School-Wide Effects of Implementing Response to Intervention in Virginia Middle Schools

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Abstract

The purpose of this study was to measure the association between school-wide student achievement on the English and mathematics Standards of Learning (SOL) tests and the degree of implementation and length of time implementing Response to Intervention (RTI) in Virginia middle schools. Recognizing that RTI is a complex process (Fuchs & Deshler, 2007; Mellard, Frey, & Woods, 2012; Mellard, McKnight, & Jordan, 2010; VanDerHeyden, Witt, & Barnett, 2005), some middle schools may experience uneven degrees of implementation in their attempts to adopt the RTI model (Mellard, Frey, & Woods, 2012). Principals serving grades 6 through 8 exclusively in Virginia were surveyed using an adapted version of the Self Assessment of Problem Solving Implementation (Castillo, J., Batsche, G., Curtis, M., Stockslage, K., March, A., & Minch, D., 2010), a Likert-like scale, to determine the degree of RTI implementation and the length of time the school had been implementing RTI. The school's implementation score and the number of years the schools had been implementing RTI were regressed against the school's school-wide scaled scores on the Standards of Learning (SOL) tests in English and mathematics. Analysis of the association between Response to Intervention implementation levels and the number of years a school had implemented Response to Intervention failed to reveal significant findings on student achievement in reading. RTI implementation levels showed a significant negative association with mathematics SOL scaled scores in the participating middle schools.

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Chapter 1
Introduction

Traditionally linked to special education (Fuchs & Deshler, 2007), Response to Intervention (RTI) was included as a method for determining eligibility under the category of specific learning disability in the latest revision of the IDEIA (2004). From this special education base, RTI has evolved from being a method for identifying learning disabilities (VanDerHeyden, Witt, & Gilbertson, 2007), to a means of preventing the need for special education services (Fuchs & Deshler, 2007; Fuchs, Fuchs, & Stecker, 2010), to a school improvement process guiding school leaders in improving the achievement levels of all students to meet the requirements of the No Child Left Behind Act (Fuchs, Fuchs, & Compton, 2010; Mellard, Frey, & Woods, 2012; Shores and Chester, 2009). RTI is a complex education model (Fuchs & Deshler, 2007; Mellard, McKnight, & Jordan, 2010; VanDerHeyden, Witt, & Barnett, 2005) of teaching and learning characterized by multiple levels of research-based interventions, teacher collaboration and decision-making, assessments for student learning, monitoring for progress within an academic intervention, and on going professional development (Brown-Chidsey & Steege, 2011; Fuchs, D. et al., 2010; Johnson, Mellard, Fuchs, & McKnight, 2006; National Center on Response to Intervention, 2010). As the purpose for implementing RTI has evolved, the number of schools practicing RTI has grown (Berkeley, Bender, Peaster, & Saunders, 2008). This growth in RTI has expanded the number of elementary schools implementing its practices while venturing into the middle grades and high schools across the country (Duffy, 2007; Mellard et al., 2012). RTI's arrival in secondary schools has been accompanied by the evolved application of RTI as a means of increasing achievement for all students through school improvement (Shinn, 2008; Shores & Chester, 2009).

According to the IDEA National Assessment Implementation Study, RTI was implemented in 61% of elementary schools, 45% of middle schools, and 29% of high schools nationwide (Bradley et al., 2011). Due to a lack of research, questions remain as to RTI's structure and promise for student achievement in secondary schools (Duffy, 2007; Fisher & Frey, 2011; Graves, Brandon, Duesbery, McIntosh, & Pyle, 2011; Shinn, 2008; Prewett et al., 2012). Qualitative case studies have demonstrated both the challenges and successes of RTI implementation in secondary schools (Dulaney, 2012; Fisher & Frey, 2011; Prewett et al., 2012)

while a need remains for broader studies examining effective implementation models and their success in meeting individual student's needs and impact school-wide (Dulaney, 2012; Prewett et al., 2012).

Background of the Problem

An achievement gap exists within our nation's public schools (National Center for Education Statistics, 2013). Historically speaking, achievement gaps are used to describe the difference in performance among racial and socio-economic groups within our nation's borders. Recently, an achievement gap between the United States and European and Asian countries has been exposed from results on the Programme for International Student Assessment (PISA) and the Trends in Mathematics and Science Study (TIMSS) international assessments (Hanushek & Woessmann, 2010; Rothman, 2014). These assessments, coupled with ongoing national assessments such as the NAEP, demonstrate gaps in achievement between the United States and other industrialized nations. Additional achievement gaps were identified among various ethnic groups within the United States and reinforced the need for effective changes in our schools to meet the needs of all students. Results from the National Assessment of Educational Progress (NAEP) indicated that two-third of our nation's students were below proficiency levels in middle school and grew to three quarter of graduating seniors being below proficiency (Rampey, Dion, & Donahue, 2009). The performance of U.S. students on the internationally administered TIMMS assessments in mathematics and science highlighted a performance gap between U.S. students and students in Asia (Gonzales et al., 2009).

The National Mathematics Advisory Panel, in *Foundations for Success: The Final Report of the National Mathematics Panel (2008)*, reported:

> During most of the 20th century, the United Sates possessed peerless mathematical prowess-not just as measured by the depth and number of mathematical specialists who practiced here but also by the scale and quality of its engineering, science, and financial leadership, and even by the extent of mathematical education in its population. But without substantial and sustained changes to its educational system, the United States will relinquish leadership in the 21st century. (p. *xi*)

The current debate surrounding the performance of U.S. students on national and international mathematics assessments centers on future competitiveness in the global marketplace and national security (National Mathematics Advisory Panel, 2008).

In addition to the existing achievement gaps among student groups and other nations, high school dropouts and failing schools create an impact on our nation's economy. The scope of the dropout problem is significant. Stetser and Stillwell (2014) reported that for the 2011-2012 school year, only 80% of first-time ninth graders finish high school with a diploma four years later. Adding to the data detailing achievement gaps among our students, the authors found that fewer than 70% African-American and Native American students finish high school while special education students' completion rate is closer to 60%. The Alliance for Excellent Education (2013) reported that increasing the graduation rate of the class of 2012 from 73% to 90% would create 8.1 billion dollars in increased annual earnings while creating nearly 66,000 new jobs to fuel the housing and auto industries. Research by Bridgeland, Dilulio, and Morrison (2006) on high school dropouts points to many weaknesses in our secondary schools in addressing the needs of adolescent learners.

Recent attempts to improve schools such as the No Child Left Behind Act and the Common Core Standards centered their efforts on standards and accountability in meeting those standards. The No Child Left Behind Act of 2001 (NCLB) was enacted as a means to improve schools across the nation and close achievement gaps among our students. The underlying belief in NCLB was that established, measurable standards driven by accountability through consequences would increase reading and mathematics achievement for all students (Lee & Reeves, 2012). However, much of the evidence regarding the effect of NCLB on student achievement remains mixed due in part to the complexity of the legislation and its implementation across the country (Lee & Reeves, 2012). Drafted by the National Governor's Association (NGA) and the Council of Chief State School Officers (CCSSO), the creators of the Common Core State Standards (CCSS) sought to, "promote equity by ensuring all students, no matter where they live, are well prepared with the skills and knowledge necessary to collaborate and compete with their peers in the United States and abroad" (p. 1). Schmidt and Houang's (2012) analysis of NAEP, CCSS, and TIMSS suggested that standards themselves do not improve schools. Rather, the authors suggested, setting high achievement expectations through

cut points on the assessments drives instructional improvement which results in higher student achievement.

As the purpose for implementing RTI has evolved and expanded in the number of schools practicing it (Berkeley et al., 2008), researchers have begun studying RTI's impact on improving achievement school-wide (Shinn, 2008; Shores & Chester, 2009). According to the IDEA National Assessment Implementation Study (2011), RTI has been implemented in 61% of elementary schools, 45% of middle schools, and 29% of high schools nationwide (Bradley et al., 2011). In 2008, Virginia initiated a three-year pilot program that provided training and technical support to 15 school divisions in implementing RTI within their division (Virginia Department of Education, n.d.). In that initial cohort of school divisions, only one school per division piloted RTI, all of them elementary schools. By 2010, a second cohort of 19 school divisions was formed. Of these 19 school divisions, 85 schools participated with 25 schools being middle schools or high schools (Virginia Department of Education, n.d.).

Statement of the Problem

Fuchs, Fuchs, and Compton, in their commentary "Rethinking Response to Intervention at Middle and High School" (2010), on Vaughn et al.'s (2010) study examining primary and secondary interventions on sixth grade students, acknowledged the challenge of implementing RTI at the secondary level and the reticence of researchers to conduct studies in middle and high schools. In addition to the challenges posed by secondary school schedules, the authors suggested that RTI implementation may look different and previously researched protocols in elementary schools may not be applicable to the secondary setting. More importantly, their commentary was indicative of the growth of RTI in schools outpacing the research on its implementation design and effectiveness. The evolution of RTI from a means of preventing and identifying special education services to one of improving achievement outcomes for all students has combined with its expansion to secondary schools to create an assumption that RTI can be an effective school improvement model for secondary schools to improve student achievement in reading and mathematics; however, research has yet to validate the presumed impact.

Theoretical Framework

The theoretical framework for this study was based on the three tiered response to intervention model articulated by Batsche et al. (2005) and cited by Castillo et al. (2010) in their development of the Problem Solving / Response to Intervention Evaluation Tool: Technical Assistance Manual. In this manual developed for the Florida Statewide Problem Solving & Response to Intervention Project, Castillo et al. noted that RTI provides several key functions related to identifying and addressing learning difficulties early to improve the achievement of individual students and groups of students. "[A] tiered system of interventions" Castillo et al. summarizes, "allows educators to solve less severe problems in the general education environment and invest additional resources in those students who require more intensive intervention to achieve educational benchmarks, thereby meeting the mandates of NCLB (2002) and IDEIA (2004)" (p. 4).

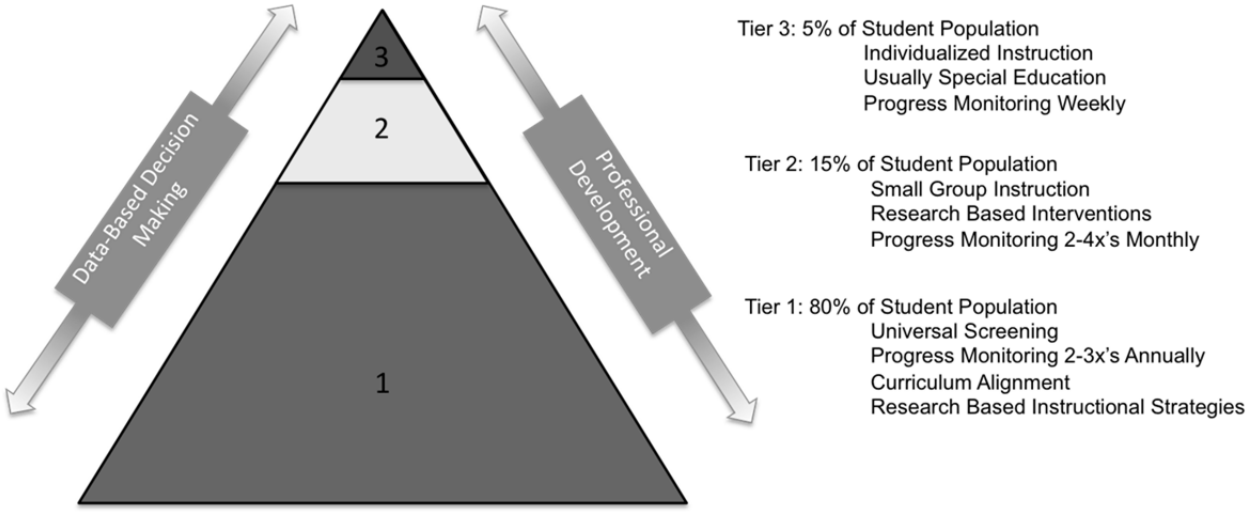

Figure 1. Theoretical framework of Response to Intervention. Adapted from Cortiella (2006), Castillo et al. (2010), Mellard & Johnson (2007), and the National Center for Learning Disabilities (2011).

Conceptual Framework

Research on RTI has been conducted at the elementary level on special education identification (Burns, Dean, & Klar, 2004; Fuchs, Fuchs, & Compton, 2004; VanDerHeyden et al., 2007; Berkeley et al., 2008) and on multiple tiers of intervention in math and reading

(Codding, Burns, & Lukito, 2011; Mellard et al., 2010). VanDerHeyden, Witt, and Barnett (2005) suggested RTI implementation in elementary schools held the potential benefit of, "increased achievement school-wide, because struggling children are identified proactively and immediate help is provided" (p. 339). Torgesen's (2009) study of the three-year implementation of RTI in 318 Reading First schools in Florida expanded the scope of analysis of RTI by examining a large sample of elementary schools and the school-wide effects of the model.

