reduced the original sample to 300 schools after the preprocessing strategy of PSM. The reduction was necessary to ensure a balanced match on each covariate in the model. The difference in means of the treatment and control group was significant for the unmatched full sample for both reading and math achievement. However, there was no difference in means for the percentage of students identified with a SLD. Analysis of the matched sample, showed no statistically significant differences with any of the three outcomes, although the t-
statistic can be misleading with just a simple difference in means test because it does not control for the other covariates. As suggested by Ho et al. (2007), a second parametric analysis was conducted on the matched sample. I used OLS regression models to analyze the effect of RTI on the three outcome variables in addition to controlling for the covariates. This analysis supported the hypothesis that schools implementing RTI had more students performing on grade level in reading but not in math. The increase in reading proficiency is likely due to the findings that schools most often utilize RTI to target reading (Shepherd & Salembier, 2011). There was no effect of RTI on the proportion of students identified with SLD. In the following chapter I will detail an analysis of the findings in relation to the literature and implications for future practice, research, and policy.
CHAPTER 5

Discussion

Schools around the country, including North Carolina, are choosing to implement Response to Intervention to address student achievement and concerns with the validity of the IQ discrepancy model. I investigated the outcomes of the North Carolina RTI framework in this study to draw some conclusions about the effectiveness of the model. In chapter five, I detail an analysis of the findings from the propensity score matching (PSM) technique and ordinary least squares regression models (OLS) I used to answer the two research questions: (1) how does RTI affect student achievement? (2) what is the effect of RTI implementation on the proportion of elementary school students identified as learning disabled? I will specify implications and recommendations for practice, research, and policy.

I used the PSM technique to preprocess the data so treatment and control groups were balanced on observable covariates that predicted adoption into treatment and outcomes. A difference in means analysis indicated a statistically significant difference in the means between the treatment and control groups in the full sample for reading and math achievement but not in the matched samples. The mean for reading in the matched sample was higher for the RTI schools than the control, whereas the mean for math achievement for the control group was .005 higher than RTI schools. The RTI schools had a slightly higher mean for the percentage of students who were considered SLD. The t-tests were not significant for any of the noted differences, but the insignificant findings can be misleading due to the assumption that the outcomes and covariates in the model were not related (Ho et
al., 2007). To overcome the false assumption, I ran OLS regression models on the matched data. The findings of the OLS on the matched sample of 300 schools revealed significant findings for reading achievement when controlling for all covariates. RTI had no effect on math achievement and no effect on the proportion of students identified with specific learning disabilities.

**Research Question 1: How does RTI affect student achievement?**

**Reading.** When controlling for the other variables, schools that implemented RTI had a 1.77 percentage point increase on overall reading proficiency on the third, fourth, and fifth grade reading end of grade tests. The positive effect on literacy is similar to the work of Ransford-Kaldon et al. (2011) who also found an increase in literacy achievement following interventions; however the current study used a state standardized test as the outcome measure whereas the former used assessments from a literacy program. Most of the previous studies noted in the literature review examined subgroups of students and monitored how they responded to interventions (see Al Otaiba et al., 2011; Shepherd & Salembier, 2011; O’Connor et al., 2013; Vellutino et al., 2008), however the current study used schools as the units of analysis instead of individual students. I used schools as the unit of analysis intentionally because RTI is a school-wide model and few studies investigate RTI as a whole, instead choosing to focus on individual parts (Hoover, 2010; VanderDerHeyden et al., 2007). Shepherd and Salembier (2011) found a pattern of increased student achievement on the state assessment for three rural schools, however the qualitative study did not investigate causality between RTI and achievement. The authors recognized that showing causality “would
provide the ultimate measure of success [of RTI]” (p. 12). When Fuchs and colleagues 
(2003) reviewed three RTI studies they could not find evidence that students in schools that 
implemented the problem-solving model of RTI made academic progress. The small but 
significant results of the current study may elevate the conversation that when quasi- 
experimental methods are employed with a substantial sample of schools, positive outcomes 
of the problem-solving model were observed.

When controlling for RTI with the sample, schools that had more students that were 
 economically disadvantaged and schools with a higher percentage of black students also had 
a smaller percentage of students who were proficient on the reading EOG. The effect size of 
the variable Black was smaller with the matched sample than with the full sample. With the 
full sample, when the school increased its black population by 1%, the percent of students 
proficient on the reading EOG decreased 26.58 percentage points, which is a large effect. 
With the matched sample, when the school increased its black population by 1%, reading 
achievement decreased 9.40 percentage points. When the sample is balanced with schools 
having similar numbers of students who are black, the effect of this variable is small on the 
number of students who were proficient on the EOG ($\eta^2 = .034$), although there is still a 
negative effect. Hoover and colleagues (2008) conducted a survey of each state and found 
that culturally responsive RTI was the least emphasized component of RTI training and may 
shed some light as to why the percentage of black students at a school is significant when 
controlling for RTI and all other variables. Harris-Murri et al. (2006) assert “response to 
intervention models must recognize that culture is central to learning and by implementing
culturally responsive pedagogy, all students will have the opportunity to learn within the RTI model” (p. 788). The findings in this study that a higher percentage of black students at a school is still a predictor of lower reading achievement indicates that meeting the needs of black students continues to be a concern. Investing in culturally responsive pedagogy when training implementers of the framework is one way to assist schools with meeting the needs of their student population.

The percentage of students who were Hispanic and had Limited English proficiency were not significant; however, there was a small representation of Hispanic and students with limited English proficiency in the study. The means were .140 for Hispanic and .069 for limited English proficiency. The NEA (2007) report notes that when school districts have a smaller number of students with limited English proficiency, the LEP group is usually overrepresented in special education. Because of the claim, one may expect that the Limited English Proficiency variable would be associated with lower achievement, even with the small percentage of students represented in the sample. This is an encouraging finding and further research is warranted to find out what support is in place with the schools in the sample for students with limited English proficiency.

Schools that had a higher percentage of students who were economically disadvantaged were also associated with lower reading achievement. Specifically, when a school increased by 1% with students who were economically disadvantaged, reading achievement decreased 31.3 percentage points. The percentage of students who were economically disadvantaged had the largest effect on the number of students who were
proficient in reading when compared to the other variables in the model. This finding supports the claim of Shifrer et al. (2010) that learning problems may reflect socioeconomic inequality and in order to address academic differences, social differences need to be addressed.

An increase of one national board certified teacher at a school was associated with a .5 percentage point increase in reading achievement. The National Board Certification variable was significant with both the full and matched sample for both reading and math and the positive effect was consistent with Clotfelter et al. (2007).

Some variables that had been found in previous studies to affect student achievement were not significant in this study, including included Years of Teaching Experience. Clotfelter et al. (2007) noted that the effect of experience is usually in the first years of teaching. This study used data from the NC School Report Card and experience is divided into three categories: 0-3 years, 4-10 years, and 10+ years. Years of teaching experience may have been significant if the number of years included in each category did not have such a wide range.

The perception of the majority of school psychologists in a survey conducted by Sullivan and Long (2010) was that after RTI implementation more time was spent on academic interventions and 68.3% believed RTI improved student achievement. The findings of the current study corroborate the perception that RTI can increase the number of students proficient in literacy. The increase of 1.77 percentage points on overall reading proficiency for RTI schools should be viewed in the context of the sample where the majority of the
schools were in rural areas with a mean of 62.8% of the third through fifth grade population considered economically disadvantaged. Rural schools face specific challenges that may be different from urban and suburban schools and RTI may be a framework that can increase reading achievement for similar schools.

**Math.** The second hypothesis was that RTI would have no effect on math achievement. The basis for the prediction is that schools implementing RTI most often focus on literacy (Dexter et al., 2008; Shepherd & Salembier, 2011) and is likely due to the finding that reading is the largest reason students are placed into special education (Fletcher et al., 2004) and RTI evolved from a special education policy. In both the PSM and OLS models, RTI had no effect on overall math achievement. The mean for the control schools in the matched sample was slightly higher (.006) than the treatment schools. These findings support the outcomes for the OLS models in reading. If the treatment schools had other variables not accounted for in the model that were driving the significant improvement in achievement for reading, it would most likely cause math achievement to be significant too. However, this was not the case. The other three variables that were significant for reading were also significant for math. These include percentage of students who are black, economically disadvantaged, and the number of national board certified teachers. Also, prior achievement on the 2003 math end of grade test predicted 2013 math achievement.

The percentage of students at a school who were black had a small negative effect on the number of students who were proficient on the math EOG by 12.54 percentage points. This is about the same effect that the variable had on reading. The percentage of students
who were economically disadvantaged had a smaller effect on math than reading. The effect of the number of National Board Certified teachers was similar for both reading and math achievement. It is worth noting that although the percentage of students who were economically disadvantaged in grades 3-5 negatively impacted reading and math achievement, a school’s Title 1 status was not significant. The Title 1 variable included schools that had a large percentage of total students who were economically disadvantaged thereby qualifying them to receive federal funds to assist these students.

Positive findings of RTI on math achievement are noted in the literature (eg. Pool et al., 2012) when students received tiered interventions specifically for math skills. The PowerPoint used for the 2012 NC RTI training that is listed on the NC DPI website, supports other studies that show reading is generally the focus of RTI (Fuchs et al., 2012; Shepherd & Salembier, 2011). All of the examples of assessments and interventions in the PowerPoint focused on reading (see NC DPI, 2012), leading one to believe that reading is also the focus of professional development offered for RTI training in North Carolina. The findings from the reading and math OLS models suggest that the implementation of the RTI framework in one subject area does not lead to improvements in other subject areas. The findings of this study are similar to Benner and colleagues (2012) when behavior interventions improved behavior but had no effect on academics. In the current sample when the focus of RTI is most likely reading, the percentage of students who were proficient in reading improved but that improvement did not affect math proficiency.
The conceptual literature of RTI focuses on instruction and intervention that prevent academic problems by placing a focus on the instructional match for the student (Fletcher et al., 2004; Fuchs et al., 2003; Fuchs et al., 2012; Hoover, 2010). The findings of the current study offer evidence that when a particular academic area is targeted with the RTI framework, positive effects on academic achievement are a result. Similarly, when RTI is implemented but an academic area is not the focus of the intervention, the outcomes are no different than if RTI was not used.

**Research Question 2: What is the effect of RTI implementation on the proportion of elementary school students identified as learning disabled?**

The hypothesis for research question two was RTI schools would have a lower proportion of students identified with specific learning disabilities. The hypothesis was based on the theory that “…RTI models have the potential to reduce special education referrals and associated placements by affecting in a positive way the academic or social/emotional growth of struggling learners” (Hoover, 2010, p. 291). The PSM and OLS models both show there is no difference in the proportion of students identified with SLD in RTI schools and control schools. In fact, the mean for treated schools in the matched sample was slightly higher at .006. These findings support those of Lindstrom and Sayeski (2013) that there is not yet a link between implementation of RTI and decreasing SLD. Some schools have shown a trend towards decreased placement (O’Connor et al., 2013; Wanzek & Vaughn, 2011), however they were not statistically significant. The current study only looked at students who were identified with SLD because IDEA 2004 only mentioned RTI with respect to SLD, a high
incidence disability. It is not anticipated that RTI would decrease other special education categories such as autism, deafness, traumatic brain injury, etc. VanDerHeyden and colleagues (2007) did find fewer evaluations were conducted after RTI implementation in the five schools in the sample. These special education evaluations included all disability categories, not just SLD.

Three variables in the current study were associated with predicting SLD identification for the matched sample. The first is the percentage of students proficient on the reading EOG in 2003. As the number of students proficient on the 2003 reading EOG increased, the percentage of students identified with a learning disability in 2013 decreased. The prior achievement variable had a small effect on SLD identification ($\eta^2=.015$). The second variable that was significant was the percentage of students at a school that were economically disadvantaged. When the economically disadvantaged population increased by 1%, the students who were identified with a SLD increased by 78.44 percentage points. The Economically Disadvantaged variable also had a small effect ($\eta^2=.037$). In addition, the total number of students at the school also had a small effect on the percentage of students with a SLD ($\eta^2=.032$). As the number of students at a school increased by 1%, the percentage of students identified with SLD decreased by .070 percentage points.

The percentage of students at a school who were black was not significant in the number of students identified with a SLD. This was an interesting finding because an increase in black students was associated with a decrease in reading and math achievement. One may assume that if black is associated with a lower percentage of students proficient on
the EOG, it may also be associated with an increase in SLD identification. The finding that it is not significant with the proportion of students identified with a SLD may be due to schools moving from a focus of eligibility to instruction (Fletcher et al., 2004). Schools may be more aware of the discrepancy of achievement between student demographics and these schools may turn their focus on changing instruction in the classroom or implementing interventions instead of referring students to special education (Fletcher et al., 2004; Proctor, 2012; Shapiro & Clemens, 2009), however this assumption warrants further investigation.