As middle and high schools implement RTI in an attempt to better serve students, the research has followed. To date, quantitative studies in middle schools have examined the effects of tier 2 reading interventions in one year (Graves et al., 2011; Vaughn et al., 2008; Wanzek, Vaughn, Roberts, & Fletcher, 2011) and across multiple years (Pyle & Vaughn, 2012). Scammacca et al. (2007) noted positive gains for older students with reading difficulties in their meta-analysis of research on reading instruction for adolescent struggling readers while Gersten et al.'s (2009) practice guide from the Institute of Educational Sciences suggests benefits from applying RTI best practices in mathematics interventions at the middle school grades. Qualitative studies have explored the implementation challenges facing middle and high schools (Fisher & Frey, 2011; Prewett et al., 2012).

The conceptual framework for this study was built from the perspective of RTI expressed by Vaughn et al. (2008) that, "the goal of any RTI approach is to raise the achievement levels of *all* students . . ." (p. 338) that marked a shift from the established purpose of RTI as a process to prevent learning difficulties (Fuchs & Deshler, 2007; Fuchs et al., 2004; Fuchs, D. et al., 2010). Vaughn et al.'s definition for the goal of RTI is echoed by Shinn (2008) who stated that RTI, "is really about overall school improvement and significant systems change" (p. 4) and Shores and Chester (2009) who stated, "[RTI] has the potential to transform classrooms into highly effective, highly motivating arenas of learning" (p. 1). Fuchs, D. et al. (2010) recognized this dichotomy of purpose for RTI by dividing those who emphasize the use of RTI to identify and reduce high incidence categories in special education as the Individuals with Disabilities Education Act (IDEA) groups and those who see RTI as a reform movement that has the potential to close the gaps in achievement among multiple populations as the No Child Left Behind (NCLB) group. More recently Mellard et al.'s (2012) examination of school-wide student outcomes in elementary schools provided qualitative evidence that RTI held promise as a school improvement model.

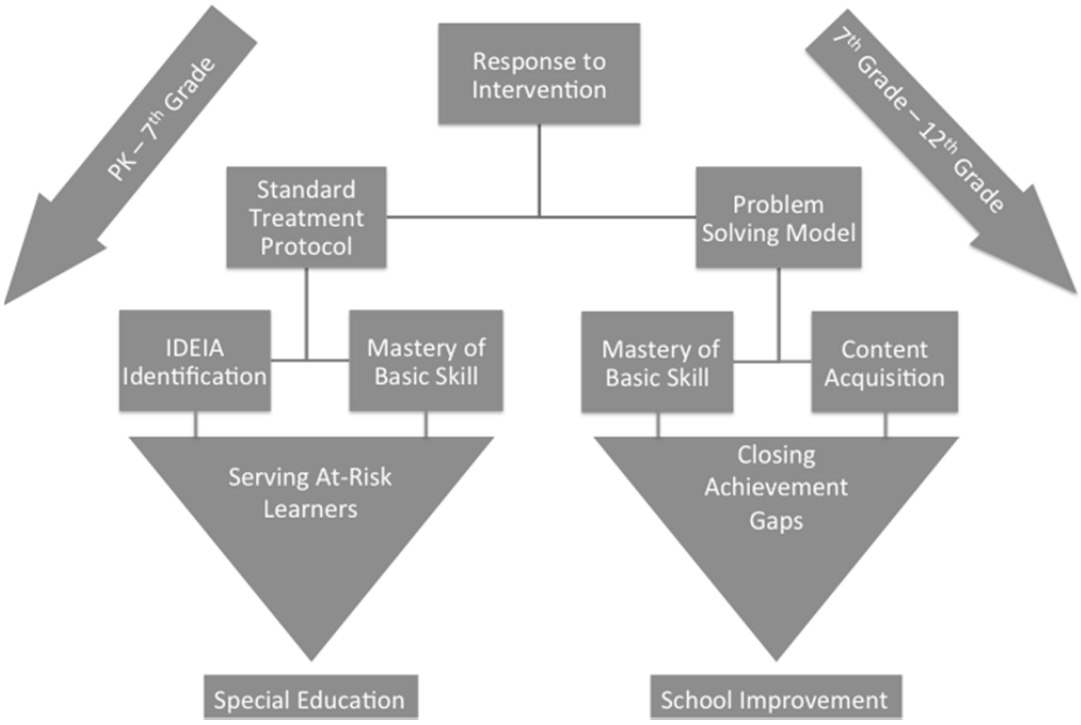

Figure 2. Conceptual Framework of Response to Intervention as a school improvement model. Adapted from Fuchs and Fuchs, (2006), Shinn (2008) and Fuchs, D. et al. (2010).

Purpose of the Study

The purpose of this study was to measure the association between school-wide student achievement on the English: Reading and mathematics SOL tests and the degree of implementation and length of time implementing RTI in Virginia middle schools. To meet this purpose, this study examined the association between a middle school's length of time and degree of implementation of RTI and student performance on the Virginia English: Reading and Mathematics Standards of Learning (SOL) tests in grades 6, 7, and 8. Principals from Virginia middle schools serving grades 6 through 8 exclusively were surveyed using an adapted version of the Self Assessment of Problem Solving Implementation (Castillo et al., 2010), a Likert-like scale, and regressed against the school-wide student achievement on the SOL tests in English and mathematics. Recognizing that RTI is a complex process (Fuchs & Deshler, 2007; Mellard et al., 2010; VanDerHeyden et al., 2005), some secondary schools may have implemented parts of the process and not others. Analyzing the length of time schools have implemented RTI and the overall level of RTI implementation reported by schools had on student achievement in English

and Mathematics in the middle grades can provide guidance to education leaders who seek to improve the achievement for all students in middle schools.

Research Questions

1. What is the relationship between the level of RTI implementation and years of RTI implementation in middle schools and student achievement in reading as measured by the cumulative scaled scores on the 2014 English: Reading Standards of Learning assessments given to students in grades 6, 7, and 8?
2. What is the relationship between the level of RTI implementation and years of RTI implementation in middle schools and student achievement in mathematics as measured by the cumulative scaled scores on all 2014 mathematics Standards of Learning assessments given to students in grades 6, 7, and 8?

Methodology

This non-experimental quantitative study used a hierarchical multiple regression analysis to determine the associations between the degree of implementing a response to intervention model and the length of time a middle school has been implementing response to intervention on school-wide student achievement on English: Reading and mathematics Standards of Learning assessments in Virginia while controlling for demographic variables of minority student populations, free or reduced lunch populations, and special education populations within each school. Independent variables for this study were the number of years each school implemented RTI and their overall implementation rating. Permission was requested and received (see Appendix A) to use an adapted version of the Self Assessment of Problem Solving Implementation (SAPSI) survey (Castillo et al., 2010). The adapted SAPSI (see Appendix B) was submitted to principals to measure the degree of RTI implementation for the 274 middle schools in Virginia and the length of time the school has been implementing RTI. The dependent variables were the combined school-wide scaled scores from the 2014 Virginia Standards of Learning assessments in English: Reading and mathematics for each school. Demographic information was combined with results from the adapted SAPSI and was linked to the student achievement in English and mathematics. The data obtained from the survey were regressed against each school's English: Reading and mathematics achievement on Virginia

Standards of Learning assessments from the Spring 2014 assessments. SOL achievement data are published annually on Virginia Department of Education's website and were downloaded for use in this study.

The design and regression statistical analysis in this study provided insight into the promise RTI holds as a school improvement model from the resulting predicting values (Segrin, 2010) determined from the association between the degree of implementation and length of time implementing RTI and student achievement in English: Reading and mathematics SOL assessments in Virginia. The predictive values of the association between RTI implementation in middle schools and school- wide student achievement can be used for guidance to education leaders who seek to improve the achievement for all students in middle schools.

Definition of Key Terms

Curriculum Based Assessment (CBA): an assessment that measures student performance on specific curricular criteria. CBA have three components: (1) close alignment to established curriculum; (2) occurs frequently; (3) data are used to make instructional decisions (Center on Response to Intervention, 2013).

Middle School: For the purpose of this study, middle schools are defined as schools that serve students in grades 6, 7, and 8 exclusively.

Problem Solving Model (PSM): a problem solving approach used to tailor an intervention to an individual student. (Center on Response to Intervention, 2013).

Progress Monitoring: process where a student's improvement or responsiveness to an intervention is measured to determine if adjustments in the instructional program are necessary (Center on Response to Intervention, 2013).

Response to Intervention (RTI): an approach to providing early academic and behavioral supports to children with learning and behavioral needs. Absent a single or widely practiced model, it is typically identified with having three tiers or levels of research-based interventions of increasing intensity of time or student teacher ratios (RTI Action Network, 2015).

Self-Assessment of Problem Solving Implementation (SAPSI): an assessment tool, originally adapted from the IL-ASPIRE SAPSI v. 1.6 developed by Loyola University Chicago, used to measure the level of implementation of Problem-Solving/Response to Intervention

practices within a school. The SAPSI was designed to be answered by School-Based Leadership Teams and contains 27 questions to assess three domains of RTI implementation (a) building consensus among key stakeholder; (b) developing the infrastructure necessary to support implementation; (c) implementing PS/RTI practices and procedures. Each question is scored on a scale of 0-4 (Castillo et al., 2010).

Standard Treatment Protocol: a research-based instructional program that is often scripted and intended for students who have academic or behavioral needs (Center on Response to Intervention, 2013).

Standards of Learning: Established by the Virginia Department of Education in 1995, the Standards of Learning established minimum learning and achievement expectations for Reading, Mathematics, Science, and Social Studies proficiency for grades K-12 in Virginia's public schools. Testing of the Standards of Learning began in 1998 in grades 3, 5, 8, and high school courses. Reading and Mathematics tests were added in grades 4, 6, and 7 in 2006. (Virginia Department of Education, 2013).

Universal Screening: process to identify students who may be at risk for poor learning outcomes by administering brief assessments to all students in a grade level. (Center on Response to Intervention, 2013).

Limitations

The researcher acknowledges several limitations in this study. The nature of self-reporting methods with surveys includes the potential influence of self-presentation bias (Cone, 2001). Utilizing school principals to measure RTI implementation levels relies on subjective assessments of RTI implementation levels recognizing that respondents may exhibit a bias regarding RTI implementation (Cone, 2001; Noell et al., 2005) in their schools and assumes the respondents are knowledgeable of the implementation levels within their building and are able to accurately recall those levels when completing the SAPSI. Castillo et al. (2010) recommended established school leadership teams complete the SAPSI as a part of their progress monitoring of the implementation and effectiveness of RTI within their buildings. For efficiency in gathering data from schools and to increase the number of participating schools, school principals were targeted for survey completion. This targeting practice may have influenced the reported accuracy of RTI practices with the participating schools. Finally, the response rate for this study

is low. Of the targeted schools in Virginia (274), only 20% (47) provided useable data for analysis within this study. This low response rate challenges broad application of this study's findings.

Delimitations

The selection and participation of middle schools in Virginia limited the scope and generalizability of the study. The population of schools studied was defined as schools serving students in grades 6-8 exclusively in an attempt to control variations in the population. This operational definition of middle school excluded all other grade combinations and restricted the population and participation size. This study provides a predictive analysis of the effect of implementing RTI in middle schools; however, it does not provide guidance on the process of implementing RTI within the school or school division. Finally, a hierarchical multiple regression (Kraha et al., 2012) was used to control for demographic variables associated with school-wide achievement-minority student population, free or reduced lunch population, and special education population (National Center for Education Statistics, 2013; Rothman, 2014; Sirin, 2005). The success of an individual school was based upon numerous elements that this study was unable to control or fully measure, any of which may contribute to the achievement of students within it walls. The demographic variables examined for this study were chosen due to their frequency in extant research related to school-wide achievement measures such as the NAEP and reports examining dropout rates across the nation.

Summary

Within the United States, an achievement gap in reading and mathematics performance exists among students of different ethnic groups on the National Assessment of Educational Progress (National Center for Education Statistics, 2013). The gap between White students and Black and Hispanic students appears at grades 4, 8, and 12 and has existed at all three grade levels since the first administration of the NAEP in 1971 (National Center for Education Statistics, 2013). According to the Programme for International Student Assessment (PISA) an achievement gap exists between the United States and several other member nations of the Organisation for Economic Co-Operation and Development (OECD) (Hanushek & Woessmann, 2010, Rothman, 2014). On the 2012 PISA, the United States scored near the average, placing

17th out of 34 nations, on reading literacy while performing below the average in mathematics literacy, placing 26th (Rothman, 2014). However, the potential economic gains from improving our nation's schools and reducing the dropout rate are estimated in the billions of dollars (Alliance for Excellent Education, 2013). This study will add to the research on school improvement and to the positive school-wide effects (Fisher & Frey, 2011; Prewett et al., 2012; Torgesen, 2009; Vaughn et al., 2010; Wanzek et al., 2011) from the implementation of Response to Intervention.

Organization of the Study

This study is organized into five chapters. Chapter 1 presents an introduction to the study by providing an explanation of the RTI process and a review of achievement gaps in our nation's schools while introducing the methodology for conducting the study. Chapter 2 presents a review of the literature related to RTI, its role in improving outcomes for struggling learners, its emergence in secondary settings, and the potential it holds for school-wide achievement gains. Chapter 3 details the methodology used to answer two research questions relating to the association between school-wide student achievement in English and mathematics, a middle school's degree of implementation, and length of time implementing RTI. Additional information regarding the quantitative research design, middle school population selection, instrument design, and regression analysis is presented. A presentation of the data and analysis is presented in Chapter 4, and Chapter 5 contains the summary, implications, and recommendations for future research.

Chapter 2
Literature Review

Structure of the Literature Review

The literature review provides a collection of research that details the growth, expansion, and evolution of Response to Intervention from an elementary school based special education identification process to school improvement model applied in secondary schools. The search process is described and followed by a discussion of the research describing gaps in achievement among students and the economic impact of high school dropouts. A general description of Response to Intervention follows with relevant research supporting its effectiveness. The literature review continues by describing RTI's success in school settings. Mirroring RTI's evolution chronologically, research supporting RTI's impact on individual struggling learners and its effectiveness in identifying students in need of special education is presented first. Following this description of RTI's narrowed focused in supporting individual students, support for a broader application of RTI- one as a school improvement model- follows. Finally, emerging studies describing the look and impact of RTI in secondary schools is summarized. The chapter concludes with a summary of the strengths and remaining questions surrounding response to intervention.

Search Process

The literature search process for this study relied heavily on the Virginia Polytechnic University Libraries services and Google Scholar to research keywords in various combinations. Keywords searched were as follows: response to intervention, responsiveness to intervention, response to intervention & special education, response to intervention & secondary schools. General searches were conducted on the websites of the Virginia Department of Education, National Center for Learning Disabilities, and the National Center on Response to Intervention to identify research on response to intervention and to define key words and essential elements of response to intervention. Reference lists of reviewed articles were closely examined to expand the search for articles germane to the study.

National and International Achievement Gaps

An achievement gap exists within our nation's public schools (National Center for Education Statistics, 2013). Historically speaking, achievement gaps are used to describe the difference in performance among racial and socio-economic groups within our nation's borders. Recently, an achievement gap between the United States and European and Asian countries has been exposed from results on the Programme for International Student Assessment (PISA) and the Trends in Mathematics and Science Study (TIMSS) international assessments (Hanushek & Woessmann, 2010; Rothman, 2014). These assessments, coupled with ongoing national assessments such as the NAEP demonstrate gaps in achievement between the United States and other industrialized nations as well as among various ethnic groups within the United States and reinforce the need for effective changes in our schools that meet the needs of all students.

The current debate surrounding the performance of U.S. students on national and international mathematics assessments centers on future competitiveness in the global marketplace and national security (National Mathematics Advisory Panel, 2008). The performance of U.S. students on the internationally administered TIMSS assessments in mathematics and science highlighted a performance gap between U.S. students and students in Asia (Gonzales et al., 2009). Results from the 2008 National Assessment of Educational Progress (NAEP), also known as the Nation's Report Card, indicate only 32% of our students were at or above the "proficient" level in mathematics at Grade 8 (Rampey, Dion, & Donahue, 2009). By Grade 12, only 23% of students were at or above the proficient level (Rampey et al., 2009).

The TIMSS measures the mathematics and science knowledge and skills of students at grades four and eight. According to the TIMSS 2007 study, the average United States mathematics score at grade four was higher than 23 and lower than 8 participating countries. Analysis by Gonzales et al. (2009) determined that all the countries outperforming the United States were located in Asia or Europe. By grade eight, the United States' performance was only better than 37 and worse than 10 other countries, all of which were located in Asia.

Results from the 2008 NAEP added to the findings from the 2007 TIMSS in demonstrating that significant gaps in mathematics performance remain among ethnic groups, school type, while showing an adding gap when considering parental education background (Rampey et al., 2009). Gonzales et al. (2009) reported that the effect size of the difference

between the U.S. White and Black students on the TIMSS is roughly the same as the effect size between the United States and Hong Kong SAR, the country with the highest estimated score. The largest effect size on the TIMSS, according to Gonzales et al., is between U.S. fourth-graders in schools with the lowest and highest poverty levels; it is 1.4 times the effect size between the United States and Hong Kong SAR. These existing mathematics performance gaps rise concerns because, "a strong grounding in high school mathematics through Algebra II or higher correlates powerfully with access to college, graduation from college, and earning in the top quartile of income from employment" (National Mathematics Advisory Panel, 2008, p. xii).

The Impact of High School Dropouts

In addition to the achievement gaps among student groups within our nation and between our nation and others on international assessments, high school dropouts and failing secondary schools create an impact on our nation's economy. Haynes (2014) reported that the share of jobs in the United States economy that required education levels beyond high school increased to 59% from 28% in the 25 years since 1973. During that same time span, the literacy performance of high school students on the NAEP has remained relatively flat. The Alliance for Excellent Education (2013) reported that increasing the graduation rate of the class of 2012 from 73% to 90% would create 8.1 billion dollars in increased annual earnings while creating nearly 66,000 new jobs to fuel the housing and auto industries.

Bridgeland, Dilulio, and Morrison's work in, *The Silent Epidemic: Perspectives of High School Drop Outs* (2006), shed light on the causes of dropping out of high school. Data gained from surveys of high school dropouts highlight many of the weaknesses in our middle and high schools. According to the authors, 35% of the dropouts surveyed reported failing grades being the primary cause for their leaving school while 45% reported being ill-prepared for the rigors of high school work. Nearly one-third of the respondents expressed doubts that they could have met their high school's requirements even with necessary efforts on their parts while 81% wanted better teachers. Nearly the same percentage felt smaller classes with more individualized instruction was needed to help students who struggled with learning. The scope of the dropout problem is significant. Stetser and Stillwell (2014) reported that for the 2011-2012 school year, only 80% of freshmen who began high school finished with a diploma four years later. The authors' finding that African American and Native American students finished high school at

rates below 70% while students with disabilities completion rate is below 60% is further indication of achievement gaps between majority and minority students.

The National Standards Movement to Improve Schools

The No Child Left Behind Act of 2001 (NCLB) was enacted based on successes reported by states such as Texas and North Carolina that utilized external accountability measures to drive student achievement (Lee & Reeves, 2012). The underlying belief in NCLB was that established, measurable standards driven by accountability through consequences would increase reading and mathematics achievement for all students (Lee & Reeves, 2012). However, much of the evidence regarding the effect of NCLB on student achievement remains mixed due in part to the complexity of the legislation and its implementation across the country (Lee & Reeves, 2012).

Lee and Reeves (2012) measured the impact of NCLB on overall math and reading achievement and on closing the achievement gap among several groups. Findings of increased achievement and narrowed achievement gaps in mathematics were tempered by findings in reading achievement. The authors found stagnate growth or declining levels of overall reading achievement and a widening of the achievement gap in reading since the implementation of NCLB. These findings, the authors noted, were especially troubling considering, "there were actually more favorable changes in instructional conditions for reading than for math (e.g., considerable investment in an early reading program)" (p. 224).

Drafted by the National Governor's Association (NGA) and the Council of Chief State School Officers (CCSSO), the creators of the Common Core State Standards (CCSS) sought to, "promote equity by ensuring all students, no matter where they live, are well prepared with the skills and knowledge necessary to collaborate and compete with their peers in the United States and abroad" (p. 1). The adoption of the CCSS marks a change from individual state standards with individual state assessments towards "high quality standards that are internationally competitive, and that will lead to improved achievement for America's children" (Schmidt & Houang, 2012, p. 294).

To determine the Common Core State Standards' potential for impacting student achievement in the United States and thereby closing the achievement gaps with other countries, Schmidt and Houang (2012) compared the CCSS to the standards of the highest achieving

countries on the TIMSS. The researchers also performed a regression analysis to predict how the implementation of the CCSS would impact state performance on the 2009 NAEP exam. Furthermore, their study investigated the level of congruence between the standards in place for the 2008-2009 school year and the CCSS. Their study revealed nearly an 85% degree of consistency between the CCSS and the mathematics standards of the highest performing nations on the TIMSS suggesting that the CCSS's focus, coherence, and rigor are comparable. Therefore the researchers hypothesized that states with a higher level of congruence with the CCSS would also have a higher level of achievement on the 2009 NAEP; however, no significant relationship was revealed. Two clusters of data lead the authors to hypothesize, "that those states in the group of 13 which on average had highly challenging standards-ones that had a high degree of coherence and focus with the CCSSM-did not on average have them become reality in terms of the content coverage that was actually implemented in the classrooms" (p. 305). The authors argued that the political decisions over established proficiency levels or cut points implicitly guide implementation:

> We postulate that higher cut points send a clear message to the teacher that the state expects them to fully implement the standards. Lower cut points by contrast send the opposite message to teachers-one that says, yes teach the standards but we do not expect your students to actually learn all of the material. (p. 305)

Schmidt and Houang's analysis revealed that increased rigor in the curriculum and standardization of a state's curriculum is not enough to increase student achievement. Their findings give further credence to the notion that improved instruction is essential to increasing student achievement and that higher cut scores on state assessments is key to sparking improved instruction.

Description of the Response to Intervention Process

RTI can be compared to medical models where initial screenings or inoculation measures are used to prevent larger, chronic health issues from manifesting (Duffy, 2007; Mellard & Johnson, 2007; Mellard et al., 2010; Mellard, McKnight, & Woods, 2009). When screenings reveal areas of concern, treatments are applied and assessed through tests for their effectiveness. A lack of response to treatment then warrants increased treatment procedures (Mellard & Johnson, 2007; Mellard et al., 2009). When applied to the education field via RTI, the multi-

tiered process is applied to preventing learning difficulties in children at an early age and in identifying students with learning disabilities who may be eligible for special education services through increasing instructional intensity via research-based interventions (Fuchs & Fuchs, 2006; Fuchs, Fuchs, & Stecker, 2010; Torgesen, 2007).

Implementation models for RTI are typically based on three levels; however, the actual implementation of the model can vary in schools (Brown-Chidsey & Steege, 2011; Fuchs, D. et al., 2010; Mellard et al., 2010; National Council on Response to Intervention, 2010). Despite the variations in specific implementation practices, research has shown that all RTI models contain the following four elements: (a) multiple level system for preventing student failure; (b) screening all students; (c) monitoring student progress; (d) utilizing data-based decision making for instruction, movement within the multi-level system, and disability identification (Brown-Chidsey & Steege, 2011; Fuchs, D. et al., 2010; Mellard et al., 2010; National Council on Response to Intervention, 2010). In practice, schools adopting RTI systematically use data to identify students who are not meeting established academic benchmarks, monitor their progress in the general curriculum, provide evidence-based interventions to targeted students, and adjust the intensity or nature of those interventions to meet the specific needs of targeted learners (Brown-Chidsey & Steege, 2011; National Council on Response to Intervention, 2010). In addition to the four common elements of RTI systems, effective RTI schools monitor the overall process and quality of interventions through fidelity checks and systematic professional development to improve tier one instruction and the quality of interventions provided (Chard, 2012; Mellard et al., 2012; Fuchs & Vaughn, 2012; Noell & Gansle, 2006).

"Even as the principle of multiple [levels] may seem intuitively simple" Mellard et al. (2010) explained, "operationalizing this principle can be very complex for schools" (p. 217). In summarizing the growth of RTI and the increased research supporting its application towards special education and reading education, Fuchs and Vaughn (2012) addressed the lack of assurance in the effective implementation of RTI in schools by questioning, "how extensively RTI has actually been implemented in schools and the extent to which those implementations represent tenable prevention models" (p. 195).