The sample of the current study included only third, fourth, and fifth grade students due to the fact that data was only collected by DPI on elementary students in these tested grades. The upper elementary grades have been found to have more students identified as SLD. O’Conner and colleagues (2013) found three times more students were identified in third through fifth grade than kindergarten through second in RTI schools. School that were not implementing RTI also had more upper grades students identified than primary grades although it was not as dramatic. The increase in SLD referrals and placement in the upper elementary grades may be due to more students struggling with reading as text complexity increases (Kavale & Spaulding, 2008). With this in mind, it should not be assumed that the findings of the current study generalize to SLD identification of K-2 students.

The current findings may help alleviate the fear that the SLD category will become a catchall for struggling learners (Kavale & Spaulding, 2008), but still may not completely answer the question as to whether RTI is the “better mousetrap” (Mellard et al., 2004 p. 229). The current study only looked at students during one academic year, therefore it provided
only a snapshot of the identification of SLD. Referral to special education can be a long process whether a school implements RTI or not. The North Carolina Department of Public Instruction suggests that two to four years is needed to change the school culture and four to seven years is needed to affect outcome data (NC DPI, 2012). The schools in the sample vary as to how long RTI has been implemented and there is no panel data available that could be used to control for this variance. Also, students in grades 3-5 may have been identified with a SLD before RTI implementation began. If data collection improves, longitudinal information could help us understand more about the quality of the mousetrap over time.

Implications

**Practice.** Teachers may assume that if a child is struggling in all academic areas, interventions in reading will automatically transfer to math achievement because of the heavy emphasis of reading on the North Carolina math end of grade test. This assumption seems justified because all of the items on the math test are word problems. The findings of the current study as well as those of Benner and colleagues (2012) invite us to rethink this supposition. The increase in reading achievement, with no change for math reflects the importance of the intervention itself in RTI. Implementing RTI may change the school culture of how teachers think about the classroom environment instead of looking within the child for a deficit, but if the focus of interventions does not specifically target students’ areas of need, the outcomes will most likely be the same. For schools that seek to increase math achievement, math will need to become a focus embedded within the RTI framework. This entails directing attention at Tier 1 to see if the majority of students (around 80%) are
meeting expectations with the general math instruction and altering core instruction when the majority of students are not successful. Fuchs et al. (2012) found that RTI can be a means for preventing poor math outcomes when struggling students are provided targeted math intervention.

Utilizing culturally relevant pedagogy and providing training on the topic could facilitate an instructional match between the tiers of instruction provided and the needs of the student for schools with minority students (Harris-Murri et al., 2006; Orosco, 2010; Proctor et al., 2012). Proctor et al. (2012) point out the gap in research that focuses on the effectiveness of interventions for students of a particular race. Knowing what interventions improve achievement for students by racial and ethnical demographics would allow teachers to choose interventions that have been shown to work for the population they are teaching within their school. IDEA 2004 did not mandate instruction, intervention, and assessments to allow schools leeway to address the needs of their population. Meeting the needs of the particular school population becomes difficult when the research literature is not clear about research-based interventions and with whom they are effective. As Klingner & Edwards (2006) explain, “it is essential to find out what works with whom, by whom, and in what contexts” (p. 110). The next step is for teachers to acknowledge the cultural differences with their students and implement the practices proven to work for students of similar demographics. If teachers are to know what culturally relevant pedagogy is and how to use it, district and state agencies that train teachers on RTI implementation need to make it a priority in the professional development.
The current study used a larger sample than previous studies noted in the literature review and contributes to the field in allowing the findings to be generalized to more schools than those studies that only contain five to ten schools (e.g. Benner et al., 2012; VanDerHeyden et al., 2007; Wanzek & Vaughn, 2011). A resulting limitation is that the large sample size constrains the type of data available. “Gathering sufficient amounts of data in such school-wide studies often proves problematic and costly for researchers” (Hill et al., 2012 p. 116). Although research investigating outcomes of large-scale implementation is important in better understanding RTI (Hoover et al., 2008), the lack of longitudinal data detailing the length of time schools have implemented RTI hampers the types of analyses that can be used. Studying large-scale efforts requires the professionals working in the field, such as teachers or district and state administrators, to document the initiative. Administrators should record the date RTI was first implemented. With this type of information, the findings could be expanded to see if the effect size of RTI increases when schools implement RTI for longer periods of time. Additional research methods are warranted and can only occur if longitudinal data is collected and shared.

This study did not include fidelity checks due to the large sample size. As VanDerHeyden and colleagues (2007) point out, “fidelity to the RTI process will almost certainly be reduced when implemented in schools; the question is whether such inevitable degradation can still produce results” (p. 227). These findings indicate that even though implementation of RTI varied, positive results can still be obtained. As mentioned in previous chapters, IDEA 2004 did not regulate the types of assessments, interventions, or
procedures that needed to be followed so that schools would have the freedom to tailor the model to meet the unique needs of the school population. Schools that overemphasize compliance to the RTI process may fall into the same trap noted in the President’s Commission on Excellence in Special Education (2002) where compliance trumped student outcomes. Adherence to the five principles identified from the literature by Barnes and Harlacher (2008) could guide schools in ensuring the main ideologies of RTI are included even if the features and delivery of the model look different. Those five principles were:

(1) a proactive and preventative approach to education
(2) ensuring an instructional match between student skills, curriculum, and instruction
(3) a problem-solving orientation and data-based decision making
(4) use of effective practices, and
(5) a systems-level approach (p. 419).

School, district, and state leaders could assist fidelity of implementation with providing a checklist of these principles to help schools ensure their frameworks are aligned. In addition, administrators that are training school personnel on the why and how of RTI should stress the five principles in the professional development. Hill and colleagues (2012) found that fidelity of implementation measures were not included in many studies focusing on Tier 2 and when it was included, it was generally when the researcher was directly involved with delivering the intervention. It is not practical to require teachers and other school personnel to be able to implement the framework and complete a detailed fidelity checklist and would most likely compromise fidelity instead of strengthening it. Including the five principles in professional
development and as part of the conversations throughout the problem-solving model could enhance the findings with integrity of fidelity.

In this particular state, RTI did not increase the proportion of students identified as SLD as Kavale and Spaulding (2008) projected, nor did it decrease the SLD numbers as the RTI theory anticipates (Hoover, 2010; VanDerHeyden et al., 2007). North Carolina schools used both the discrepancy and/or RTI for identification of students with SLD (Berkeley et al., 2009). The sample for the current study did not include data about how schools used RTI for the identification of SLD. This may affect the SLD outcomes; therefore it would be beneficial if data on the type of model used at each school were also collected to improve the type of analyses conducted. For instance, it would be helpful to know if RTI data is exclusively used for SLD identification or if it is paired with the IQ discrepancy model, and if so, how the RTI data compliment the discrepancy findings.

The ambiguity with how RTI is used for SLD identification introduces the same concerns as the IQ discrepancy model without clear guidelines for how to define non-responders (Barnes & Harlacher, 2008). The three tiered model utilized in North Carolina outlines what happens before SLD identification, but the specifics of intervention frequency, instruction group size, research-based practices, and how long students receive instruction in each tier before they are considered to have a SLD is left to the respective problem solving teams at each school (Berkeley et al., 2009). A system where each school figures out the specifics of SLD identification reduces the reliability of the RTI model and may be a factor
in the findings of this study where there is no difference between RTI schools and control schools in the percentages of students identified with a SLD.

**Research.** The findings of an increase of 1.77 percentage points on overall reading proficiency for RTI schools, although statistically significant may not seem practically significant considering all that is involved with RTI implementation. RTI requires formal systems in place (Berkeley et al., 2009), ongoing professional development that is connected to school initiatives (Shepherd & Salembier, 2011) and it can be “costly in time and resources” (Fuchs et al., 2012 p. 264). Future research will be hindered if data collection procedures do not improve. While conducting this research project, it became evident that there is not a designated place where information about RTI at all the schools in North Carolina is kept. School districts’ websites varied with the types of information they provide regarding RTI implementation. Two district websites provided the names of schools that implemented RTI, the year each school adopted RTI, and future plans for adoption at other schools. The majority of websites offered a general overview of the framework if anything at all was mentioned. The Principal’s RTI Implementation Survey collected by the North Carolina Department of Public Instruction only detailed information for 5.19% of North Carolina schools. This sample size is not adequate to gain a clear picture of RTI implementation for the state. The North Carolina training material reflects the need for RTI to break down silos between regular education and special education within the public school to meet the needs of students (Public Schools of North Carolina, 2013), but the experiences of conducting this research also revealed the need to break down silos between school,
district, and state departments so that information can be compiled for all schools and shared with researchers.

Information in North Carolina is only available for students in tested grades. RTI is a whole school model and the collection of achievement and SLD data for K-2 students would allow measurement of outcomes for the entire student population and provide a better picture for how achievement and identification rates are impacted by the initiative.

The findings of the current study add to the literature by substantially increasing the sample size for increased validity of the results. Most of the previous studies in the literature review included between five and seven schools from a small number of districts, however the current study included 300 schools from across the state in multiple districts. Half of those schools implemented RTI, whereas the other half served as the control schools. The majority of the schools was in rural areas of NC and should be taken into account when generalizing the results to other contexts.

This study also adds to the body of knowledge by utilizing a quasi-experimental design to analyze treatment and control schools. Propensity score matching paired with OLS reduced selection bias so that schools implementing RTI could be compared to schools not implementing RTI. The method makes a stronger case for the effect of RTI than studies that reported a trend for achievement and SLD identification. VanDerHeyden and colleagues (2007) allowed participants to volunteer for when the schools in the sample adopted RTI. She noted that those schools that chose to implement RTI first were the ones who had the largest number of special education referrals. This type of selection bias that occurs because schools
choose to implement RTI due to an observable characteristic of the school was controlled for in this study with the PSM technique using previous literature and the theoretical assumptions of RTI. There is a gap in the research that explains why schools choose to adopt RTI. There have been claims made about the reasons schools choose to adopt RTI, but the motives of why some schools do not implement RTI is not evident. Buffum et al. (2010) claim that schools are not adopting the framework because they are unwilling to change their practices and prefer to blame others for the students’ difficulties, however that assertion has not been substantiated with research. Qualitative studies that seek to learn more about the non-adopters would assist with other PSM studies that seek to address variables that predict selection into treatment.

The small sample size and methodological choices that do not support causal inferences in previous literature were likely due to the difficulty of collecting all the data required for multiple schools and advanced statistical techniques. Using large datasets managed by agencies such as the NCERDC and DPI could assist researchers with increasing sample size, although data would still need to be gathered by the researcher due to the current limitations of variables collected by these agencies. If panel data becomes available, a difference-in-difference model could be employed to determine a robust estimate of the effects of RTI. Also, panel data would make it possible to control for district level effects in the model. More research is needed on the outcomes of RTI and panel data is imperative in determining the long-term effects. Additionally, more research is warranted as to whether RTI is more cost-effective than the traditional model of instruction and assessment.
With the current study, the variable National Board Certification was the variable that was most difficult to match and resulted in the need to use the no replacement matching technique. Additional studies could investigate the relationship between National Board Certification and RTI schools.

Studies that measure outcomes of interventions implemented by university researchers are not always relevant to the practicalities of the field where teachers are the individuals who will need to carry out the interventions long term (e.g. Vellutino et al., 1996). As noted by Fuchs and colleagues (2003), when interpreting RTI research, a question we should ask ourselves is “…how many schools have the resources to provide all their poor readers with 70-80 sessions of one-to-one tutorials conducted by highly trained personnel?” (p. 167). The current study, like VanDerHeyden and colleagues (2007), measured outcomes when educators implemented RTI within the daily structures of the school and showed that positive results can occur with reading when “frontline educational professionals” (VanDerHeyden, 2007 p. 226) are responsible for the implementation. More studies should seek to understand outcomes of RTI when school personnel are responsible for the entire initiative.

The current findings are still only representative of 29.77% of North Carolina’s public elementary schools. Another recommendation for future studies is to attempt to increase the sample to include information from a larger percentage of elementary schools that are more representative of the diverse population of North Carolina students. In addition, the finding with this sample that there were no differences between achievement or SLD
identification when comparing Hispanic students to white students is also worthy of investigation. Are these schools utilizing certain instructional strategies to meet the needs of these students that can be recommended to other schools?