The most readily acknowledged aspect of RTI is its three levels or tiers of increasing instructional support that are often utilized to prevent student learning difficulties (Cortiella, 2006). Tier 1 is generally characterized as having high quality classroom instruction, screening

for all students, and large group interventions that will meet the needs of approximately 80% of all students (Brown-Chidsey & Steege, 2011; Cortiella, 2006; Torgesen, 2007; Torgesen, 2009; National Council on Response to Intervention, 2010). Tiers 2 and 3 of a multi-tier system are recognized by increases of instructional intensity by adjusting variables of instructional minutes, frequency of instruction, duration of intervention, instructional group size, immediacy of feedback, mastery requirements, number of response opportunities, number of transitions between classes, specificity of curricular goals, and instructor specialty (Mellard et al., 2010). Tier 2 intervention is applied along with Tier 1 instruction (Johnson et al., 2006) and typically occurs in groups of 2-6 students who are monitored frequently for progress towards established curricular goals (Cortiella, 2006; Johnson et al., 2006; Torgesen, 2007; Torgesen, 2009). Tier 3 intervention replaces Tier 2 and is characterized by increased instructional intensity through increased instructional time in smaller groups, more frequent monitoring of progress towards curricular goals (Mellard et al., 2010), and often indicates eligibility for special education services under the Individuals with Disabilities Education Act (Cortiella, 2006; Torgesen, 2007; Torgesen, 2009).

Adding to the complexity of implementation is the debate surrounding the purpose and goals of RTI. The National Center on Response to Intervention's brief, *Essential Components of RTI – A Closer Look at Response to Intervention* (2010), provided one perspective on the purpose in defining RTI as:

> [Integrating] assessment and intervention within a multi-level prevention system to maximize student achievement and to reduce behavioral problems. With RTI, schools use data to identify students at risk for poor learning outcomes, monitor student progress, provide evidence-based interventions and adjust the intensity and nature of those interventions depending on a student's responsiveness, and identify students with disabilities or other disabilities. (p. 2)

This special education-based definition of RTI has historically guided the spread of RTI in schools across the country. Its influence in special education was recognized when it was included in federal law as a method for determining individuals as Learning Disabled (Individuals with Disabilities Education Improvement Act, 2004). With numerous studies showing the positive effects of appropriately implemented tier one instruction on the number of students requiring interventions, the number of students being referred for and placed in special

education in elementary schools (Torgesen, 2009; Vaughn et al., 2009; VanDerHeyden et al., 2007), RTI's purpose and goals have expanded to include improved outcomes for all students while the implementation of RTI has spread to middle and high schools (Fuchs, L. et al., 2010; Mellard et al., 2012; Shinn, 2008; Shores and Chester, 2009; Vaughn et al., 2010). The evolution of RTI's benefits to all students and its expansion into secondary schools has outpaced the research defining the most effective structure for older students much less its effectiveness in improving school-wide achievement at all grade levels (Chard, 2012; Fuchs, L. et al., 2010; Fuchs & Vaughn, 2012, Mellard et al., 2012; Shinn, 2008; Vaughn et al., 2008).

RTI and Multiple Tiers of Intervention

Ardoin, Witt, Connell, and Koenig (2005) demonstrated that an application of the three-tiered model of interventions developed from the work of Fuchs and Fuchs (Fuchs & Fuchs, 1998) had multiple benefits for students in an upper level elementary classroom. Noting the lack of research attention on RTI in upper grades in general but more specifically on the "ecological validity and pertinence for the school-based practitioner" (p.364), the authors implemented a three tiered model of interventions in a 4th grade mathematics class to determine the effectiveness and efficiency of the RTI model. The three-phase study consisted of universal screening of all students, class-wide intervention, and small group intervention. Each phase of the three-phase model yielded benefits for student achievement from the RTI implementation. Reinforcing the need for universal screening, Phase I of the study revealed a class-wide deficit in mathematics fluency. Phase II, the class-wide intervention, improved the fluency and accuracy of all but five students who then received small-group intervention in Phase III. Four of the five students were then able to make adequate progress in the small-group setting with the authors recommending the remaining child receive specialized instruction through special education services. In this study, the authors were able to show that the introduction of a simplified RTI model into the upper elementary grades held benefits for multiple students who received needed interventions, aided in the identification of a student who failed to respond appropriately to interventions, and that interventions for all but the neediest child could be accomplished through slight adjustments in the classroom instruction.

Mellard et al. (2010) examined 41 schools' methods for increasing the instructional intensity provided to students. The authors described the use of ten methods or variables:

minutes of instruction, frequency of instruction, duration of intervention, instructional group size, immediacy of feedback, mastery requirements, number of response opportunities, number of transitions between classes, specificity of curricular goals, and instructor specialty. The authors found that while 73% of schools reported providing reading instruction five days weekly, schools were less consistent in increasing the amount of time (minutes per student per week) provided to students as students ascended the tier levels. Surprisingly, the authors noted, "only a few schools reported Tier 3 as more time intensive than Tier 2 and many reported Tiers 3 and 4 as less time intensive than Tier 2" (p. 219). In their conclusion, the authors note, "intensity is the operational word. If the levels do not offer increasingly intense instructional opportunities and they are not delivered with fidelity, they are wasted" (p. 224).

Roberts, Vaughn, Fletcher, Stuebing, and Barth (2013) contributed to the research supporting the effects of multiple tiers of intervention in their examination of the effect the Response to Intervention process had on struggling middle school readers. Moving away from smaller, investigator-led studies that examined the effects of reading interventions in one year (Vaughn et al., 2008; Graves et al., 2011) and multiple years (Vaughn et al., 2010), the authors studied the effects multiple tiers of intervention had on 768 struggling readers. Drawn from seven middle schools located in two different cities, students identified as struggling readers based on their state assessments were randomly assigned to an RTI process or to a business as usual (BaU) condition. Students in these two groups and a group of students reading at typical levels were monitored for the next three years to determine their growth in reading skills. The demographic profiles of each group were statistically similar.

Roberts et al. (2013) found that students who participated in the RTI process and received varied interventions based on individual need outperformed students in the BaU condition. An effect size of .26 was documented and, although in the small-to-medium range, was found to be statistically significant. In explaining this gain, the authors noted that the BaU group was not a traditional "control" group in that students received additional support designed to improve performance on the state administered tests. Additionally, the authors found that the treatment students experienced statistically greater growth, as determined by a comparison of their growth slopes, than the typical readers in the study. While the results are encouraging, the authors noted "a considerable gap remained at the end of eighth grade between typically achieving readers and the group of treatment condition students" (p. 250).

From this study, Roberts et al. (2013) made several suggestions. First, struggling readers may require more than one school year to realize significant gains over comparable students. Second, a response-based, tiered model for interventions may represent a better model than the BaU intervention design for meeting the needs of struggling readers. In reflecting on prior research and the findings this study, the authors surmised:

> Using smaller groups or providing additional instructional time improves student outcomes only to the extent that these more intense opportunities are used well. In the absence of evidence-based intervention, providing greater instructional intensity during the school day may be counterproductive and even wasteful (p. 251).

Lastly, the authors suggest that while more successful interventions may occur with students prior to entering traditional middle school grades, effective implementation in secondary schools would require "considerable professional development, ongoing coaching and (possibly) repurposing of some structures" (p. 251).

RTI and Special Education

In viewing RTI as a tool to reform the daily delivery of instruction, Fuchs, D. et al., describe a "bottom-up" approach (2010 p. 305) that relies on instruction that is "more individualized than standardized; more flexible than formal; and as recursive as necessary to accelerate student learning" (p. 305). The overlap between the two applications for RTI lies in tier one where all students are routinely screened for appropriate academic progress and, where necessary, adjustments are made to the general classroom instruction to meet the needs of approximately 85% of students (Castillo et al. 2010; Cortiella 2006; Mellard & Johnson, 2007; National Center for Learning Disabilities, 2011). From this application of RTI that researchers have suggested RTI holds promise for improving the outcomes of all learners (Shinn, 2008; Mellard et al., 2012) and its application as a school improvement model (Mellard et al., 2012, Shores & Chester, 2009).

RTI's place in special education lies in the promise that effective, early intervention will prevent many low achieving students from being misidentified as needing special education and creating a "more meaningful identification" (p. 302) for those who are in need of more intensive and specialized instruction for success (Fuchs, D. et al., 2010). The premise is that by matching research-based interventions to struggling learners and doing it at the appropriate intensity level,

many struggling learners will have their needs met and negating the need for special education services. Fuchs, D. et al. (2010) in debating the role of RTI in special education suggest the Standard Treatment Protocol (STP) application of RTI where decision-making and progression of interventions are standardized through a reliance on research-based interventions (applied with high levels of fidelity) for established time periods. By establishing a "replicable, linear, and time-sensitive process with fewer tiers of instruction" (p. 305) RTI can improve two key issues with special education identification: early intervention with struggling students and greater accuracy in identifying students who truly need specialized instruction by moving away from the established discrepancy model for special education identification.

The 2004 reauthorization of the Individuals with Disabilities Education Act (IDEA) added language that moved states away from requiring a severe discrepancy as the sole method for the identification of a Specific Learning Disability (SLD) in children. In granting that states, "may use a process that determines if a child responds to scientific, research-based intervention" (20 U.S.C. §1414(b) (6)) as part of the SLD identification, the authors of IDEA blurred the procedures for identifying SLD and created confusion among State Education Agency's (SEA) tasked with revising policies. The resulting regulations in 2008 required states to allow RTI as a method for identifying SLD in and precluded states from requiring the severe discrepancy model as the means for identification of SLD. In mandating an alternative path to identifying SLD, the reauthorization of IDEA allowed states to set alternate, and often confusing, policies for the identification of students in need of special education services.

Zirkel and Thomas (2010) attempted to develop a "snap shot" of relevant state laws related to the identification of SLD following the reauthorization of IDEA. Specifically, the authors attempted to determine which states, "opted for mandating RTI, permit[ed] or prohibit[ed] severe discrepancy" (p. 58) and how the state managed its mandate for changing the SLD identification procedure. Zirkel and Thomas found that several states responded to the federal mandate to allow RTI in the identification process by adopting policies and guidelines rather than through legislation or regulations while other states' policies still awaited formal revision nearly two years after the IDEA regulations were released.

Zirkel and Thomas' major finding was that 12 states had moved from severe discrepancy to RTI as the required approach for SLD identification. Within those 12 states however, a continuum of implementation emerged where the severe discrepancy model was nearly or

completely prohibited to where some combination of the two methods were allowed. The attempt to allow flexibility for SEA's and LEA's has created confusion among states as they navigate the complexity and limited research on the effectiveness of RTI.

VanDerHeyden et al.'s (2007) study examined the systemic effects of RTI on the identification of students for special education. In building on studies that examined elements of the RTI process applied by researchers, VanDerHeyden et al. analyzed practitioner applied models over multiple years and evaluated the implementation through examination of the number of special education evaluations conducted, percentage of students who eventually qualified for services, and a comparison of the gender and race of students found eligible before and after RTI implementation. While acknowledging an established research base supporting the success of researcher-applied RTI elements, the authors questioned the applicability of the RTI model effectiveness when implemented by school-based practitioners. Citing Noell et al. (2005), VanDerHeyden et al. acknowledged that, "intervention integrity has shown uniformly dismal results with implementation of only the intervention component" (p. 226).

The authors' study examined the effects of implementing an STP model in five elementary schools over periods of two years. Baseline data on the number of referrals to special education, number of students found eligible for special education, and the gender and race of qualifying students were compared pre and post RTI implementation. While baseline levels for each question varied among the schools, VanDerHeyden et al. found that the number of evaluations for special education decreased for each school while the likelihood of students being found eligible increased under RTI. The authors also noted that RTI had a positive effect on the disproportionality of males being placed in special education.

A key question in VanDerHeyden et al.'s study was the practicality of school-based personnel being able to successfully implement an STP model of RTI within their schools. The researchers provided training to all staff members within the schools prior to implementation. The results from this study builds a critical link from researcher-based implementation of elements of RTI to practitioner-based implementation of the complex RTI process, it is important to note that researchers remained in the buildings to conduct fidelity checks of the implementation of universal screening assessments and intervention programs. As schools embark on RTI implementation independent of researcher support, fidelity of implementation remains an important variable for examination.

School-Wide Impact of RTI

In one of the first studies to document RTI with increases in school-wide student achievement, Torgesen (2007) noted the importance of "strong instruction from the classroom teacher coupled with robust interventions available when needed" (para 5). Torgesen's study reaffirmed the role of each of the key elements within RTI held in schools participating in Reading First in Florida and included professional development as an integral part of RTI's success in helping all students. While Torgesen (2007) noted gains made by all students, he argued that RTI should be used by educators "[to] provid[e] instruction to young students that can help to prevent the emergence of early reading or other learning difficulties" (p. 1); however, Vaughn et al. (2008) argued for a broader role for RTI "to raise the achievement levels of *all* students . . ." (p. 338). Vaughn et al.'s goal of RTI is reinforced by Shores and Chester (2009) and by Shinn (2008) who stated that RTI, "is really about overall school improvement and significant systems change" (p. 4).