Policy. Many facets of RTI are left to the discretion of the state and individual schools, including whether to adopt RTI. The findings of the current study may help further the conversation as to whether the resources some schools are devoting to the initiative are making a difference with achievement and SLD identification. District policies and procedures that focus school personnel on RTI principles instead of following a certain number of steps can help keep the emphasis on the students’ needs instead compliance of a procedure. Models with many complex levels are less likely to be implemented due to the decrease in practicality (Fuchs et al., 2012). The North Carolina Department of Public Instruction made the decision to transition from a four tier model to a three tier model. The transition is aligned with the recommendation of the International Reading Association that “schools and districts should adopt an approach that best matches their needs and resources while still accomplishing the overall goals or RTI” (Systematic and Comprehensive Approaches section). As schools become more comfortable implementing the three tiers, the effect size on reading achievement may increase due to fidelity of implementation that may result from a more succinct framework. In addition, if schools shift the sole-focus away from reading and include math in the interventions, math achievement may also increase.

A state agency should identify practical recommendations for how to use RTI with SLD identification even if it the model is not mandated. Leaving schools and districts to
determine SLD criteria individually will put RTI at risk for succumbing to the same deficit view pitfalls pointed out with the IQ discrepancy model. If teachers have no guidance for how long to implement interventions and the amount of progress considered non-responsive, then teachers may have to rely on a value judgment of the child’s ability. When value judgments are used in the place of data, reliability of the RTI model for SLD identification is reduced and in turn, is not consistent with the intent of RTI as an SLD identification tool.

During the 2012-2013, the Standard Course of Study that outlines the learning standards for every school in the state was changed to reflect adoption of the Common Core State Standards (National Governors Association Center for Best Practices and Council of Chief State School Officers, 2010). RTI is a framework that can be implemented regardless of the standards or curriculum adopted at a school. With this in mind, policymakers should communicate how RTI complements other school and state education initiatives (Shepherd & Salembier, 2011) such as the Common Core Standards. Otherwise, RTI may seem like just one more thing added to the daily mandates resulting in a lack of fidelity of implementation.

It is also important to note that the North Carolina Department of Public Instruction has a website devoted to RTI. The website includes the presentations from trainings and information about the problem-solving model. The website also contains a map of North Carolina that delineates the state into eight regions to be served by an RTI field consultant (http://www.dpi.state.nc.us/curriculum/responsiveness/). Currently, the website lists all eight field consultant positions as vacant whereas previously contact information for consultants
were posted. Future research could explore why the positions are vacant and if the lack of statewide support had an effect on adoption or implementation of RTI in North Carolina.

**Limitations of the Study**

The variation with adoption and implementation of RTI makes the topic difficult to investigate. The disparity with how data is collected and stored is a hurdle that must be tackled to study the effects of RTI. The current study used statewide databases that included enough participants to give the results power; however the variables were limited to those that were collected by the state department of public instruction. There may be other observable characteristics that should be included that is not in the literature or currently not collected by state agencies. Also, the power of PSM relies on the inclusion of covariates that both predict assignment to treatment and outcomes. Previous literature and knowledge of the RTI theoretical framework were used to determine the covariates, however some observable characteristics may predict adoption of RTI and outcomes that have not yet been realized and documented and more research is needed on these topics.

The RTI framework is a guide that schools use to meet the needs of their particular population. There are guiding principles of RTI that are generally included but implementation may look different depending upon local decisions. Due to the large sample size, there is no fidelity of implementation measure in this study.

One hurdle with investigating outcomes of RTI is the availability of data. The Department of Public Instruction only had information for RTI adoption on a small sample of schools because of the low response rate of principals with the implementation survey. These
gaps were overcome by contacting administrative leaders in the district. The assignment of schools to the correct treatment and control group depended on the accuracy of information of the administrators.

Quantitative research methods were used to research questions for the current study. More information could be gathered using qualitative methods about how schools in the sample implement the RTI framework and their level of implementation. Whereas these topics are worthy of investigation, they are beyond the scope of this study. When using quantitative methods in social science research, random assignment is the gold standard. In the practical world of education, students are not randomly assigned to schools, classrooms, and interventions. Although I used the preprocessing strategy of PSM to compensate for the lack of random assignment, the results should still be analyzed with caution to ensure all assumptions of PSM hold. Additionally, using PSM resulted in the erosion of the sample size in order to obtain a balance between the covariates. The sample decreased and the percentage of schools in a rural area increased. The mean of economically disadvantaged students slightly increased with the matched sample. The exclusion of some schools through PSM weakens the generalizability of the findings to other elementary schools.

**Conclusion**

This study adds to the current literature by investigating outcomes of the entire RTI framework. Schools matched on observable characteristics showed an increase in overall reading achievement on the third, fourth, and fifth grade end of grade tests, whereas there were no effects on math achievement or the identification of SLD. The findings that the
percentage of students proficient in math did not increase with RTI schools further supports
the analysis that the positive results with reading achievement was due to the RTI model.
Wixson (2011) acknowledged, “when RTI is seen as a system with multiple components, it is
clear how difficult it is to conduct research in this area that reflects the complexity of the
enterprise” (p. 509). The increase in RTI implementation and the attempts to expand to large-
scale implementation make the effort to research the topic even more important (Hoover et
al., 2008). Schools and state agencies must be intentional in collecting data that will allow
evaluations of the framework to happen if these efforts are to bear beneficial guidance for
those implementing RTI. In the same way, schools must also be intentional in the focus of
RTI. Interventions in one content area do not necessarily transfer to another if the
intervention does not specifically address the skills needed, therefore it is necessary for
problem-solving teams to find ways to implement interventions for students in multiple
disciplines while ensuring that implementation is practical for educators. As VanDerHeyden
and colleagues (2007) note, “implementation is the linchpin of RTI” (p. 226). Although well
intentioned, if research efforts and policy mandates add too many pieces to the process,
implementation may actually suffer and the potential of RTI never realized. In order for RTI
to have a dramatic effect on achievement and SLD identification, teachers must first look at
the classroom environment and ensure core instruction meets the needs of the majority of
students. Without a strong core at Tier 1, the rest of the pyramid will crumble. Next, the
interventions in Tiers 2 and 3 must target the area of need for the student and be proven
effective with students from similar cultural backgrounds. Finally, the top and final tier is
where decisions are made regarding SLD identification. Tier 3 necessitates a structure in place that guides problem-solving teams with deciding whether a student is truly a non-responder or needs an adjustment of Tier 2 or 3. This seems to be the biggest question that is yet to be answered and could topple the pyramid if not addressed.
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APPENDICES
Appendix A

Definition of Terms

**Individuals with Disabilities Education Act (IDEA):** A law originally enacted in 1975 that mandated a free and appropriate education for students with disabilities (National Dissemination Center for Children with Disabilities, 2012).

**IQ-achievement Discrepancy:** A measure that is usually determined by a school psychologist after giving assessments to a student that measure aptitude and achievement. If a student is determined to have a higher aptitude or perceived intellectual ability to complete tasks, but does not receive an adequate measure on an achievement test, the student has a discrepancy between the perceived mental ability and actual performance.

**Response to Intervention (RTI):** A multi-tiered framework of instruction and assessment that may be used to identify students with specific learning disabilities.

**Special Education:** Instructional services for students who are identified with a disability. It is federally funded and instruction usually takes place in a small group.

**Tier 1 Intervention:** Tier 1 is the first level of instruction within the RTI framework. This is the core instruction of all students and occurs in the general education classroom.

**Tier 2 Intervention:** Tier 2 is the second level of instruction within the RTI framework. Weaknesses are targeted with explicit instruction, usually delivered by a specialist. This may occur individually or in small groups.

**Tier 3 Intervention:** Tier 2 is the most intensive level of instruction within the three-tiered RTI framework. Weaknesses are targeted with explicit instruction, and may be delivered by a
special education teacher. This may occur individually or in small groups and students receiving instruction may have an Individualized Education Plan that specifies academic and behavioral goals to target.
## Table 9

### Literature Review Details

<table>
<thead>
<tr>
<th>APA Citation &amp; Research Questions</th>
<th>Research Design</th>
<th>Framework</th>
<th>Main Findings</th>
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<tr>
<td>Al Atoaiba, S., Folsom, J.S., Schatschneider, C., Wanzek, J., Greulich, L., Meadows, J., Connor, C.M. (2011) Predicting first-grade reading performance from kindergarten response to tier 1 instruction, <em>Exceptional Children</em>, 77(4) 453-470</td>
<td>Longitudinal with 7 schools Observational Design</td>
<td></td>
<td>Participants: Kindergarteners until their 1st grade year Average: 27.28 min per day of code instruction; 21.51 min per day of meaning instruction. Classroom instruction rated effective. Kindergartners who made the most growth in kindergarten were disadvantaged on 1st grade ORF and comprehension tests Finding: kindergarten response to Tier 1 does not predict first grade performance</td>
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<tr>
<th>Conceptual</th>
<th>5 Principles of RTI</th>
<th>Coordinated, school-wide supports, not whether or not students are receiving additional supports</th>
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<td></td>
<td>Heuristic model</td>
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<td>4 Features of RTI</td>
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<td>Philosophical approach that all children can learn.</td>
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<td>More focus on environmental variables and less on within-student characteristics.</td>
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In literature SPED referral can happen 1-after tier 2 instruction 2-as part of Tier 2,
3-after Tier 3 have been provided.

Protocols used 1-problem-solving approach 2-standard protocol (Fuchs & Fuchs, 2005), 3-combined protocol, which combines both.

Defining non-responders: 1-rate of growth 2-3-point decision where a goal is determined, data is graphed with an aimline and 3 consecutive data points.

Use figure provided to illustrate the RTI features.

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<td>Berkeley, S., Bender, W. N., Peaster, L. G., &amp; Saunders, L. (2009). Qualitative-review of state Dept. of Ed. websites and</td>
<td>Tiered intervention</td>
<td>Tier 1: should meet about 80% of needs Tier 2: 15% and Tier 3 5%. Notes some criticism of RTI- only modest</td>
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<td>conversations with people from state Dept. of Ed.</td>
<td>empirical validation and it doesn’t look at construct of underachievement - used Kavale, 2005 to make this point. For RTI to be used for SLD determination, RTI must be formally in place throughout a school. Looked at states: 15-large or small scale adoption, 22 were in the development phase, and 3 had not developed any model. Article includes table by state with information regarding type of implementation. Differences between implementation as to when SPED referral is initiated. Researchers believe the standard protocol is more valid, but most schools use problem solving because it is more closely aligned with what they are already doing. Problem Solving models were not explicit with intensity of interventions b/c they wanted the problem-solving team to determine this based on individual student needs (this is in conflict with the Kavale &amp; Spaulding 2008 article where authors claims RTI only focuses on whole school needs and not particular students).</td>
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<td>Used data from 2007-after 1st year after final regulations were passed from IDEA.</td>
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*Journal of Learning Disabilities, 42(1), 85-95.*
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<td>Bianco, S.D. (2010)</td>
<td>Qualitative- Case Study with a co-teaching class</td>
<td>Notes that some argue the problem with discrepancy model is that it is inconsistently applied, but findings how RTI is also inconsistent between states.</td>
</tr>
<tr>
<td>Bianco, S.D. (2010)</td>
<td>Improving student outcomes. Data-driven instruction and fidelity of implementation in a response to intervention (RTI) model. TEACHING Exceptional Children Plus, 6(5), Article 1. Retrieved from <a href="http://escholarship.bc.edu/education/tecplus/vol6/iss5/art1">http://escholarship.bc.edu/education/tecplus/vol6/iss5/art1</a>.</td>
<td>Universal Screenings: DIBELS, Fountas &amp; Pinnell Benchmark Assess. (3 times a year) P.M. noted but did not say what it was Tiered instruction: SPED teacher. Tier 2: extra/more intensive instruction one-on-one or with small group. Tracking fidelity of interventions using 1-a form 2-reading coaches 3-video clips Intervention Team; K-3 implementation only; District P.D. for a year K-3 prior to implementation (4) 2nd grade students Improved student outcomes for most areas of literacy, declining rates of referral, positive feedback from teachers. (No data to back this up in conclusions section)</td>
</tr>
<tr>
<td>Brundage, A., Beckmann-Bartlett, C., &amp;</td>
<td>Article in The Newspaper of the</td>
<td>Universal Screening: Maze probe and ORF</td>
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## Table 9 (continued)

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<tr>
<th>Source</th>
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Table 9 (continued)


above

4-examined reading outcomes;

READING STUDIES:
Bollman et al. gradual rise on CBM, but no control group to compare.
Callender (2007)-higher reader outcomes for students with intervention, but no details about the comparison group.
O’Connor et al. (2007) students in tiered groups had higher reading scores.
Vaughn et al. (2003)-1/3 of participants in intervention groups failed to thrive in regular ed classroom.

1-examined math outcomes:
(Ardoin et al. 2005) 5/15-did not respond to Tier 2 class wide intervention; 1/15-did not respond to individual intervention.

1-examined academic behaviors (time-on-task, task completion, task comprehension).
Kovaleski et al. (1999) Students receiving high implementation did better than low implementation models and those without implementation. Did not explain checklist
Table 9 (continued)

to determine implementation although it was mentioned.

1-examined academic performance on achievement test:
Marston et al. (2003) Compared performance of students needing interventions to students identified with LD with traditional methods. Both groups had similar performance on Minnesota Basic Standards Test. Did not include information about “academic impact” of MBSM.

6-examined effects on SPED referral/placement
Bollman et al. (2007) looked at SCRED Model: over 10 years placement rates dropped 4.5% to 2.5%; statewide dropped from 4% to 3.3%.
Callender (2007) looked at RBM Model. Districts with at least one RBM school had rates drop by 3% with an overall state decrease by 1%.
Marston et al. (2003) SPED placement stayed constant with MPSM Model.
Peterson et al. (2007) SPED placement
Table 9 (continued)

stayed constant with RtI implementation. O’Connor et al. (2005) examined effects of Tiers of Reading Instruction (TRI) on placement rates. Rates fell from 15% to 8% over 4 years compared to a historical contrast group. VanDerHeyden et al. (2003)-decrease in referrals and increase in placement: interpreted as more appropriate referrals.

Noted that all studies included some type of improvement although weak design models and procedures-used historical groups or only trends over time. Needed some type of quasi-experimental or randomized control to attribute outcomes to RTI.

Most studies looked at reading skills-need more with other academic areas and secondary schools.

Authors felt solid conclusions about SPED placements could not be made b/c studies did not outline how nonresponders were identified…cutoff scores, etc.
No studies focused exclusively on rural schools/districts.

Table 9 (continued)

Tiered instruction: Tier 1: differentiated instruction Tier2: Reading Rewards Tier 3: Reading Horizons (computer-based curriculum) PD for principal/SST prior to implementation PD every month for staff on diff. instruction Parent volunteer on team Rti Report card home Monthly newsletter and brochure from principal re: Rti Students missed FACT elective for tier 2 and 3 Middle school Most of tier 2 improved at least one grade level Beg data of % of students in each tier for reading comprehension: Tier 1=75.1%, Tier 2=21.3%, Tier 3=13.2% | Dissertation-Qualitative with descriptive statistics. |
Table 9 (continued)

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<td><strong>Empirical:</strong> Quantitative-factor analysis with survey.</td>
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<td>Used 15 phrases from Dunn (2006) study while allowing free-written response on the questionnaire so respondents could add their own referral criteria.</td>
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<tr>
<td>Studies show student characteristics impact referral: inattention, misbehavior, and gender. Teaching philosophy may impact practice and expectations. School demographics can impact referral: rural, large student population, lower SES, demographics of the community surrounding the school. Performing ANOVA to see if there were differences b/w rural, suburban, and inner-city teachers’ referrals. Significant differences in Inattention scores, NOT aptitude scores. Ratings of rural teachers were lower than inner-city. Ratings b/w rural and suburban were NOT statistically significant. Although some studies show referral may be based on race, culture, ethnicity, gender or SES- this study did not find these factors to be significant- could be b/c teachers were self-reporting and may not</td>
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<tr>
<td>3=3.5% End of year Data: Tier 1=87.5% Tier 2: 9.8% Tier 3: 2.7%</td>
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<tr>
<td>Questions:</td>
</tr>
<tr>
<td>1. What are the underlying factors for general education teachers’ referral reasons which could be used in an RTI model?</td>
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<tr>
<td>2. Are there any significant differences between rural,</td>
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Table 9 (continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Methodology</th>
<th>Findings</th>
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<tbody>
<tr>
<td>Eversole, V.L. (2010)</td>
<td>Dissertation-Quantitative</td>
<td>Did not specify universal screening, progress monitoring, or tiered instruction. 2-5th grade-Latino students Three cohort 1)no Rti 2)partial impl 3)full implementation Post mean scores higher on AYP for students receiving Tier 2 and 3 interventions. Number of students eligible for SPED lowered with increased stage of implementation.</td>
</tr>
<tr>
<td>Fletcher, J. M., Coulter, W. A., Reschly, D. J., &amp; Vaugh, S. (2004). Alternative approaches to the definition and identification of learning disabilities: some questions and answers. <em>Annals of Dyslexia,</em></td>
<td>Conceptual: Used 4 consensus reports</td>
<td>In 1970’s federal definition: LD-due to intrinsic factors within the student so it needed to be proven that difficult was from neurological factors. Several reports acknowledged that # of students in SPED could be reduced if reading instruction was effective. RtI provides an opportunity to reduce referrals</td>
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Table 9 (continued)

54(2), 304-331.

that are inappropriate and replace a “wait to fail” model. Moves from “test and treat” to “treat and test” model. IQ discrepancy is harmful because treatment is delayed until achievement is so low that there is a discrepancy.

Students placed in SPED as LD show minimal progress and rarely leave SPED.

Assessments for IQ discrepancy models are costly and require time; delaying intervention.

Advantages of RTI: focus moves from eligibility to instruction; it is not dependent on teacher referral which is shown to be biased against boys and African Americans. The challenge is to prevent disabilities. SPED is not the only way to receive help.

Reading is the largest reason students are in SPED. Some evidence showing schools that implemented aggressive reading programs showed a decrease in SPED referral.
Table 9 (continued)

Tests based on a single norm-referenced test cannot differentiate b/w low-achievement and LD.

Interpreting IQ as a measure of aptitude can be damaging to students. It is weak at predicting achievement in certain students.

The best way to combat concerns over over-identification of students is to utilize better instruction in the general ed classroom and in cooperation with SPED.

If students who made progress with interventions do not make progress when they are removed, look at other factors such as grouping, attendance, home support, and others that may influence learning.

Milk and jug thinking- from Sir Cyril Burt in 1937-“Capacity must obviously limit content. It is impossible for a pint jug to hold more than a pint of milk and it is equally impossible for a student’s educational attainment to rise higher than his educable capacity.” (p. 477). Author
Table 9 (continued)


Study 1: Tutored at-risk students showed more growth on most measures than control group that was not at-risk although performance was still below the control group. Tutored at-risk performed better.

says there is no evidence that IQ sets a limit on the capacity for a person to learn.
Table 9 (continued)

its power and limitations. 

than non-tutored at-risk.

Study 2: Two tutoring conditions (1) focused on math facts (2) focused on word problems. There was a control group. Effect size of math fact tutoring= .55 and word problem=.62. Both tutoring sessions showed superior outcomes over the control group but not statistically significant. Success with word problems transferred to success with calculations, but success with calculations did not transfer to the word problems- concluded it must be the language of the problem and not ability to do the calculation.

Study 3: 40 classrooms assigned to control 80 receive schema-broadening word problem instruction. Found tutoring was more effective when combined with validated classroom instruction. Implications: the need in RTI for classroom instruction plus tutoring for the at-risk learners. Also it is unrealistic to expect every child will respond. Each study had a group of nonresponders. Work is needed to determine a reliable method to determine nonresponders,
otherwise RTI will have the same problems as IQ-achievement discrepancy. Suggests tier 3 be considered special education where student receive individual instruction, but leave it flexible for students to move in and out.

| Fuchs, D., Fuchs, L. S., & Compton, D. L. (2012). Smart RTI: a next-generation approach to multilevel prevention. *Exceptional Children*, 78(3), 263-279. | Conceptual | Smart RTI with separate special education feature. | 3 Features of RTI: 1-multistage screening to identify risk: not just one time universal screening. This leads to many false positives which waste time and money when teachers intervene. Also these screenings would allow teachers to better predict which level of intervention students need so kids would not waste time receiving level 2 when they need intensive level 3. 2-appropriate levels of instruction: taught at the instructional level, not grade level. 3-special education teachers support prevention and works at the most intensive level to meet needs of individual students. General education teacher can not have this responsibility-they are not prepared/trained for this role. Authors do not see the goal of RTI as preventing SPED placement, rather as to |
reduce the need for intensive intervention. There will still be students who need SPED—around 5%.

<table>
<thead>
<tr>
<th>Conceptual</th>
<th>Treatment Validity Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuchs, L. Fuchs, D., &amp; Speece, D. L. (2002). Treatment validity as a unifying construct for identifying learning disabilities. <em>Learning Disability Quarterly</em>, 25(1), 33-45.</td>
<td>Increase in number of students in SPED have caused concern about how students are identified. SPED cost more than general education and there is an overrepresentation of minority students in SPED. Messick (1984) says the overrepresentation is a problem if minority students did not receive quality general education, were placed in SPED due to an invalid measure, or receive SPED instruction that hinders academic progress.</td>
</tr>
<tr>
<td>Fuchs, D., Fuchs, L. S., &amp; Stecker, P.M. (2010). The “blurring” of special education in a new continuum of general education placements and services. <em>Exceptional Children</em>, 76(3), 301-323.</td>
<td>Identified 2 groups—IDEA group and NCLB group that do not agree on purpose or nature of RTI. IDEA group—Standard Protocol NCLB group—problem solving approach. IDEA group’s goal—promote early intervention and identify students for SPED in a valid manner—wants replicable instruction. NCLB Group—effective classroom instruction will eliminate high-incidence disabilities. Two groups of students (those</td>
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</table>
considered disabled and those not) do not require different curriculum—individualized instruction instead of standardized. No silos—SPED and general ed. mingle together. SPED is viewed as ineffective and unnecessary. Disability is viewed as socially constructed. Promote full inclusion of students receiving SPED in the general ed classroom.

Suggests that research shows the standard protocol is superior to problem solving, but the insufficient number of protocols result in teachers using problem solving.

| Conceptual | Problem solving approach v. standard protocol approach | Outlines history of LD from 1920s. States adopted discrepancy formulas but varied in computation and tests used. This resulted in variance between states in LD prevalence. This lead to argument that discrepancy differentiates between low achievers and disabled, is arbitrary, and keeps needy students from receiving services—thus becoming a social justice issue. 2 groups emerged as RTI catches on—early: “early interventionalists and school |

psychologists”. Psychologists: problem-solving model and for Early Interventionists: standard and validated protocol method. This has lead to confusion about RTI.

Outlines problem solving procedures from:
Ohio: Ohio’s Intervention Based Assessment (IBA) and Pennsylvania: Instructional Support Teams (ISTs).
Discusses Heartland’s (Iowa) model- 4 level problem solving model.
Minneapolis’ Problem Solving Model (PSM) - uses multiple data sources, not one published test to determine eligibility.
Children are not labeled LD instead as “Student Needing Alternative Programming (SNAP).
Outlines Standard Protocol Approach- questions whether teachers can replicate the interventions used in Vellutino et al’s work and if some students are being deprived by not receiving instruction tailored to their specific needs.

Concludes Standard Protocol-facilitates
Table 9 (continued)

<table>
<thead>
<tr>
<th>Gardner, D. P. (1983). A nation at risk. Washington, D. C.: The National Commission on Excellence in Education, US Department of Education.</th>
<th>Government Report</th>
<th>Education is important for a common culture. Used an IQ discrepancy as an indicator of risk, “Over half the population of gifted students do not match their tested ability with comparable achievement in school” p. 16 Excellence in education would involve individual learner, schools, and society. Called for equitable treatment of diverse populations to not be sacrificed for educational reform. Called for the need to invest in human resources (the students). Theme of high expectations for all students regardless of background. “Our recommendations are based on the beliefs that everyone can learn, that</th>
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<td>quality control PSM-sensitive to individual student needs. Authors favor a two level approach- the more levels, the greater the disconnect b/w classroom and intervention, transference is less likely and RTI becomes more complex and fidelity is lost.</td>
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everyone is born with an urge to learn, that a solid high school education is within the reach of virtually all, and that life-long learning will equip people with the skills required for new careers and for citizenship” p. 32

Stated that educationally disadvantaged may need smaller classes or individual tutoring.

Attention should be given to the content as well as individual student needs.

Also called on the use of standardized achievement tests to evaluation student progress.