While most of the studies exploring RTI's impact on older students have been investigator-led, small-scale studies examining gains made by students receiving interventions in elevated tiers (Roberts et al., 2013; Pyle & Vaughn, 2012; Scammacca et al., 2007; Vaughn et al., 2008; Vaughn et al., 2010) few studies have examined school-wide effects from RTI implementation. Torgesen's (2009) examination of Florida's implementation of RTI in Reading First schools showed, on a large-scale, practitioner-implemented basis, the improvements made by students. Specifically, he noted a significant reduction of students being identified as Learning Disabled within the first three years of implementation. Additionally, Torgesen noted the number of students performing in the 5th, 10th, and 20th percentiles in reading dropped as well.

Florida's implementation of the Reading First program was a large-scale attempt to implement the RTI instructional model in elementary schools that served traditionally at-risk students (Torgesen, 2007; Torgesen, 2009). The 318 schools that participated in the program focused on RTI-based areas of improvement by providing high-quality, differentiated instruction, using reliable screening and progress monitoring, and providing interventions to struggling learners (Torgesen, 2009). Within the first three years of implementation, dramatic reductions in the identification of students as Learning Disabled were reported in Kindergarten (81%), Grade 1 (67%), Grade 2 (53%), and Grade 3 (42%) (Torgesen, 2007; Torgesen, 2009). Beyond the

identification of learning disabilities, the Reading First schools saw reductions in students reading below the 20th, 10th and 5th percentiles on a nationally standardized test of reading comprehension in Grade 1, 31%, 33%, and 30% respectively, and in Grade 2, 30%, 41%, and 30%, respectively (Torgesen, 2007).

Building on the momentum to shift RTI's purpose from identifying students needing special education services to school improvement, Shinn (2008) and later, Shores and Chester (2009), proposed RTI held promise as a means for improving schools for all students. In their qualitative case study of the implementation of RTI in a high school, Fisher and Frey (2011) found, while noted the challenges of implementing the RTI in a high school, that the efforts of implementation, reaped dividends in the form of improved achievement, attendance, grade point averages and a decrease in special education referrals. Mellard et al.'s (2012) study began to fill the void in research on school-wide outcomes from RTI implementation. While carefully screening the participating middle schools for high RTI implementation levels, the researchers documented student growth in reading above the norms in four of the five schools.

Mellard et al.'s (2012) study examining the school-wide effects of RTI on reading achievement in elementary schools adds to Torgesen's (2009) research supporting RTI's impact for all students. To measure school-wide impact, the authors examined the rate of improvement from benchmark scores in the fall to the spring of the selected schools and compared their rates of improvement against the normal growth rate established by the assessment instrument. Their findings supported the use of RTI to improve school-wide achievement in reading by showing that four of the five schools examined outperformed the expected norm for reading growth. The authors noted three additional findings. First, three of the five schools that exceeded the norm in the fall, increased their distance over the norm in the spring measure. Second, the one school that performed well below the norm in the fall, made "substantial gains that closed the gap" (p. 28) by the spring. Finally, the lone school that failed to exceed growth rates were actually above the norm in the fall but performed at the norm for the spring assessment.

Mellard et al.'s (2012) study of RTI's school-wide effects is relevant beyond the authors' finding of increased growth in elementary reading scores. Recognizing the importance of examining schools that implemented RTI, the authors notes, "Identification of schools actually practicing RTI was perhaps the mot important aspect of our study design . . . Therefore, we performed a broad search and evaluation process prior to selecting the schools addressed in this

study" (p. 18). To be included in the study, schools were evaluated by fellow RTI researchers on the school's implementation of several of the key elements of RTI. By only including schools determined to have high levels of RTI implementation (total implementation scores greater than 80% and greater than 75% on the LD identification aspect of the survey) in the school-wide achievement analysis, the authors were able to examine the impact of full RTI intervention on student achievement. Additionally, the authors' examination of the fidelity of implementation exhibited by the participating schools showed the highest fidelity ratings belonged to the school with highest growth rate.

RTI in Secondary Schools

Research on the implementation of RTI in middle schools and high schools remains scant (Fuchs, L. et al., 2010; Shinn, 2008; Prewett et al., 2012; Vaughn et al., 2008). Vaughn et al. (2008) attribute the lack of clarity in effectiveness on RTI models to the complexity of reading related issues experienced by older students. Fuchs, L. et al. (2010) cite "scheduling problems" and "compliance issues often encountered when working with adolescents" (p. 22) as a cause for few secondary studies. However, Vaughn et al. (2008) explain, " the goal of any RTI approach is to raise the achievement levels of all students, which requires a multi-tiered approach beginning in general education settings that provides increasingly intense and differentiated interventions for students who struggle with reading and learning from text" (p. 338).

In an attempt to fill a void in research regarding middle grade students, Vaughn et al. (2010) examined the effectiveness of a year-long reading intervention program with sixth grade students. Students from seven middle schools in Texas qualified for intervention based on their below-proficiency score on the recent state-wide assessment (Texas Assessment of Knowledge and Skills). All struggling readers and a random sample of typical readers from the sampled schools were selected for the study. The students identified as struggling readers were randomly assigned to the researcher-provided intervention or to a comparison group. The year-long, Tier 2 intervention focused on word recognition, vocabulary, fluency, and comprehension was segmented into three specific skill focused phases of varying lengths. Intervention was administered daily for approximately 50 minutes and was administered by interventionists who received nearly 70 total hours of professional development from the researchers prior to and

during the study. Vaughn et al. (2010) noted small gains by the treatment group over the comparison group in word attack, spelling, comprehension, and phonemic decoding efficiency.

Vaughn et al.'s study differs from previous research in three important areas. First, the Tier 2 intervention duration was longer suggesting a leaning towards a problem-solving model style of RTI. Second and third, extensive professional development and instructional coaching was provided to the Tier 2 comparison group and to the Tier 1 teachers. In an attempt to examine struggling readers in a middle school RTI framework, the researchers noted, "all students in all classrooms may have benefited from professional development introduced to their content area teachers" (p. 17).

Vaughn et al.'s 2010 study was extended to a three year, longitudinal study to examine the effect of implementing a three tier model of intervention. Treatment students who, through minimal responsiveness to interventions, progressed through increasingly intensive interventions outperformed students in a comparison group (Pyle & Vaughn, 2012). Pyle and Vaughn (2012) suggest from their study that, "this application of RTI is fundamentally different from the implementation RTI at the elementary level. It can be concluded that the approach to instruction and intervention is conceptually different in an RTI model with secondary students" (p. 282).

The success of reading intervention at the secondary level was further reinforced by Graves et al.'s (2011) work with urban sixth grade students. The authors' examination of RTI and Tier 2 reading interventions for struggling middle school showed greater effects than Vaughn et al. (2010) for students receiving intervention. Albeit smaller in scale and in duration, Graves et al. showed a significant difference ($F(1,49) = 5.08$, $p < .005$, $\eta_p^2 = 0.094$, $d = 0.14$) in oral reading fluency between a treatment group of 24 students and a control group of 27 students (2011). The standardized mean difference improvement of 30% between the treatment group over the control group in oral reading fluency was not observed in the measures of comprehension ($F(1,46) = 0.07$, $p = 0.78$, $\eta_p^2 = 0.002$, $d = 0.001$).

Building on Vaughn et al.'s (2010) study, Wanzek et al. (2011) examined the efficacy of Tier 2 reading interventions provided to students with learning disabilities (LD). Again noting the desire to improve reading instruction for all students in the building, basic professional development was provided to all teachers while the intervention teachers received extensive and on-going training throughout the year-long study (Wanzek et al., 2011). Students randomly assigned to the treatment group received a supplemental reading class in addition to their regular

education and special education classes. Control group students attended a regularly scheduled elective class instead of the supplemental reading course. The class of 10-15 students met daily for 50 minutes in three skill-focused phases during the course of the entire school year. One moderately sized significant difference ($F(1,117) = 6.68$, $p = .011$, $\eta^2 = .018$) in the Sight Word subtest on the Test of Word Reading Efficiency (TOWRE) was observed between the intervention and control groups. No significant results were observed in passage comprehension, word attack, or letter-word identification between the two groups of LD students. Wanzek et al. also noted that, "[f]our months after the intervention was completed, the treatment groups still significantly outperformed the comparison group on sight word fluency" (p. 83). However, the researchers lament, "[d]espite some of the accelerated gains in the treatment group, many students in both [groups] demonstrated reading outcomes well below expected grade levels at posttest" (p. 84).

Prewett et al. (2012), used a multi-phase method collective case study approach to describe how middle schools began implementing RTI, the issues these schools faced with implementation, and suggested that, "middle schools are capable of implementing a fluid multilevel instructional system complete with academic and behavioral screening, progress monitoring, data-based decision-making, multilevel instruction and fidelity of instructional practices" (p. 146). Specifically, the authors interviewed middle schools in an attempt to gauge their implementation of (a) effective general education instruction; (b) universal screening; (c) progress monitoring; (d) data-based decision-making; (e) tiered levels of intervention; and (f) fidelity of implementation of the interventions.

One key finding was that all the middle school administrators who met criteria for practicing RTI ($n = 40$) reported their purpose for implementing RTI was to "close achievement gaps by providing remediation for students struggling with reading and mathematics basics" (p. 139). The authors found a majority of schools reported practicing multiple universal screenings during the year (73%) in reading (100%) and in mathematics (90%). Although most schools did not monitor tier one progress, 63 percent monitored progress in tiers two and three. All administrators reported focusing on improving tier one instruction although their methods to improve varied. While all schools reported having multiple levels of intervention, some variety existed when the interventions occurred during the day (common intervention block or during the elective block).

Fisher and Frey's (2011) high school RTI implementation case study further explored the expansion of the RTI process into secondary schools. In reviewing the research related to RTI, the authors noted two broad concerns. First, the bulk of data on RTI were born of large research centers with significant support led to questions of its practicality of its implementation by school practitioners. Second, the majority of RTI research has focused on students at the elementary level. By engaging in a qualitative study, the researchers attempted to answer two key questions: (a) As RTI is implemented in one high school, what happens to student achievement? and (b) How are interventions organized and delivered in a high school that focuses on RTI as a school improvement process?

Fisher and Frey collected field notes during 56 days over the two-year period of observation of Carver High School. Their data were collected by observing classrooms, staff development sessions, faculty meetings, and individualized education program (IEP) meetings. Each classroom was observed three times on unscheduled days with each visit lasting between 20 and 55 minutes for a total of 112 classroom observations. Eighty-seven pages of field notes were filled from observing staff development sessions and faculty meetings. In addition to each IEP and Section 504 meeting, every problem-solving and student-study team meeting was attended by one of the observers. In all, 55 non-classroom observations were conducted. At least one interview was conducted with each teacher during the second year of the study. Interviews focused on the growth of RTI in the school, the teacher's implementation efforts, and the successes and challenges experienced with implementation. Initial interviews lasted 30-45 minutes, were conducted during the school day and were recorded and transcribed later. The semi-structured interview guide covered three broad topic areas: the individual's teaching experience, their perception of RTI at Carver High, and the teacher's experiences with students who struggle academically. Of the teachers who provided extensive information, nine were interviewed a second time to capture additional examples.

Qualitative data were analyzed and categorized into broad areas for the development of themes. Theoretical constructs emerged during data analysis using a constant-comparative method. Five themes were identified, explained, and detailed with quotes from interviews. Quantitative data analysis used measures of central tendency and across-group comparisons to examine relationships with grade-point averages and attendance rates. Frequency measures were

used to examine the referral rate for special education while student achievement was measured using changes in state test scores.