Recommended additional time to meet needs of students who require more diversity in instruction (included slow learners as well as gifted).

Remove students from regular classroom into alternative settings if they are disruptive.

Group students by instructional need and academic progress instead of by age.

Recommended that it is the federal, state and local responsibility to meet the needs of gifted as well as disadvantaged students. Specifically states
Table 9 (continued)

| Gresham, G. & Little, M. (2012). RtI in math class. *Teaching Children Mathematics*, 19(1), 20-29. | Conceptual | RtI framework with math instruction | Gives an example of how to RTI looks with a math lesson- Suggests using observation and assessment to identify students who are struggling then giving a CBM to pinpoint concept that needs more support. Progress monitoring data is also used in math to determine if intervention is working and student is making progress. |
| Harris-Murri, N., King, K., & Rostenberg, D. (2006). Reducing disproportionate minority representations in special education programs for students with emotional disturbances: toward a culturally responsive response to intervention model. *Education and Treatment of Children*, 29(4), 779-799. | Conceptual | Culturally Responsive RtI Model | Looks beyond RtI for determining SLD and applies it to eligibility for ED (emotional disturbance). Sociocultural factors should be examined that influence behavior-student background, teacher background and potential bias, opportunities impacted by institution and societal factors. CRI should be applied in Tier 1. Data shows once a child is referred for evaluation there is a high probability they will be found to have a learning disability. |
ED is underrepresented in schools; however within the ED category African-American males are overrepresented.

Misalignment between home and school as to what behavior is acceptable.

Gave recommendations related to being culturally responsive in home/school/community connections, PD, Curriculum & Instruction, and assessment.

| Hill, D. R., King, S. A., Lemons, C. J., & Partanen, J. N. (2012). Fidelity of implementation and instructional alignment in response to intervention research. Learning Disabilities Research & Practice, 27(3), 116-124. | Literature Search: Studies between 2004 and 2011 with participants of elementary school age. Fidelity of implementation and alignment of instruction between tiers. | There is a gap between research and practice. Multifaceted nature of RTI makes it difficult for researchers to control for variables and also the inability to get sufficient data is an issue. Researchers not describing Tier 1 when looking at effectiveness of Tier 2 are a limitation to others generalizing results. The review used indicators from Baker et al. (2010) to evaluate alignment between Tiers 1 and 2 in the studies reviewed. Identified 153 articles. Coded based on experimental or quasi-experimental design, there was a focus on reading at... |
Table 9 (continued)

| Is sufficient information provided to consider the alignment between instruction provided in Tiers 1 and 2? |
| Tier 2, excluded studies that were not conducted in English or that did not provide one-on-one or small group instruction at Tier 2, and study needed to represent original data. |
| Ancestral search added 22 more studies or 25 articles. |
| Used a rubric to score Fidelity at Tier 1 and at Tier 2. |
| Used another rubric to assess alignment of instruction between the two tiers. |
| Majority did not report implementation fidelity at Tier 1. When Tier 2 is the focus of the article, Tier 1 is usually minimized. Usually it is included if the researcher is directly involved with Tier 1. |
| At tier 2, 17 of 22 studies reported fidelity of implementation at Tier 2. Usually quantitative data was provided and a checklist was utilized. |
| Seven studies did not sufficiently report information about alignment between Tiers 1 and 2. |
11 studies suggested a connection between Tiers 1 and 2.  
4 studies stated an explicit connection between Tiers 1 and 2.

Authors discuss possibility of page restrictions being the reason why the information is not reported and hopes the review enhances future research.  
Questions whether a new definition is needed for fidelity for Tier 1 b/c of the difficulty of collecting this data.

Research that only reports Tier 2 outside of the context of Tier 1 is concerning.  
Lack of growth with Tier 2 could be due to insufficient Tier 1 and this information needs to be assessed and reported. Tier 2 interventions need to be viewed as to how it relates to the broader school context.

Empirical-survey of SPED state department directors: 50 states + DC.  
86% response rate (41 states) | Every state that responded is putting emphasis on RTI at the development or implementation stage.  
Culturally-responsive RTI and the roles of |
Table 9 (continued)

**Intervention (RTI): Research Summary.**

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<table>
<thead>
<tr>
<th>Hoover, J. J. (2010). Special education eligibility decision making in response to intervention models. <em>Theory Into Practice</em>, 49(4), 289-296.</th>
<th>Conceptual</th>
<th>Examines 1) big ideas associated with SPED process and core RTI principles 2) transitioning from pre-referral intervention to RTI model 3) the RTI-SPED nexus to meet contemporary discrepancy needs of struggling learners.</th>
<th>Makes a case that what happens within RTI is highly relevant to SPED eligibility.</th>
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Educators who are implementing RTI receive the least amount of training.

Over 1/3 plan to use RTI to make SPED decisions either as replacement of discrepancy or to supplement discrepancy model.

Need for research: “Role and policy implications of RTI in the identification of learning disability on a national as well as state level.” (p. 12).

Quotes Kavale & Flanagan who wrote the “real value of RTI lies in the prospect of providing a systematic and rigorous pre-referral process” (p. 134).

Quotes Kovaleski (2007) “if the number of students are successful in the
benchmark and targeted phases increases, fewer students will need special education” (p. 86).

Makes case RTI has the potential to reduced SPED referrals and placements.

True paradigm shift must occur for RTI to change practice and not just terminology.

The most desirable outcome of RTI would be to reduce referrals, but also important is how RTI and SPED interface if a student needs a legitimate referral.

Using CBM and monitoring progress with interventions shifts the focus to classroom performance instead of an intrinsic deficit of the child.

3 Discrepancy Methods for Identifying Students
1) Potential-Achievement Discrepancy (least preferred): uses IQ test; controversial due to issues of validity and reliability with accurately identifying LD.
2) Expected-Actual Achievement
Table 9 (continued)

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<th>Methodology</th>
<th>Description</th>
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Discrepancy: actual student performance levels are used for making instructional and eligibility decisions; uses district curriculum and does not consider rate of progress.

3) Dual Discrepancy Model: considers level of proficiency AND rate of progress. Quotes Burns & Gibbons (2008) that dual discrepancy “is superior to a single discrepancy approach” (p. 44). Looks at the rate of progress child is making in relation to rate of progress of peers even if they are functioning at a lower proficiency level. This suggests no LD.

Author notes a need in research to examine efficacy of RTI as a whole and less on various components when considering SPED eligibility.

Disproportionate representation in SPED is criticized b/c of the effects of labeling, segregation, and the perception that SPED is ineffective. IDEA policy refers maximum access of students in general education curriculum with nondisabled peers. African Americans are more segregated than other
Bias may play a part b/c most teachers are white. Those from other cultures are more susceptible for being viewed as a behavior problem b/c expectations between the cultures for behavior are different. Authors argue that referral is the most important variable related to overrepresentation. Most students who are referred are placed in SPED. Explains different ways overrepresentation is sometimes calculated as well as positives/negatives of methods. Statistically Significant: referral for African Americans compared to whites. Not statistically significant: referral for Hispanics when compared to whites.

| Hosp, J. L. & Reschly, D. J. (2004). Disproportionate representation of minority students in special education: academic, demographic, and economic predictors. *Exceptional Children*, 70(2), 185-199. | Quantitative-MLS regression. IV: SPED representation of minorities. DV: district-level academic, demographic, and economic variables. | Academic achievement was significant for most groups. The argument is that over-representation and achievement are related. Educators can impact achievement, unlike other factors. They advocate for early intervention to address overrepresentation. |
Table 9 (continued)

What proportion of the variance in ratios of representation rates is accounted for by blocks of academic, demographic, and economic variables both independently and incrementally?

Does academic achievement account for significant proportions of that variance?


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<td>Impediments to Working Relationships: lack of understanding and communication.</td>
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<td>There is a focus on academic accountability and discussions between</td>
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principals and counselors could provide a foundation with how both groups can work to meet the shared mission of the school.

For school improvement efforts to work, purposeful, collaborative school leadership practices are needed.

Moral model-disability is a result of sin  
Medical model-disability is a defect needing to be cured with medical help  
Rehabilitation model-disability is a defect that needs to be fixed with rehabilitation by a professional  
Disability (Social) model-disability is socially constructed by dominating culture and inadequate support. |
|---|---|---|---|
| **Kavale, K. A. & Spaulding, L. S. (2008). Is response to intervention good policy for specific learning disability? Learning Disabilities Research & Practice, 23(4), 169-179.** | Conceptual | Implications on SLD construct with RTI implementation that excludes psychometric measures. | Makes the argument that the problem with the discrepancy model was not psychometric, rather was a lack of rigor with implementation-50% of those who were labeled SLD did not meet the criteria.  
Argues that predictive validity of IQ discrepancy is still supported. |
Discrepancy determines underachievement, not SLD only. RTI does not identify underachievement. Other studies have found RTI reducing referrals in early primary grades, but possibly increasing in intermediate grades. RTI research is incomplete. Feels NCLB led to low achievers being helped via SPED as SLD. Thinks that RTI is resulting in all slow learners viewed as SLD. Thinks alignment of RTI and NCLB is moving SPED away from meeting needs of individual students and focuses on whole school needs. “RTI research appears to have focused on promoting more effective instructional and assessment practices with far less emphasis on alternative identification procedures” p. 174. Authors feel SLD will become a catch-all for all slow learners, but nonresponsive does not mean SLD. Views RTI as part of the pre-referral process and not diagnostic. Sees RTI as a one-size-fits-all and not about needs of individual students.
The neglect of information about RTI as a diagnostic process suggests that SLD identification may not be a primary policy focus even though originally offered in the context of SLD identification” (p. 175). Lists problems with using RTI only to identify SLD. Sees RTI as a screening and a comprehensive evaluation should be included in the identification process.

|---------------------------------------------------------------|-------------|---------------------|

Regarding changes to IDEA “but the new classification criteria also reflected current political trends in general education (i.e. student accountability)… (p. 7).

Another criticism of RTI-cannot discriminate SLD from other disabilities such as mental retardation, ADD/ADHD, or behavioral disorders.

Table 1 outlines criticisms of RTI and IQ discrepancy.

Discusses trend in decreasing % of students receiving SPED since 2005. Many possible reasons have been given-students are labeled Other Health
Impaired or with Autism Spectrum Disorder. RTI could be one reason. There is a concern that determining SLD is more subjective to human error than other disabilities; “thus SLD identification is perhaps more affected by related changes in policy, budget, personnel, and so forth” (p. 14).

Because of the lack of clarity as to why the numbers are decreasing, there is little empirical evidence as to whether there is a relationship between RTI and the decreasing numbers of SLD students.

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<tr>
<th>Author(s)</th>
<th>Reference</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RTI promotes inclusions of all students into general ed. 2 definitions of LD-federal def. and one from National Joint Committee on Learning Disabilities (NJCLD). Discrepancy method used with the passage of IDEA (1997). Issus surrounding discrepancy are “equity, accuracy, and consistency” (p. 117).</td>
<td></td>
</tr>
<tr>
<td>Authors</td>
<td>Methodology</td>
<td>Concept/Model Evaluation</td>
</tr>
<tr>
<td>--------------------------------</td>
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</tr>
<tr>
<td>Marks, D. (1997).</td>
<td>Conceptual</td>
<td>Medical model- disability is within the person. Posits that disability is not a clear boundary between able-bodied but is on a continuum. Social model- recognizes that disability is not an impairment of the body, but locates disability within a social environment that excludes those with disabilities from participating.</td>
</tr>
<tr>
<td><strong>Table 9 (continued)</strong></td>
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</tbody>
</table>
interventions, yet SPED identification stayed constant.

Showed a positive impact on disproportionate identification of African American students, but not for Native American. Small sample size could be a factor for explaining this.

“Thus, all data comparing students at problem-solving versus traditional model sites are not directly comparable given the lack of randomization and control groups” (p. 198).

Authors felt it was “likely that PSM helped contain special education placements” (p. 199).

Table 9 (continued)

LD Identification as a mousetrap—trying to get better at catching students with LD more accurately. Determination besides cognitive characteristics so these sociocultural factors need to be acknowledged and accounted for.

Noted that teachers often view SPED as help for struggling learners, even if they do not have a LD.

Culture of schools and context need to be understood for school improvement to happen.

School participants viewed a child’s “need” for services as more important than whether they met the guideline for LD; this may be why some students (mentioned in other article) are labeled when they do not meet the criteria.

Found a relationship between the level of parental involvement in the schools and how happy parents were with IDEA and services.