The Fisher and Frey identified the following five themes from their two years observing the implementation of RTI at Carver High School: (a) focus on quality core instruction; (b) use course competencies to monitor student progress; (c) schedule intervention to supplement, not supplant, core instruction; (d) dedicate resources to support intervention efforts; and (e) adopt a school-wide approach to RTI to maximize intervention impact. Although the authors did not attribute the student achievement and other gains identified through the quantitative analysis solely to the implementation of RTI, the gains are nevertheless noteworthy. Overall grade point averages (GPA) increased significantly from 2.89 to 3.36 ($t = 12.58$, $df = 742$, $p < .001$). More importantly, the GPA for students living in poverty ($t = 16.84$, $df = 414$, $p < .001$) and students with disabilities ($t = 7.26$, $df = 61$, $p < .001$) experienced the largest gains during the two-year period. Attendance rates increased from 90.4% to 95.6%. Though the gain were noticeable by the staff members, it was not statistically significant. One staff member noted, "[w]e do a lot in one day, so they don't want to miss. School's interesting now, and they do real work in every class. In fact, I get texts during every break that my students would rather be at school" (p. 110). Fisher and Frey noted that 11.5% of students across the country have an IEP while only 8.5% of the students had an IEP at the end of the observation period. Referrals to special education were reduced from a baseline of 17% of the student population to only 3% in the final year of the study. One of the comments noted by the researchers explained the school-wide approach to RTI theme's impact with special education referrals, "I used to refer students to special education when I needed help with them. Now I have that help, and I am part of that help" (p. 110).

Fisher and Frey's study accurately addressed the limitations of the study. By observing only one urban high school in the southwestern portion of the United States with 444 students enrolled in grades 9-12 their findings are not generalizable. However, the school's demographic composition did represent many of the challenges facing schools across the U.S. Sixty-two percent of students received free or reduced-priced lunches, 44% were Latino or Hispanic, 22% were Black, 16% were Asian, and 18% were White. Additionally, 70% of the students spoke a language in addition to English. Despite the size of the school investigated, this qualitative study added to the body of growing research supporting the implementation of RTI. Most importantly, Fisher and Frey's study filled a void in the research on RTI implementation in secondary

schools. The authors addressed the two main focal points of RTI implementation: school improvement and identification for special education.

Summary

Research on RTI has been conducted at the elementary level on special education identification (Berkeley et al., 2008;Burns et al., 2004; Fuchs, Fuchs, & Compton, 2004; VanDerHeyden et al., 2007) and on multiple tiers of intervention in math and reading (Codding et al., 2011; Mellard et al., 2010). VanDerHeyden et al. (2005) suggested RTI implementation in elementary schools held the potential benefit of, "increased achievement school-wide, because struggling children are identified proactively and immediate help is provided" (p. 339). Torgesen's (2009) study of the three-year implementation of RTI in 318 Reading First schools in Florida expanded the scope of analysis of RTI by examining a large sample of elementary schools and the school-wide effects of the model.

As middle and high schools implement RTI in an attempt to better serve students, the research has followed. To date, quantitative studies in middle schools have examined the effects of tier 2 reading interventions in one year (Graves et al., 2011; Vaughn et al., 2008; Wanzek et al., 2011) and across multiple years (Pyle & Vaughn, 2012). Scammacca et al. (2007) noted positive gains for older students with reading difficulties in their meta-analysis of research on reading instruction for adolescent struggling readers while Gersten et al.'s (2009) practice guide from the Institute of Educational Sciences suggests benefits from applying RTI best practices in mathematics interventions at the middle school grades. Qualitative studies have explored the implementation challenges facing middle and high schools (Fisher & Frey, 2011; Prewett, et al., 2012).

The evolution of RTI from a means of preventing and identifying special education services to one of improving achievement outcomes for all students has combined with its expansion to secondary schools to create an assumption that RTI can be an effective school improvement model for secondary schools to improve student achievement in reading and mathematics; however, research has yet to validate the presumed impact. This dissertation study further examined the extension of RTI from its roots in special education at the elementary school level to its application as a school improvement tool in secondary schools. Inherent to this transition is the shift in philosophy from a standard treatment protocol for special education

eligibility to the problem-solving model to increase content acquisition for older struggling learners. A discussion of the research methodology used to examine these questions follows.

Chapter 3
Methodology

Purpose of the Study

The purpose of this study was to measure the association between school-wide student achievement on the English and mathematics SOL tests and the degree of implementation and length of time implementing RTI in Virginia middle schools. To meet this purpose, this study examined the association between a middle school's length of time and degree of implementation of RTI and student performance on the Virginia English: Reading and Mathematics Standards of Learning (SOL) tests administered to students in grades 6, 7, and 8. Principals from 273 Virginia middle schools serving grades 6 through 8 exclusively were surveyed using an adapted version of the Self Assessment of Problem Solving Implementation (Castillo et al., 2010), a Likert-like scale. Results of the survey were regressed against the school-wide student achievement on the SOL tests in English and mathematics. Recognizing that RTI is a complex process (Fuchs & Deshler, 2007; Mellard et al., 2010; VanDerHeyden et al., 2005), some secondary schools may have implemented parts of the process and not others. Analyzing the length of time a school had implemented RTI and the collective effects of the key elements of RTI - universal screening, progress monitoring, multiple tiers of instructional support, data-based decision-making, and professional development elements - on student achievement in English: Reading and Mathematics in the middle grades provides guidance to education leaders who seek to improve the achievement for all students in middle schools.

Research Design

Although RTI may look slightly different at each school (Mellard et al., 2010), the National Center on Response to Intervention (2010) explained that all RTI models contain the following four elements: (a) multiple level system for preventing school failure; (b) screening of all students; (c) monitoring student progress; and (d) utilizing data-based decision making for instruction. RTI, like any system change process, is complex and dynamic requiring ongoing assessment to inform implementation efforts (Castillo et al., 2010; Fixsen, Naoom, Blase & Wallace, 2007; Noell & Gansle, 2006). Sarason (1990) and Fixsen et al. (2007) argue that the implementation of any school improvement initiative is critical to the effectiveness of the

intended school improvement initiative. Acknowledging that middle schools across Virginia may be at varying stages in their implementation of RTI, this study proposed an ex post facto survey design to measure the association between the degree of implementation and the length of time a school has implemented RTI on the achievement of middle school students.

Independent variables for this study were the length of time schools had implemented RTI and their collective level of RTI implementation as measured by the adapted SAPSI. Dependent variables for student achievement were the collective scaled scores on the English: Reading and mathematics Standards of Learning assessments for grades 6 through 8 as reported by the Virginia Department of Education. All mathematics assessments were included to account for variations within school curricula configurations. Four key elements of RTI were derived from state and national implementation guides as well as from the extant literature regarding RTI. These four elements - multiple tiers of instruction, data-based decision-making, universal screening of students, and progress monitoring of intervention effectiveness - were further divided into three to five descriptors for reliability of measurement by the adapted SAPSI. The SAPSI measured the implementation of the key elements of RTI as they existed across three domains: consensus building, infrastructure development, and implementation. Additional demographic variables for free and reduced priced population, minority student population, and special education population were included in the analysis for control for the potential confounding on student achievement in schools. Participating middle school principals were surveyed to determine their school's degree of RTI implementation during the 2013-2014 school year and to determine the length of time each school had been implementing RTI. Overall RTI implementation rating scores and total years implementing RTI for the school were regressed against the school-wide pass rates on the 2014 Standards of Learning (SOL) tests in English: Reading and mathematics.

Research Questions

The following research questions were proposed for this study:

1. What is the relationship between the level of RTI implementation and years of RTI implementation in middle schools and student achievement in reading as measured by the overall scaled scores on the English: Reading Standards of Learning assessments given in grades 6 through 8?

2. What is the relationship between the level of RTI implementation and years of RTI implementation in middle schools and student achievement in mathematics as measured by the overall scaled scores on the mathematics Standards of Learning assessments given in grades 6 through 8?

Population Selection

For this study, middle school was defined as a school that exclusively serves students in grades six through eight. A review of the Virginia Department of Education's website revealed 274 schools in Virginia meeting this definition. Schools with other grade configurations were excluded from this study in an attempt to standardize the population. After excluding the researcher's school, the remaining 273 schools meeting this definition were targeted for this study in an attempt to capture a broad understanding of the degree of RTI implementation in middle schools across Virginia, the length of time it takes schools to fully implement RTI and the association that RTI implementation has on school-wide student achievement. The 273 schools were found in 90 different school divisions. Research approvals were obtained from 37 school divisions resulting in 94 surveys being sent to middle school principals. Surveys were returned from 56 principals.

Data Collection Procedures

School-wide achievement was measured by the school-wide scaled scores in English: Reading and mathematics. Student achievement data and demographic data for each school are published annually on the Virginia Department of Education website and was downloaded in an excel format to the researcher's password protected laptop. An adapted version of the Self Assessment of Problem Solving Implementation (SAPSI) was utilized as the survey instrument to measure the degree of implementation of RTI and the length of time schools have been implementing RTI. Qualtrics, an online survey instrument available through Virginia Tech was utilized to distribute and administer the SAPSI to superintendent approved principals. Student achievement and demographic data for each school were aligned with their data from the SAPSI. Each school was then assigned a numerical code to provide anonymity. Coded school data was uploaded to SPSS (IBM, 2011) to perform the regression analysis and other statistical analyses.

Instrument Design

The Self Assessment of Problem Solving Implementation (SAPSI) survey (see Appendix B, developed by the Florida Statewide Problem Solving and Response to Intervention Project and approved for use for this survey (see Appendix A) was adapted and submitted to middle school principals across Virginia. Castillo et al. (2010) described the SAPSI as, "a progress monitoring tool used to assess the extent to which schools are making progress toward full implementation of problem solving / response to intervention practices" (p. 14). The SAPSI is a self-reporting instrument designed to follow the school change model adopted by the National Association of State Directors of Special Education (NASDSE) that measures consensus, infrastructure, and implementation of initiatives for school change (Castillo et al., 2010). As implemented by the Florida Statewide Problem Solving and Response to Intervention Project, the SAPSI serves a dual purpose: (a) to assess current levels of consensus, infrastructure development, and implementation of the Problem Solving model of RTI and (b) to assist educators in assessing the ongoing implementation and adaptation of RTI within their schools.

The 27-item self-assessment measured the extent that schools are building consensus for RTI within their school community, developing the requisite infrastructure for implementation of RTI, and implementing key RTI practices and procedures (Castillo et al., 2010). Responses to each item were scored by respondents on a scale of 0 to 3 where: 0 = Not Started (the activity occurs less than 25% of the time); 1 = In Progress (the activity occurs approximately 25% to 74% of the time); 2 = Achieved (the activity occurs approximately 75% to 100% of the time); and 3 = Maintaining (the activity has been achieved and continues to occur approximately 75% to 100% of the time). For the statistical analysis, scores on the SAPSI were converted from a 0 – 3 scale to a 1 – 4 scale. Although grouped under different category names, analysis of the SAPSI reveals alignment among the four elements of RTI discussed earlier in this chapter and with the SAPSI categories of building consensus, developing infrastructure for implementation and implementing key RTI practices.

For use in this study, the SAPSI was adapted in four ways. First, as this study examined the effects of RTI on academic achievement for students, references to behavioral implementations were removed. Second, Castillo et al. (2010) recommended the SAPSI be completed by established school leadership teams as a part of their progress monitoring of the on going implementation and adaptation of RTI in their buildings. For efficiency of gathering data

from schools and to increase the number of participating middle schools, school principals were targeted for survey completion. Third, questions were added to determine the length of time a school had been implementing RTI and to identify the participating school so that survey results could be linked with SOL results. Finally, the SAPSI was modified for electronic distribution via Virginia Tech's site license for Qualtrics, a web-based surveying program.

Instrument Validation

The content validity and reliability for the Florida Statewide Problem Solving and Response to Intervention Project's version of SAPSI was documented in the Problem Solving / Response to Intervention Evaluation Tool Technical Assistance Manual (Castillo et al., 2010). Castillo et al. (2010) reported that content validity was determined by a review of the domains within RTI within the literature and after comparing the SAPSI to other instruments used to measure the domains of RTI. Internal consistency reliability for each domain was derived from an administration of the SAPSI among 34 schools in 2010 with the following results: Consensus ($\alpha = .64$), Infrastructure Development ($\alpha = .89$), and Implementation ($\alpha = .91$). Content reliability and validity were reassessed using Cronbach's α and are discussed in Chapter Four of this report.

Data Treatment and Management

The following procedures were used in collecting, storing, and managing the data for this study. After receiving Institutional Review Board (IRB) training (see Appendix C) and approval from the Virginia Tech IRB (see Appendix D), a letter seeking permission to survey middle school principals within their divisions was sent to all Virginia superintendents (see Appendix E) whose division contained a middle school serving grades 6 through 8 exclusively. Once approval was secured, an adapted version of the SAPSI and request to participate in the study (see Appendix F) was emailed to each middle school principal. A reminder letter (see Appendix G) was emailed five days after initial contact with a second email reminder sent five days following the first reminder. Survey data were downloaded from Qualtrics and stored on a password protected laptop and an external hard drive accessible only to the researcher. School names were necessary initially to link the school's survey data with its demographic and student

achievement data. Once the data were aligned, each school was assigned a three-digit identifier to protect anonymity and the data were uploaded to SPSS for statistical analysis.

Middle school demographic and performance data are published annually on the School Report Card for each school by the Virginia Department of Education (VDOE) and was obtained via the department website. Scaled scores for English: Reading and mathematics for each of the participating schools was downloaded. Demographic data including percentages of students receiving free and reduced priced lunches, percentages of students who identify as African-American or Hispanic, and percentages of students receiving special education services in the 2013-2014 school year were also obtained from the VDOE website and linked with the school performance data. RTI implementation results from the SAPSI was downloaded from the Qualtrics site, linked with the existing coded school data, and uploaded to SPSS for the statistical analysis.

Data Analysis Techniques

A quantitative study using student achievement data from the Spring 2014 Virginia Standards of Learning (SOL) assessments and data derived from surveys administered to administrators of middle schools serving grades six through eight was examined to determine the relationship between RTI implementation and school-wide student achievement. A hierarchical multiple regression analysis was conducted to determine the association between the overall level of RTI implementation and school-wide achievement in reading and math and between the years of implementation of RTI and school-wide achievement in English and mathematics. Separating these two independent variables provided clarity in the results and reduced the potential for over estimation due to multicollinearity. Segrin (2010) explained that regression in applied settings "can be used to test associations between individual variables and a dependent variable, as well as interactions among multiple independent variables and a dependent variable" (p. 845). Recognizing the potential impact demographic factors play in student achievement (Caldas & Bankston, 1997; Hattie, 2009; Sirin, 2005; Vincent, Tobin, Hawken, & Frank, 2012), a hierarchical multiple regression analysis was used. Demographic variables were entered in the regression equation to control for their impact (Field, 2013; Howell, 2011) prior to entering the RTI implementation variables. To develop an understanding for the relationship between overall RTI implementation and the amount of time it takes schools to implement RTI, an independent

samples t-test was conducted. Participating schools were assigned to two groups, one to three years of implementation and four or more years of implementation. Research has shown that schools require time to fully implement the complexities of RTI (Chard, 2012; Fixsen et al., 2007; King & Lemons, 2014; Roberts et al., 2013).

The use of regression analysis in this study of middle school implementation of RTI moved away from the qualitative examination of implementation practices and sought to define the predicted school-wide effects of RTI on student achievement. The results of this study will add to the research surrounding RTI's role in school improvement (Mellard et al., 2012; Shores and Chester, 2009).

Time Line

Permission to conduct this study was granted by the Virginia Tech IRB on November 6, 2014. Survey data were gathered from November of 2014 through February of 2015 and student achievement data from the Spring 2014 assessments of the Standards of Learning was obtained from the VDOE once the survey window closed. The statistical analysis of the data was conducted via SPSS during the spring of 2015 while the summary of findings, implications, and suggestions for future research occurred during the summer of 2015.

Summary

If secondary schools are to improve to meet the challenges of global competitiveness, reduce dropouts, and meet the needs of all learners, guidance and predictability of school improvement models are critical to these ends. As implementation of RTI reaches into the secondary level, quantitative research has provided insight to the effectiveness of multiple tiers of intervention in middle schools (Graves et al., 2011; Prewett et al., 2012; Vaughan et al., 2010; Vaughn et al. 2011; Wanzek et al., 2011) and suggested guidelines for implementation in middle and high schools (Duffy, 2007; Fuchs et al., 2010; Shinn, 2008) while qualitative case studies have examined the implementation of high school RTI models (Fisher & Frey, 2011).

As school leaders seek guidance in utilizing effective methods for meeting the instructional needs of students in the battle against high school dropouts, closing the achievement gaps among student populations and increasing our competitiveness globally, this study begins to fill the void in the literature on the effectiveness of the RTI model in meeting school

improvement goals. This quantitative study conducted a hierarchical multiple regression analysis on student achievement and RTI implementation levels to determine the potential RTI implementation holds for school improvement as proposed by Shores and Chester (2009).

Chapter 4
Results of the Study

The purpose of this study was to measure the association between school-wide student achievement on the English and mathematics SOL tests and the degree of implementation and length of time implementing RTI in Virginia middle schools. This study sought to expand the body of research examining the effect RTI has on student achievement. Specifically, this study builds upon Shores and Chester's (2009) suggestion that RTI holds promise as a school improvement model and Fisher and Frey's (2011) secondary school case study of a high school's implementation. Recognizing that RTI is a complex process (Fuchs & Deshler, 2007; Mellard et al., 2010; VanDerHeyden et al., 2005) where implementation of key aspects may be uneven, this study examined the association between a middle school's length of time and degree of implementation of RTI and student performance on the Virginia English: Reading and Mathematics Standards of Learning (SOL) tests in grades 6, 7, and 8 to determine what effects RTI plays on the school-wide achievement of middle school students.

Virginia middle schools serving grades 6 through 8 exclusively were surveyed using an adapted version of the Self Assessment of Problem Solving Implementation (Castillo et al., 2010), a Likert-like scale, and regressed against the school-wide student achievement on the SOL tests in English and mathematics in attempt to answer the following two research questions:

1. What is the relationship between the level of RTI implementation and years of RTI implementation in middle schools and student achievement in reading as measured by the overall scaled scores on the English: Reading Standards of Learning assessments given in grades 6 through 8?
2. What is the relationship between the level of RTI implementation and years of RTI implementation in middle schools and student achievement in mathematics as measured by the overall scaled scores on the Mathematics Standards of Learning assessments given in grades 6 through 8?

Analyzing the length of time schools have implemented RTI and collective effects of the elements, universal screening, progress monitoring, multiple tiers of instructional support, data-based decision-making, and professional development elements, on student achievement in English and Mathematics in the middle grades will provide guidance to education leaders seeking to improve the achievement for all students in middle schools.

This non-experimental quantitative study used a regression analysis to determine the association of the degree of implementing a response to intervention model and the length of time a middle school has been implementing response to intervention on school-wide student achievement on English and mathematics Standards of Learning assessments in Virginia. Independent variables for this study were the length of time schools have implemented RTI and their degree of RTI implementation while dependent variables were the overall pass rates on the 2014 English and mathematics SOL tests for grades 6, 7, and 8. An adapted version of the Self Assessment of Problem Solving Implementation (SAPSI) survey (Castillo et al., 2010) was submitted to participating principals electronically to measure the degree of RTI implementation in their schools during the 2013-2014 school-year and the number of years their schools have been implementing RTI. Each school's demographic information was obtained through the Virginia Department of Education website (http://bi.vita.virginia.gov/doe_bi/ rdPage.aspx?rdReport=Main&subRptName=Fallmembership) and was linked to their SAPSI results. SOL achievement data were obtained by examining each school's accreditation data published annually on Virginia Department of Education's website (http://www.doe.virginia.gov /statistics_reports/accreditation_federal_reports/accreditation/index.shtml).

Demographic Profile of Participating Schools

For this study, middle school was defined as a school that exclusively serves students in grades six through eight. Schools with other grade configurations will be excluded from this study in an attempt to standardize the population. A review of the Virginia Department of Education's website revealed 274 schools in 90 different school divisions across Virginia meeting this definition. The researcher's middle school was immediately excluded from this study. Approval for research was obtained from 37 school divisions (42%) that resulted in 94 surveys being sent to principals for their participation. Surveys were returned from 56 principals of the targeted 274 (20%). Nine surveys contained incomplete responses regarding their RTI implementation and were discarded from the analysis leaving a population of $N = 47$ (17%). Descriptive information related to the demographic profile, specifically the percentage of minority students, students receiving free or reduced priced lunches, and student eligible for special education services, of participating schools was obtained from the Virginia Department of Education website (http://bi.vita.virginia.gov/doe_bi/ rdPage.aspx?rdReport

=Main&subRptName= Fallmembership). The demographic profile and descriptive statistics of the 47 participating middle schools are detailed in Table 1.

Table 1

Demographic Profile and Descriptive Statistics of Participating Middle Schools

Characteristic	*N*	%	*M*	*SD*
Total Population	47	100	743.89	249.77
< 250	1	2		
251 – 500	8	17		
501 – 750	14	30		
751 – 1000	18	38		
1,001 – 1250	5	11		
1251 <	1	2		
% Students Eligible for Special Education	47	100	11.71	3.38
6.0 – 10.0	18	38		
10.1 – 15.0	19	40		
15.1 – 19.0	10	21		
% Students Identified as Minority	47	100	27.75	24.48
0 – 15.0	17	36		
15.1 – 30.0	14	30		
30.1 – 45.0	6	8		
45.1 – 60.0	5	11		
60.1 – 75.0	1	2		
75.1 – 90.0	3	6		
90.0 <	1	2		
% Students Receiving Free/Reduced Lunch	47	100	42.22	18.99
0.0 – 15.0	4	9		
15.1 – 30.0	9	19		
30.1 – 45.0	16	34		
45.1 – 60.0	9	19		
60.1 – 75.0	6	13		
75.1 – 90.0	3	6		

Note. Minority students were defined as students who identified as African-American or Hispanic.

School size ranged from a low of 224 students to a high of 1472. Sixty-eight percent of the participating schools fell between 500 and 1,000 students. The percentage of minority students ranged from a low of 2.23% to a high of 93.96% while the mean was $M = 27.25$. Sixty-six percent of the schools served populations comprised of 0% to 30% minority students. The percentage of students receiving special education services in the participating schools ranged from a low of 6.55% to a high of 19.00% and had a mean of $M = 11.71$. Seventy-eight percent

of the schools had special education eligible percentages between 6% and 15%. The percentage of students receiving free or reduced priced lunch was combined in the database on the Virginia Department of Education website therefore the combined category was utilized for reporting in this study. Students receiving free or reduced priced lunch percentages ranged from a low of 3.14% to a high of 83.54% with a mean of $M = 42.22$.

Instrument Validation and RTI Implementation Variables

The content validity and reliability for the Florida Statewide Problem Solving and Response to Intervention Project's version of SAPSI is documented in the Problem Solving / Response to Intervention Evaluation Tool Technical Assistance Manual (Castillo et al., 2010). Castillo et al. (2010) reported that content validity was determined by a review of the domains within RTI within the literature and after comparing the SAPSI to other instruments used to measure the domains of RTI. Internal consistency reliability for each domain was derived from an administration of the SAPSI among 34 schools in 2010 with the following results: Consensus ($\alpha = .64$), Infrastructure Development ($\alpha = .89$) and Implementation ($\alpha = .91$).

An adapted version of the Self Assessment of Problem Solving Implementation (SAPSI) survey, developed by the Florida Statewide Problem Solving and Response to Intervention Project, was used to measure RTI implementation in the participating middle schools. The survey contained 30 questions designed to measure the extent schools are building consensus for RTI within their school community, developing the requisite infrastructure for implementation of RTI, and implementing key RTI practices and procedures (Castillo et al., 2010). Due to alterations being made to the survey for the purpose of this study, internal consistency reliability for each domain and overall RTI implementation were recalculated using Chronbach's alpha. The consensus domain within the survey was comprised of five questions and was found to have a reliability of $\alpha = .86$. Consensus domain questions (1 – 5) reflected the amount of commitment and support provided by district and school based leadership and the school's faculty to RTI within the division and school. The Infrastructure Development domain ($\alpha = .93$) consisted of 13 questions (6 – 17) and assessed the school's collection, management, and use of data by school-based teams to make instructional decisions. The Implementation domain ($\alpha = .96$) contained 12 questions (18 – 19i) related to the establishment of multiple tiers of intervention, the decision-making process behind moving students within the tiers, and the evaluation of the effectiveness

of the instruction provided within those tiers. Descriptive statistics related to the internal reliability of the SAPSI and the overall RTI implementation scores for schools are listed in Table 2.

Table 2

Internal Reliability of Adapted SAPSI and Overall Implementation Sum Scores for Participating Middle Schools

RTI Category	No. of Items	Min Score	Max Score	*M*	*SD*	α
Overall Sum	30	38	118	82.15	22.70	.97
Consensus	5	5	20	13.68	4.27	.86
Infrastructure	13	17	52	34.94	10.11	.93
Implementation	12	12	48	33.53	9.7	.96

(*N* = 47)

Forty-seven schools completed the SAPSI providing survey data on the level of implementation of Response to Intervention in their schools. Scores on the SAPSI could range from a minimum score of 30 to a maximum score of 120. The population's overall RTI sum scores ranged from a low of 38 to a high of 118 with a mean of *M* = 82.15 and standard deviation of *SD* = 22.70. Examination of skewness (-.16, *SE* = .35) and mean (*M* = 82.15, *SD* = 22.70) statistics indicates a population of middle schools that are implementing RTI but with a relative broad range of implementation levels.