Participants indicated a better model of identification would “emphasize early identification, child-centered evaluations, and general education accountability” (p. 240).

“While our search for an improved LD
Table 9 (continued)

<table>
<thead>
<tr>
<th>Study Authors</th>
<th>Study Design</th>
<th>Methodology</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nunn, G. D. &amp; Jantz, P. B. (2009).</td>
<td>Empirical-survey of 429 K-12 teachers and support personnel.</td>
<td>Teacher efficacy defined as an “indicator of how teachers perceive their empowerment to influence positive learning outcomes” (p. 599).</td>
<td>Higher levels of RTI involvement and implementation were associated with higher efficacy beliefs and behaviors. The data did not support an association between external control efficacy (family resources, peers, circumstances) and RtI implementation or involvement.</td>
</tr>
<tr>
<td>O’Connor, R. E., Harty, K. R., &amp; Fulmer, D. (2005).</td>
<td>Empirical-Quantitative-Descriptive Statistics</td>
<td></td>
<td>Used a historical control group from the two target schools. Schools participated for 4 years. Tier 1: Teacher PD; Tier 2: small group instruction 3x a week; Tier 3: daily instruction individually or with a group of 2. (Tier 3 was not considered SPED). The authors only used descriptive statistics to make their claims. Findings: Rate of SPED placement decreased from 15% to 8%. No discussion of statistical significance.</td>
</tr>
<tr>
<td>Orosco, M. J. (2010).</td>
<td>Qualitative Study- Sociocultural</td>
<td>Views RTI as possibly being able to</td>
<td></td>
</tr>
<tr>
<td>Study Description</td>
<td>Methodology</td>
<td>Findings</td>
<td></td>
</tr>
<tr>
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</tr>
<tr>
<td>Sociocultural examination of response to intervention with Latino English language learners. <em>Theory Into Practice</em>, 49, 265-272.</td>
<td>Classroom observations</td>
<td>RTI with culturally relevant pedagogy remedy over-referred students who are ELL due to the cultural and linguistic differences of teacher and student. RTI should include high quality instruction utilizing funds of knowledge (Gonzalez, Moll &amp; Amanti, 2005). If Culturally responsive RTI is not provided in Tier 1, there is a possibility of over-identification of ELL. Encourages looking at sociocultural variables to study their impact.</td>
<td></td>
</tr>
<tr>
<td>Orosco, M.J. &amp; Klingner, J. (2010) One school’s implementation of RTI with English language learners: “referring into RTI.” <em>Journal of Learning Disabilities</em>, 43(3), 269-288</td>
<td>Qualitative Study - classroom observations</td>
<td>Universal Screening: DIBELS P.M.: Did not state specific instrument. Said the assessment was misaligned with instruction Tiered Instruction: Tier 1: Open Court Tier 2: Reading First Methods and Kaleidoscope. Lacked up to date resources so teachers piecemealed resources and some were inappropriate for the grade/level One bilingual teacher in the school Using 4-step problem solving model but still using IQ discrepancy model Urban Elementary K-2 ELL students Using interventions not proven to be</td>
<td></td>
</tr>
</tbody>
</table>
Table 9 (continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Methodology</th>
<th>Intervention Approach</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pool, J. L., Carter, G. M., Johnson, E. S. &amp; Carter, D. R. (2012).</td>
<td>Empirical: case study</td>
<td>Direct instruction, Drill and practice with cumulative review, and motivators.</td>
<td>Generalizing what they know from reading to math - if students are not successful early with computational skills they will have difficulty moving forward with math concepts. Authors wanted to investigate creating a tier 2 intervention for 3rd graders. Used the scripted program VMath as intervention. Motivators were positive feedback and tickets for rewards that were part of the PBS system.</td>
</tr>
<tr>
<td>Assessing African American students for specific learning disabilities: the promise and perils of response to intervention. The Journal of Negro Education, 81(3), 268-282.</td>
<td>Conceptual</td>
<td>Culturally Responsive RTI to meet needs of African American students and prevent overrepresentation in SPED.</td>
<td>Explains the history of IQ testing with African Americans and how it has been perceived as utilized for segregation purposes and to show African Americans are inferior to European races. Notes the court case in California 1979 Larry P. v. Riles where the ruling was a moratorium on using IQ tests to qualify African Americans for EMR programs. Reasoning was the overrepresentation of African Americans in EMR programs, the ruling that IQ tests were not sufficiently effective with ELL students Deficits based model No quantitative data on effectiveness</td>
</tr>
</tbody>
</table>
validated to be used with minority populations, and the EMR programs were perceived as “dead end” (cited Powers et al., 2004, p. 146).

ED, ID, and SLD are considered by some to be “judgmental and socially constructed disability categories” (p. 271).

When comparing SLD with nondisabled students, they have a harder time finding employment post high school and fewer opportunities for postsecondary education.

Promise of RTI for African Americans:
- early prevention targets skills early so they do not experience academic/beha
davior problems later that lead to discipline or SPED referrals.
- use of universal screening and progress monitoring data to guide problem-solving teams’ discussions assists with having a more objective task and may reduce teacher bias influencing referral decisions.
- focus on providing appropriate instruction to all students in Tier 1 may assist with the problem of overrepresentation of African American students (author makes a distinction b/w
Possible “Perils” of RTI for African Americans:
- there is a lack of effective research-based interventions that are culturally responsive to African American students
- RTI requires buy-in from staff and redefining roles that may impact effectiveness of RTI if not achieved.
- RTI requires human, financial, and educational resources, which may become an issue for students attended under-resourced schools.

*Look at the research agenda items for this article. Discusses need for state level database and need to analyze RTI from African American students’ and parents’ perspectives.

- District need to ensure there is a research-based reading curriculum in K-3.
- Family training to increase knowledge and resources
- Culturally relevant pedagogy
Tier 3 standardized assessments that are
<table>
<thead>
<tr>
<th>Source</th>
<th>Study Type</th>
<th>Description</th>
</tr>
</thead>
</table>
| Reid, W. A. (1987). Institutions and practices: professional education reports and the language of reform. *Educational Researcher*, 16(8), 10-15. | Conceptual | Reform of education and practice must take institutional context of where it is taking place into consideration. Authors noted that institutions are fundamentally resistant to change (my take: schools are resistant to change). Three elements that need equilibrium within the institution: 1-social system 2-
If change is taking place one must “acknowledge that reform implies a reinvention through which a new stability replaces the old” (p. 11).

“Practices involve standards of excellence, obedience to rules, and achievements of goods” (p. 12).

Table 9 (continued)

<table>
<thead>
<tr>
<th>Reynolds, C., Livingston, R., &amp; Willson, V. (2009). Measurement and Assessment. New Jersey: Pearson.</th>
<th>Conceptual: Book Testing and Measurement</th>
<th>Aptitude Test: “designed to measure the cognitive skills, abilities, and knowledge that individuals have accumulated as the result of their overall life experiences” p. 331</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achievement Test: “designed to assess students’ knowledge or skill in a content domain in which they have received instruction.” P. 300</td>
<td></td>
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<tr>
<td>Aptitude-achievement discrepancy: performance on aptitude test is compared to performance on achievement test. If achievement is lower than aptitude students may be considered underachievers.</td>
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<td>Many states continue to use it as essential in diagnosing learning disabilities.</td>
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<tr>
<td>Critics of discrepancy model argue that the discrepancy may be due to measurement error, differences in instructional content, variation in student attitudes and motivation. Cites Anastasi &amp; Urbina, 1997; Linn &amp; Gronlund, 2001.</td>
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Table 9 (continued)

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<tbody>
<tr>
<td>Rocco, T. S. (2011). Moving forward: two paradigms and takeaways. <em>New Directions for Adult and Continuing Education</em>, 132, 97-101.</td>
<td>Notes that some believe RtI will reduce # of students needing SPED services which will reduce education costs. Note that RTI holds promise but is still a concern b/c it has been defined and applied differently depending upon context. Author does not agree that RTI should be a stand-alone process to identify LD students but could be part of a process that includes formal psychological testing.</td>
</tr>
</tbody>
</table>

Technical Rational views the disability as requiring interventions or technology to fix it. Social Construction views nondisabled people as oppressors that think they know what is best for disabled. Author is writing with an adult education perspective. Believes disability should be explored as it relates to social construction and how this is the reason for impairments. This view sees able-bodied as privileged. Author believes disability is a social justice issue.
Table 9 (continued)

<table>
<thead>
<tr>
<th>Conceptual-Book</th>
<th>Schoolwide RTI model</th>
</tr>
</thead>
</table>

Gives history of the policy-handicap was seen as a negative term. Disability term became popular frame. Disability frame rooted in medical model-diagnose, label, and teach with a prescribed approach-although students were failing to achieve. Fordham Foundation and Progressive Policy Institute (2001) came out with publication *Rethinking Special Education for a New Century*. G. Reid Lyon (2001) took up the position that it was not the students necessary, but possibly a disability to teach-believed the environmental circumstance should be addressed by matching resources to pupil needs.

3 types of RTI- (1) Standard Protocol RTI: focused on disability determination. Targeted students receive curriculum-based measures instead of normative distribution measures like IQ test. (2) Problem Solving RTI: Introduced intervention for behavior problems. (3) Schoolwide RTI: Extends problem solving RTI and puts the focus on environmental factors instead of it always being a
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Conceptual</th>
<th>Providing an evaluation methodology with 3 domains.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers gain most of their knowledge about school law from other teachers and principal. They are often unaware of rulings of court cases involving school matters. Misunderstandings of the law can lead to reactive learning, victimhood, and confusions. It can also waste time and resources. The authors encourage principals to take leadership of teaching school law to their staff during professional development.</td>
<td></td>
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<tr>
<td>Indicators of evaluating RTI should focus on 3 components 1-universal screening 2-tiered instruction 3-special education 3 indicators of RTI success: 1-“changes of student level of risk for successful future academic performance and the rate of improvement (ROI) over time in the universal screening measures…degree to which students progress from tier to tier as well as ROI while in tiered instruction…the accuracy of decision making related to special education eligibility” (p. 5).</td>
<td></td>
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<tr>
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</tbody>
</table>
Table 9 (continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Methodology</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shepherd, K. &amp; Salembier, G. (2011)</td>
<td>Qualitative: case study/cross-case analysis</td>
<td>Case study of three rural schools. Noted positive changes within all three. 1-use of data-based decisions 2-collaboration between general and special education teachers 3-common knowledge base among stakeholders in the school 4-redefining of principal’s involvement in RTI 5-trend of increased reading achievement and decrease or stabilization of SPED referrals. All schools used RTI+iQ Discrepancy. Two schools wanted to move away from discrepancy to RTI.</td>
</tr>
</tbody>
</table>

If RTI is working, # of students in higher tiers will decrease.

With the preventative nature of RTI, it is anticipated that fewer students will need intensive interventions through SPED. “In these studies, reductions to referrals to special education have been substantial and truly reflect the anticipated outcomes that were expected when RTI was put forward as an alternative to identification of SLD in the Individuals with Disabilities Education Improvement Act of 2004” (p. 12).
Table 9 (continued)

<table>
<thead>
<tr>
<th>Authors</th>
<th>Method</th>
<th>Sample</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sullivan, A. L. &amp; Long, L. (2010). Examining the changing landscape of school psychology practice: a survey of school-based practitioners regarding response to intervention. <em>Psychology in Schools</em>, 47(10), 1059-1070.</td>
<td>Empirical-Survey</td>
<td>Sample: 557 school psychologists involved in NASP. Survey results – they spend more time involved in academic intervention and less time testing students when compared to non-RTI peers. Many reported positive effects on academic performance, but no effect on school culture. 92.3% received some training re: RTI 52.3% reported RTI was implemented at their site. 63.6% report more time spent on interventions when compared to pre-RTI implementation 52.8% report a decrease in SPED evals. 40.7% reported no change and 6.5% reported an increase in evals.</td>
<td>Authors noted the lack of empirical implementation studies, particularly in rural schools. One of the findings is that two of the principals did not know how to access SPED money to support RTI initiatives, while one did. Researchers noted the complexity of the change process.</td>
</tr>
</tbody>
</table>
Table 9 (continued)

<table>
<thead>
<tr>
<th>Author</th>
<th>Methodology</th>
<th>Reading First as RTI and RTI as a response to intervention instructional model and response to intervention diagnostic approach</th>
<th>Used descriptive statistics to make the argument that with 3 years of Reading First implementation there was:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valencia, R. R. (1997). Conceptualization in the notion of deficit thinking. In Valencia, R. R. (Ed.), <em>The evolution of deficit thinking</em> (pp. 1-12). Bristol, PA: The Falmer Press.</td>
<td>Conceptual</td>
<td>Deficit thinking</td>
<td>Deficit thinking-students who are not successful in school do so because they have internal deficits. 6 characteristics of deficit thinking: 1-A person-centered explanation for school failure and is linked to membership in a particular group. 2-It is an oppressive model that does not give hope to success for students. 3-Uses pseudoscience with negative biases. 4-Belief that the deficit comes from inferior genes, cultures, classes, or families. 5-May contain a prescriptive model based on perceptions of the low SES minority</td>
</tr>
<tr>
<td>Purpose</td>
<td>Empirical-multiple baseline design with 5 elementary schools: reported findings of effect of RTI on number of SPED evaluations conducted, cost-analysis, and details of procedures reported.</td>
<td>RTI as an identification and evaluation of students</td>
<td>Purpose- evaluate referral, identification process, and student outcomes.</td>
</tr>
<tr>
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</tr>
<tr>
<td>VanDerHeyden, A. M., Witt, J. C., &amp; Gilbertson, D. (2007). A multi-year evaluation of the effects of a response to intervention (RTI) model on identification of children for special education. <em>Journal of School Psychology, 45</em>, 225-256.</td>
<td>STEEP-System to Enhance Educational Performance</td>
<td>STEEP maximized # of correctly identified children for referral, which were superior to teacher identification. (More students who were referred were qualifying after students were given an evaluation).</td>
<td></td>
</tr>
<tr>
<td>What effect would STEEP implementation have on total number of evaluations and percentage of evaluations that qualified for services?</td>
<td>Using STEEP helped to identify students at comparable rates along gender and racial factors.</td>
<td>Costs were not reduced with STEEP, but they were shifted. Money saved on fewer evaluations was used for extra data collection teachers requested.</td>
<td></td>
</tr>
<tr>
<td>To what degree would decision-making teams utilize STEEP data to...</td>
<td>Prior to STEEP there was an overrepresentation of males identified.</td>
<td>With STEEP, fewer evaluations were...</td>
<td></td>
</tr>
</tbody>
</table>
determine whether or not an evaluation should be conducted?

What effect did STEEP implementation have on identification rates by ethnicity, gender, free or reduced lunch status, and primary language status?

How did the use of STEEP reduce assessment and placement costs for the district and how were funds re-allocated?

What were the outcomes for children judged to have an adequate RTI relative to those children who were judged to have an inadequate RTI?

<table>
<thead>
<tr>
<th>Source</th>
<th>Conceptual</th>
<th>Eliminate tracking and promote personalized learning that is relevant to</th>
<th>Defines tracking as “the separation of students by academic ability into career paths base on standardized test scores and</th>
</tr>
</thead>
</table>

Table 9 (continued)

Students in the low track receive instruction that emphasizes low order thinking. Author feels tracking is “morally unacceptable” (p. 19). Students on the higher track learn how to use data while lower track students do not. Higher track students are usually white so it is a way to segregate students and “perpetuate a racist society” (p. 19). Argument follows the reproduction theory of keeping students in their place. Points to one paradox- if teachers only respond to mandates from on high, it is not possible to hold them accountable for educating children. If information is presented in schools as segregated, then it makes it acceptable to segregate students. Argues that mastering a core curriculum does not take individual students into consideration and is a way to control a diverse population. This seems to go against the RTI foundation of Tier 1 meeting the needs of most students in the core instruction as the goal. Uses Friere’s
banking theory to support this claim—teachers are pouring information into students even thought it may be irrelevant to the students’ lives and is done in an impersonal way. Argument is that instruction needs to be restructured to make it relevant to students (goes well with culturally relevant pedagogy).

<table>
<thead>
<tr>
<th>Authors</th>
<th>Experimental Design</th>
<th>Efficacy of preventative model on student outcomes in reading.</th>
<th>RTI is a preventative model with the goal of reducing inappropriate referrals and identification of students for SPED.</th>
</tr>
</thead>
</table>
- 3 cohorts of students in K-2 within one district with 7 elementary schools.
- 5 years of data collected from a database.
- Cohort 1-no interventions (historical control) followed K-3.
- Cohort 2-first treatment group; first year of implementation; followed K-3.
- Cohort 3-second treatment group; second | **No theoretical framework.** | Stated there is an “implicit assumption” that RTI will reduce number of student with severe academic problems and reduce number of students identified for SPED. |
|                   | **Intervention:**
- Tier 2-Daily small group instruction outside of class. 30 min in groups of 4-6.
- Tier 3-Daily small group of instruction outside of class. 50 min in groups of 2-4.
- Fidelity check once a month. | Did not change how they referred or |
Table 9 (continued)

year of implementation; received only one year of implementation b/f study ended.

Did not describe what statistical tests were run. Only provides the descriptive statistics and whether it was significant.

identified for SPED-continue with discrepancy model with a standard regression procedure.

Results: overall total % of identified students decreased with each year of implementation. It is NOT statistically significant. Also NOT statistically significant when looking at students identified as LD across the three cohorts. More males identified than females-statistically significant for cohort 3 only. Ethnicity NOT statistically significant for any cohort.

Argues that a 5 percentage point decrease in SPED eligibility is practical significance even if not statistical. Shows a trend in decrease of SPED identification over time.

Explained the sample number as a limitation. Need a large sample to study the change in percentage of students identified.

White, R.B., Polly, D., & Qualitative-Case study Universal screening: Benchmark
Table 9 (continued)

<table>
<thead>
<tr>
<th>Reference</th>
<th>Method</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wilkins, T. &amp; Nietfeld, J. L. (2004). The effect of a school-wide inclusion training programme upon teachers’ attitudes about inclusion. <em>Journal of Research in Special Educational Needs</em>, 4(3), 115-121.</td>
<td>Empirical-survey of 89 middle school teachers from 4 schools. Preference for inclusion increased as teachers’ perceived expertise in special education increased. The Project WINS training did not instill positive attitudes about inclusion. Authors noted the possibility that “training methods need to take a more aggressive approach at increasing both the knowledge and efficacy of teachers in their approach to working with special needs students in a regular education classroom” (p. 119).</td>
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</table>
Table 9 (continued)

|----------------------------------------------------------------------------------------------------------------|

A comprehensive, systemic approach to teaching and learning designed to address learning problems of all students through increasingly differentiated and intensified assessment and instruction” (p. 504).

The policy is purposefully vague so school districts can have the flexibility to adapt RTI to the needs of their situation.

When professionals frame RTI as an identification tool it often sees the child as the source of the problem if interventions are not successful.

When framed as a prevention of difficulties, assessments drive the instruction and instruction is not considered evidence-based unless the individual student is showing progress.

Because RTI is a system with multiple components, it is difficult to conduct research on it that reflects this complexity.

Notes that RTI is a reform initiative that is promising but if the contexts and the
variability of individual students are not taken into account, research will likely show little or no effects.

Need to examine the conditions where RTI is least and most successful.


Questions:
1. Have the upward slope and California predominance in frequency continued?
2. Has the trend of district-friendly outcomes changed?
3. Has RTI become a major decisional factor in these cases?

Used database: Individuals with Disabilities Law Reporter (IDELR) to tabulate results.

SLD is highest proportion of special education enrollment than all classifications under IDEA.

12 adopted RTI as required approach; Most permit both RTI and discrepancy model.

2006-2010: 18 court decisions regarding SLD eligibility.
California had most decisions (7) with Pennsylvania second (3).

1/18-parents prevailed in establishing eligibility. In this case, child was ADHD-used expert testimony to make case of the need for SPED services.
The other cases deferred to teachers and experts’ decision.
RTI arose in 2 or 3 of decisions in favor of non-eligibility.
Table 9 (continued)

<table>
<thead>
<tr>
<th></th>
<th>Most decisions based on non-eligibility determination and RTI has NOT been a decisional factor. This may be b/c the 12 states implementing RTI were not the most litigious.</th>
</tr>
</thead>
</table>


# Appendix C

Table 10

*Stata commands used for data cleaning and running PSM and OLS models*

<table>
<thead>
<tr>
<th>Command</th>
<th>Dataset</th>
</tr>
</thead>
<tbody>
<tr>
<td>destring Grade3ReadPct03, generate(NGrade3ReadPct03)</td>
<td>2003 NC Report Card</td>
</tr>
<tr>
<td>destring Grade4ReadPct03, gen(NGrade4ReadPct03)</td>
<td></td>
</tr>
<tr>
<td>destring Grade5ReadPct03, gen(NGrade5ReadPct03)</td>
<td></td>
</tr>
<tr>
<td>destring GradeallReadPct03, gen(NGradeallReadPct03)</td>
<td></td>
</tr>
<tr>
<td>destring Grade3MathPct03, gen(NGrade3MathPct03)</td>
<td></td>
</tr>
<tr>
<td>destring Grade4MathPct03, gen(NGrade4MathPct03)</td>
<td></td>
</tr>
<tr>
<td>destring GradeallMathPct03, gen(NGradeallMathPct03)</td>
<td></td>
</tr>
<tr>
<td>drop if LowGrade03==&quot;06&quot;</td>
<td></td>
</tr>
<tr>
<td>drop if LowGrade03==&quot;07&quot;</td>
<td></td>
</tr>
<tr>
<td>drop if LowGrade03==&quot;08&quot;</td>
<td></td>
</tr>
<tr>
<td>drop if LowGrade03==&quot;09&quot;</td>
<td></td>
</tr>
<tr>
<td>drop if LowGrade03==&quot;10&quot;</td>
<td></td>
</tr>
<tr>
<td>gen newcode = LEA03 + Schlcode03</td>
<td></td>
</tr>
<tr>
<td>destring Urbanicity11, gen(NUrbanicity11)</td>
<td>2011 NC Public School Universe</td>
</tr>
<tr>
<td>drop if SchoolType11==&quot;H&quot;</td>
<td></td>
</tr>
<tr>
<td>drop if SchoolType11==&quot;M&quot;</td>
<td></td>
</tr>
<tr>
<td>drop if SchoolType11==&quot;T&quot;</td>
<td></td>
</tr>
<tr>
<td>drop if LowGrade11==&quot;06&quot;</td>
<td></td>
</tr>
<tr>
<td>drop if LowGrade11==&quot;07&quot;</td>
<td></td>
</tr>
<tr>
<td>drop if LowGrade11==&quot;08&quot;</td>
<td></td>
</tr>
<tr>
<td>drop if LowGrade11==&quot;09&quot;</td>
<td></td>
</tr>
<tr>
<td>drop if LowGrade11==&quot;10&quot;</td>
<td></td>
</tr>
</tbody>
</table>
drop if LowGrade11=="11"
gen newcode = LEA + Schlcode11
merge 1:1 newcode using RevisedSchrepcard03.dta
Merged 2003 and 2011 Datasets

drop if grade=="06"
drop if grade=="07"
drop if grade=="08"
drop if grade=="09"
drop if grade=="10"
drop if grade=="11"
drop if grade=="12"
drop if grade=="13"
replace Tch0thru3Yrs12= Tch0thru3Yrs12/100
replace Tch4thru10Yrs12= Tch4thru10Yrs12/100
replace Tch11plyrs12= Tch11plyrs12/100

Merged Dataset

drop if HighGrade11=="06"
drop if HighGrade11=="07"
drop if HighGrade11=="08"
drop if HighGrade11=="09"
drop if HighGrade11=="10"
drop if HighGrade11=="11"
drop if HighGrade11=="12"
drop if NType11==2
drop if NType11==4
recode ReadingFirst .=0

Merged Dataset

destring Urbanicity11, gen(N_Urbanicity11)
recode N_Urbanicity11 11=11 12=11 13=11 21=21 22=21 23=21 31=31 32=31 33=31 41=41 42=41 43=41
recode ReadingFirst .=0
replace ReadAllPct12= ReadAllPct12/100
replace MathAllPct12= MathAllPct12/100
drop if RTI==.

duplicates list mastid
list eccode if lea==# & schlcode==#

Command	Method

logit RTI NGradeallReadPct03 NGradeallMathPct03 MalePct12	Propensity Score Matching
Black12 Hispanic12 EconDis12 LEPPct12 TotalSt12
N_Urbanicity11 Magnet12 TradSched12 Title1St12
ReadingFirst BooksperSt12 InstLearnDevice12 Tch0thru3Yrs12
Tch4thru10Yrs12 TchTurnover12 NatBoards12
predict p
drop if p==.
psgraph, treated(RTI) pscore(p)
keep if p>.17852 & p<.9728377
set seed 318
generate x=uniform()
sort x
psmatch2 RTI, out(ReadAllPct12) pscore(p) noreplacement
caliper(.01)
psmatch2 RTI, out(ReadAllPct12) pscore(p) neighbor(5)
caliper(.01)
psmatch2 RTI, out(ReadAllPct12) pscore(p) noreplacement
caliper(.044)
psmatch2 RTI, out(ReadAllPct12) pscore(p) noreplacement
caliper(.044)
```
psmatch2 RTI, out(MathAllPct12) pscore(p) noreplacement
caliper(.044)
psmatch2 RTI, out(PctLD) pscore(p) noreplacement
caliper(.044)
pptest NGradeallReadPct03 NGradeallMathPct03 MalePct12
Black12 HIspanic12 EconDis12 LEPPct12 TotalSt12
N_Urbanicity11 Magnet12 TradSched12 Title1St12
ReadingFirst BooksperSt12 InstLearnDevice12 Tch0thru3Yrs12
Tch4thru10Yrs12 TchTurnover12 NatBoards12, both

regress ReadAllPct12 i.RTI NGradeallReadPct03
NGradeallMathPct03 MalePct12 Black12 HIspanic12
EconDis12 LEPPct12 TotalSt12 N_Urbanicity11 i.Magnet12
i.TradSched12 i.Title1St12 i.ReadingFirst BooksperSt12
InstLearnDevice12 Tch0thru3Yrs12 Tch4thru10Yrs12
TchTurnover12 NatBoards12 if _weight==1,
regress MathAllPct12 i.RTI NGradeallReadPct03
NGradeallMathPct03 MalePct12 Black12 HIspanic12
EconDis12 LEPPct12 TotalSt12 N_Urbanicity11 i.Magnet12
i.TradSched12 i.Title1St12 i.ReadingFirst BooksperSt12
InstLearnDevice12 Tch0thru3Yrs12 Tch4thru10Yrs12
TchTurnover12 NatBoards12 if _weight==1,
regress PctLD i.RTI NGradeallReadPct03 NGradeallMathPct03
MalePct12 Black12 HIspanic12 EconDis12 LEPPct12
TotalSt12 N_Urbanicity11 i.Magnet12 i.TradSched12
i.Title1St12 i.ReadingFirst BooksperSt12 InstLearnDevice12
Tch0thru3Yrs12 Tch4thru10Yrs12 TchTurnover12
NatBoards12 if _weight==1,
```

OLS on Matched Sample
Appendix D  
North Carolina State University  
Institutional Review Board for the Use of Human Subjects in Research  
SUBMISSION FOR NEW STUDIES

GENERAL INFORMATION

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1.</td>
<td>Date Submitted: <strong>12-3-13</strong></td>
</tr>
<tr>
<td>1a.</td>
<td>Revised Date: ______</td>
</tr>
<tr>
<td>2.</td>
<td><strong>Title of Project:</strong> An Investigation of the Effects of Response to Intervention on the Identification of Disabilities and Student Achievement</td>
</tr>
<tr>
<td>3.</td>
<td><strong>Principal Investigator:</strong> Amy Mattingly</td>
</tr>
<tr>
<td>4.</td>
<td><strong>Department:</strong> Leadership, Policy, Adult and Higher Education</td>
</tr>
<tr>
<td>5.</td>
<td><strong>Campus Box Number:</strong> ______</td>
</tr>
<tr>
<td>6.</td>
<td><strong>Email:</strong> <a href="mailto:awmattin@ncsu.edu">awmattin@ncsu.edu</a></td>
</tr>
<tr>
<td>7.</td>
<td><strong>Phone Number:</strong> 919-632-0851</td>
</tr>
<tr>
<td>8.</td>
<td><strong>Fax Number:</strong> ______</td>
</tr>
</tbody>
</table>
| 9. | **Faculty Sponsor Name and Email Address if Student Submission:** Dr. Matthew Militello  
   matt_militello@ncsu.edu |
| 10. | **Source of Funding? (required information):** N/A |
| 11. | **Is this research receiving federal funding?** No |
| 12. | **If Externally funded, include sponsor name and university account number:** ______ |
| 13. | **RANK:**  
   | Faculty | Student: ☐ Undergraduate; ☐ Masters; or ☑ PhD |
   | ☐ Other (specify): ______ |

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

**Principal Investigator:**

Amy Mattingly  
(typed/printed name)  
(signature)  
(date)

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

**Faculty Sponsor:**

Matt Militello  
(typed/printed name)  
(signature)  
(date)

*Electronic submissions to the IRB are considered signed via an electronic signature. For student submissions this means that the faculty sponsor has reviewed the proposal prior to it being submitted and is copied on the submission.
Please complete this application and email as an attachment to: debra_paxton@ncsu.edu or send by mail to: Institutional Review Board, Box 7514, NCSU Campus (Administrative Services III). Please include consent forms and other study documents with your application and submit as one document.

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

For SPARCS office use only

Reviewer Decision (Expedited or Exempt Review)

☐ Exempt    ☐ Approved    ☐ Approved pending modifications    ☐ Table

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

_____________________________________________  ______________________________________
Reviewer Name                        Signature                        Date
In your narrative, address each of the topics outlined below. Every application for IRB review must contain a proposal narrative, and failure to follow these directions will result in delays in reviewing/processing the protocol.

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

The purpose of the research proposal is to investigate the effect of implementing a Response to Intervention (RTI) framework in K-5 public schools on the number of students identified with a specific learning disability and student achievement. The theory behind RTI is that it will improve instruction for all students and an anticipated outcome is that less students will be identified with learning disabilities because learning problems will be caught early and instruction and intervention provided will reduce the number of students who require intensive intervention from special education. In addition, RTI will improve student achievement. The effects of RTI on LD identification and student achievement have not been studied in NC to see if RTI is reducing the number of students with learning disabilities and increasing achievement outcomes for the school population. This is important because more school districts in the state are implementing RTI, yet the outcomes of RTI implementation are still unclear.

2. If student research, indicate whether for a course, thesis, dissertation, or independent research. The proposed study will be conducted for dissertation research.

B. SUBJECT POPULATION
1. How many subjects will be involved in the research? Estimates or ranges are acceptable. Please be aware that if you recruit over 10% more participants than originally requested, you will need to submit a request to modify your recruitment numbers.

Approximately 1,000,000 K-5 students

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

The subjects will not be recruited. Data on the sample is available for researchers to access at the North Carolina Education Research Data Center.

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

Students who attended a North Carolina public school and were in grades K-5 during the 2012-2013 academic year are eligible.

4. Explain any sampling procedure that might exclude specific populations.

Pre-K students and 6-12 grade students will be excluded, as well as students who are in private school
5. Disclose any relationship between researcher and subjects - such as, teacher/student; employer/employee. The dataset does not contain names of students; therefore the researcher is unaware of any relationship to the sample.

6. Check any vulnerable populations included in study:

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

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

The data will involve elementary school students. The information has already been collected by a state agency so there is no need for a consent form of parents or guardians.

C. PROCEDURES TO BE FOLLOWED

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

- The researcher will complete the necessary paperwork to access the Masterbuild, Public School Universe, and School Report Card dataset from the North Carolina Education Research Data Center located at Duke University. The dataset contains demographic information, whether students are identified with a disability and the type, scores on state tests, the school name, LEA name, school and teacher demographic data, as well as school achievement data, and school demographic data.
- All information regarding pre-k or students in grades 6-12th grade will be deleted
- The researcher will contact NC Department of Public Instruction to gain access to RTI census data that identifies which school implemented RTI in the 2012-2013 academic year.
If the RTI census data is unavailable or access is not granted by DPI, the researcher will use LEA and school websites to determine if schools use the RTI framework of instruction.

If the websites do not identify whether the schools implement RTI, the researcher will email the Special Education Director or RTI coordinator and ask if (1) Any elementary schools in the district implement RTI and if so, (2) What are the names of the elementary schools that implemented RTI during the 2012-2013 academic year?

The researcher will code the schools in the dataset as RTI or non-RTI schools.

The researcher will use propensity score matching to determine which RTI schools and non-RTI schools can be matched due to similar observable student and school characteristics using Stata software.

The researcher will use the Stata software to run linear regression models to determine the effect of RTI on the proportion of students identified as specific learning disabled and student achievement on third through fifth grade end of grade test scores.

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

The study will require no time of student subjects. In the unlikely event that RTI census data is not available from DPI, some school personnel may need to be contacted. Many district/school websites list whether they use RTI and which schools are implementing RTI. For those districts that do not mention RTI on a website, it should take district personnel approximately 2-15 minutes to identify in an email whether they use RTI and the names of the schools.

D. POTENTIAL RISKS

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

I do not foresee any potential risk to any participants.

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

The student information has already been gathered. The information requested from DPI and LEA leaders are part of public domain and is not personal or sensitive. If yes, please describe and explain the steps taken to minimize these risks.

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

3. Could any of the study procedures produce stress or anxiety, or be considered offensive, threatening, or degrading? If yes, please describe why they are important and what arrangements have been made for handling an emotional reaction from the subject.
None of the procedures will produce stress or anxiety of participants.

4. How will data be recorded and stored?

The data will be stored on a secure server at the College of Education at NC State University. The researcher will access the server using a laptop that has a secure password that is only accessible to the researcher. The data may be shared with the chair of the dissertation committee as well as members of the dissertation committee. The data will be deleted at the completion of the study and all paper copies of data will be shredded. A data security plan is attached for your review.

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

The NCERDC encrypted student identifier will be used in study notes when documenting student information. The school name or LEA code will be used in notes to identify schools. Schools and LEAs will not be reported in the dissertation or any publications that come from the study.

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

Results will be written in aggregate terms.

5. If audio or video recordings are collected, will you retain or destroy the recordings? How will recordings be stored during the project and after, as per your destruction/retention plans?

There will be no collection of audio or video recordings.

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

No deception is involved in the study.

E. POTENTIAL BENEFITS

This does not include any form of compensation for participation.

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

   Knowledge may be gained that will assist others.

F. COMPENSATION

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

1. Describe compensation

   No compensation will be provided.
2. Explain compensation provisions if the subject withdraws prior to completion of the study.

N/A

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

Class credit will not be given.

G COLLABORATORS

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

I do not anticipate any additional investigators will be involved. The dissertation committee at NC State may review data: Kristin Conradi: Curriculum, Instruction, and Counselor Education keconrad@ncsu.edu; Paul Umbach: Leadership, Policy, Adult and Higher Education pdumbach@ncsu.edu; John Nietfeld: Educational Psychology jlnietfe@ncsu.edu; and Matt Militello; Leadership, Policy, Adult and Higher Education matt_militello@ncsu.edu

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

Only the research team will have access to the data.

H. CONFLICT OF INTEREST

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

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

I. ADDITIONAL INFORMATION

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

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

3. Please provide any additional materials that may aid the IRB in making its decision.

J. HUMAN SUBJECT ETHICS TRAINING

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

Data Security Plan

In compliance with the NCERDC’s requirements regarding data security and confidentiality protections, I will ensure that all data files will be stored on a password-protected network space
provided by the North Carolina State University College of Education. Only the project researchers who are named on the application cover page and system administrators responsible for data backups will be able to view and access this secured network drive. The data files will be used exclusively for the purpose of this dissertation research project or any publications that derive from the dissertation research project.

When using the student and school data, the following procedures will be observed:

**Computing Equipment**
All data supplied by the NCERDC will be stored and accessed on the secure server with password-protected access. No data will be stored on any portable devices, including laptop computers. Any laptop computer used to access the secure server will also be password-protected with access only available to the researcher.

**Network System**
Storage services are provided by Celerra storage appliances and protected by a firewall. Access is limited to on-campus computers or by computers using an authenticated VPN. Tape backups are made daily and held for 28 days. All client computers and servers are protected by Trend Micro antivirus.

**Paper Printout Access**
Any information that is printed will be printed directly from the server. Printouts derived from data analysis will be stored in a locked file cabinet at the home of the principal investigator where only she can access it. Printed information will only be shared with the dissertation committee members who are considered as part of the research staff. Once printed information is no longer needed, it will be shredded before disposal.

**Treatment of Derived Data**
No data or analysis output will be transmitted via email, email attachments, or unsecured File Transport Protocol. The time frame for the analysis of this data will begin upon receipt of access by NCERDC and end by December 31, 2014. All electronic and paper data will be destroyed at the project end date. All data derived from restricted data will be handled in the same manner as the original restricted data. Analysis of the restricted data will be published, however it will not include any information that can identify students or individual schools.