Five of the 47 participating middle schools did not answer the question of the year their school began RTI implementation or stated they had not begun implementing RTI. Of those five schools, three principals added comments that they did not know when the school initiated RTI. The majority of schools (51.1%) fell between 1 – 3 years of implementation with the greatest number (n = 10, 21.3%) having implemented RTI for only one year. The number of years implementing RTI ranged from a low of 0 to a high of 14 with a mean of *M* = 3.62 and *SD* = 2.86. Table 3 describes the distribution of schools by the number of years implementing RTI.

Table 3

Number of Years Implementing Response to Intervention

No. Years Implementing RTI	*n*	%
0	1	2.4
1	10	21.3
2	6	12.8
3	8	17.0
4	6	12.8
5	2	4.3
6	4	8.5
7	1	2.1
8	1	2.1
9	1	2.1
10	1	2.1
11+	1	2.1

Note. Five schools did not provide responses as to the number of years the school has been implementing RTI. (N = 42, M = 3.62, SD = 2.86)

Examination of skewness (1.60, SE = .37) and mean (M = 82.15, SD = 22.70) statistics for the years of implementing RTI indicates most of the middle schools have recently begun implementing RTI. The implementation levels and years of implementation of RTI of the schools examined for this survey represents a higher level of middle school RTI participation than observed by Bradley et al.'s (2011) IDEA National Assessment Implementation survey and cohort participation levels in 2010 reported by the Virginia Department of Education (VDOE, 2014).

An independent samples t-test was conducted to determine if significant differences in overall implementation existed between schools with one to three years (n = 24) of experience and schools with four or more years (n = 17) of experience in implementing RTI. On average, schools who reported implementing RTI for four years or more implemented RTI (M = 84.53, SD = 22.19) at similar levels to schools with one to three years of experience (M = 84.46, SD = 19.67). Results of the t test revealed the difference between the groups (-.07, CI [-13.37, 13.32]) was not significant (t (39) = -.011, p = .99).

Dependent Variables

School-wide scaled scores on the Standards of Learning assessments in mathematics and English - Reading, administered annually in grades 6, 7, 8, served as the dependent variables for

this study. By targeting scaled scores as the dependent variable, variations in mathematics course sequences utilized by middle schools can be neutralized because all mathematics courses taken, regardless of the grade level of the student, can be included in the analysis. School accreditation, the goal of school improvement, is based, in part, on the overall pass rates of the students in the content areas (i.e. mathematics, English); however, analyzing the scaled scores of the participating schools provides a more detailed description of student performance within the school. A Pearson product-moment correlation was conducted between the 2014 overall pass rates on the English-Reading SOL test, the Mathematics SOL test and their corresponding scaled scores on the same test. As expected, a significant correlation between the variables ($r = .89$, $p < .001$; $r = .91$, $p < .001$) suggests that an increase in a school's overall scaled score would indicate an increase in their pass rates as well. Therefore, the use of scaled scores to measure student performance on the Standards of Learning assessments presents a greater potential to identify the effects implementing RTI has for all students in a middle school. A summary of student achievement data on the English: Reading and Mathematics Standards of Learning assessments is provided in Table 4.

Table 4

Summary of School-Wide Pass Rates and Scaled Scores for Participating Middle Schools

Characteristic	*M*	*SD*	State Avg.	Annual Measureable Objective
Reading Pass Rate	73.06	9.38	74	69
Reading Scaled Score	423.50	20.77		
Math Pass Rate	75.92	11.68	74	66
Math Scaled Score	425.27	17.28		

Note. ($N = 47$)

The mean ($M = 73.06$) for English: Reading pass rates was below the state average while the mean score ($M = 75.92$) exceeded the state average. Scaled scores in English: Reading ranged from a low of 375.66 to a high of 460.1 ($M = 423.50$, $SD = 20.77$). Scaled scores in Mathematics ranged from a low of 371.44 to 461.1. Scores of 400 and above indicate a passing score on the SOL assessment.

A correlation analysis using Pearson Product-Moment was conducted to understand the individual relationships among the variables prior to conducting the hierarchical multiple

regression. This analysis helped to determine the existence of significant relationships (Howell, 2010; Field, 2013) prior to examining their blocked predicted influence on student achievement scores. Table 5 details the correlation relationships and their significance for the variables examined in this study.

Table 5

Intercorrelations for Demographic Factors, RTI Implementation Measures, and Student Achievement.

	Years RTI (N = 42)	RTI Score (N = 47)	Scaled Math (N = 47)	Scaled Eng (N = 47)	% SpEd (N = 47)	% FRL (N = 47)	% Minority (N = 47)
Years RTI	-						
RTI Score	.10	-					
Scaled Math	.07	-.19	-				
Scaled Eng	.03	-.06	.86**	-			
% SpEd	.14	.07	-.39*	-.46*	-		
% FRL	-.07	-.04	-.71**	-.85**	.53**	-	
% Minority	-.08	.05	-.56**	-.62**	.47*	.59**	-

Note. *$p < .01$, **$p < .001$. Years RTI = Years implementing Response to Intervention; RTI Score = Overall RTI implementation score on the SAPSI; Scaled Math = School-wide scaled score on all mathematics SOL tests; Scaled Eng = School-wide scaled score on all English: Reading SOL tests; % SpEd = percentage of student population receiving special education services; % FRL = percentage of the student population receiving free or reduced price meals; % Minority = percentage of the student population who report being either African-American or Hispanic.

Within the schools examined for this study, a significant positive correlation existed between the scaled scores in English: Reading and mathematics ($r = .86$, $p < .001$) indicating that a relationship where school-wide student performance level on one assessments would suggest a similar performance level on the other assessment. Among all the demographic variables examined (% of students receiving free or reduced priced meals, % of student receiving special education services, and % of minority students), significant positive relationships were observed suggesting that, within this population of middle schools, as the percentage of any one of the demographic variables increases, so too, would the percentages of the remaining two variables. While significant relationships existed among all the demographic and achievement variables, the strongest associations between demographic variables and achievement variables involved students who receive free or reduced priced meals (%FRL). The relationship between student achievement in reading and mathematics and the percentage of students receiving free or reduced

priced lunch suggests that higher values of %FRL are associated with lower school-wide achievement in reading (r = -.85, p < .001) and mathematics (r = -.71, p < .001). Although not as strongly associated with lower school-wide achievement, the reported percentage of minority students attending the schools was also linked to lower school-wide scaled scores in reading (r = -.62, p < .001) and mathematics (r = -.56, p < .001).

Significant associations were found to exist within the demographic variables examined in this study. The strongest relationships were observed to exist between %FRL and %Minority (r = .59, p < .001) and between %FRL and %SpEd within the schools (r = .53, p < .001). These results indicate that as the percentage of students receiving free or reduced priced meals increases within the school, so too, did the percentage of minority students and the percentage of students receiving special education.

No significant correlations were found to exist between the independent variables (RTI Score and Years RTI, r = .10, p = .517) adding to the finding of the independent t-test on implementation groups from table 3 that shows no evidence within this population that overall levels of RTI implementation are related to the number of years a school has been implementing RTI. The lack of correlations between either RTI variable and any of the independent variables suggests no association exists between the studied schools serving higher percentages of historically at-risk populations and their reported implementation of RTI.

Research Question 1

What is the relationship between the level of RTI implementation and years of RTI implementation in middle schools and student achievement in reading as measured by the overall scaled scores on the English: Reading Standards of Learning assessments given in grades 6 through 8?

To determine the relationship between a middle school's scaled score on the English Reading Standards of Learning tests in 2014 and the school's level of implementation of Response to Intervention, a hierarchical multiple regression analysis was performed. Demographic variables, percent of students eligible for special education services, percent of students identified as African-American or Hispanic (listed as minority), and percent of students receiving free or reduced price lunches were forced into the first block to control for their potential influence on a school's overall scaled score on the English Reading SOL tests. The

total score on the SAPSI, a measure of RTI implementation, was entered into the second block to determine the additional variance of the scaled scores after the demographic variables were controlled. Table 6 details the unstandardized B scores and standardized β scores for each variable and R^2 values for each model.

Table 6

Summary of Hierarchical Regression Analysis for RTI Implementation Level Predicting English Reading Scaled Scores (N = 47)

	Model 1				Model 2			
Predictor	*B*	*SE B*	β	R^2	*B*	*SE B*	β	ΔR^2
Control Variables				.74				
% SpEd	.14	.48	.03		.19	.48	.04	
% Minority	-.14	.07	-.20		-.13	.07	-.19	
% FRL	-.68	.09	-.75**		-.69	.09	-.76**	
Exp. Variable								.007
Overall RTI Sum					-.07	.06	-.09	

*$p < .05$ **$p < .001$

Tests for multicollinearity indicated a low level was present (VIF = 1.77 for % FRL, 1.48 for % SpEd, 1.61 for % Minority, and 1.02 for Overall RTI). The demographic variables, controlled for in model one, accounted for 74% of the variability in the outcome (F (3, 43) = 40.59, $p < .001$, $R^2 = .739$). Standardized β scores indicate the amount of variance in the dependent variable explained by each independent variable singularly (Field, 2013; Howell, 2010; Kraha, Turner, Nimon, Zientek, & Henson, 2012). In model one, the largest and only significant β coefficient was % FRL (-.75, $p < .001$) indicating it held a predicted suppressive impact on reading achievement in the schools. The remaining two demographic variables, % SpEd (.028, $p = .77$) and % Minority (-.195, $p = .05$), were not significant contributing variables in determining the predicted variance in school-wide reading scores. Model two, remained significant due to the relative strength of the % FRL variable (-.76, $p < .001$) in predicting the variance of English: Reading scaled scores. The addition of Overall RTI increased predictability of the variance to 75% of the outcome (F (4, 42) = 30.86, $R^2 = .746$); however, Overall RTI Implementation's contribution as a variable (β = -.09) did not significantly improve the model's ability to explain the variance in English: Reading SOL scaled scores ($\Delta R^2 = .002$, $p = .29$). The inclusion of the Overall RTI variable into the regression equation yielded an increase of 0.2% to

the predictability of the variance in school-wide reading scores. This small influence was not deemed significantly related to the Overall RTI variable compared to chance alone.

A separate hierarchical multiple regression analysis was conducted to determine how the number of years as school has implemented RTI explained the variance of scaled reading scores. The need for a separate analysis arose from five schools not completing that question on the survey resulting in a smaller population (N = 42). Tests for multicollinearity indicated a low level was present (VIF = 1.89 for % FRL, 1.68 for % SpEd, 1.64 for % Minority, and 1.07 for Years Implementing RTI). Table 7 details the unstandardized B scores and standardized β scores for each variable and R^2 values for each model.

Table 7

Summary of Hierarchical Regression Analysis for Years of Experience in RTI Predicting English Reading Scaled Scores (N = 42)

	Model 1				Model 2			
Predictor	*B*	*SE B*	β	R^2	*B*	*SE B*	β	ΔR^2
Control Variables				.76				
% SpEd	.27	.56	.05		.27	.56	.05	
% Minority	-.17	.07	-.23*		-.17	.08	-.24*	
% FRL	-.68	.10	-.74**		-.69	.10	-.74**	
Exp. Variable								.002
Years RTI					-.28	.53	-.04	

*$p < .05$ **$p < .001$

In this smaller population, the demographic variables entered in block one accounted for nearly 76% of the variability in reading scaled scores (F (3, 38) = 39.44, $p < .001$, $R^2 = .757$). The inclusion of years of experience implementing RTI (β = -.04) into the model failed to add significant predictability in explaining the variance in scaled reading scores (F (4, 37) = 29.09, $R^2 = .73$, $\Delta R^2 = .002$, $p = .60$). The inclusion of the Years of Experience in RTI variable into the regression equation yielded an increase of 0.2% to the predictability of the variance in school-wide reading scores. This small influence was not deemed significantly related to the Years of Experience in RTI variable compared to chance alone.

Research Question 2

What is the relationship between the level of RTI implementation and years of RTI implementation in middle schools and student achievement in mathematics as measured by the

overall scaled scores on the Mathematics Standards of Learning assessments given in grades 6 through 8?

To determine the relationship between a middle school's scaled score on the Mathematics Standards of Learning tests in 2014 and the school's degree of implementation of Response to Intervention, a hierarchical multiple regression analysis was performed. Demographic variables, percent of students eligible for special education services, percent of students identified as African-American or Hispanic (listed as Minority), and percent of students receiving free or reduced price lunches were forced into the first block to control for their potential influence on a school's overall combined scaled score on the SOL tests. The total score on the SAPSI, a measure of RTI implementation, was entered into the second block to determine the additional variance of the scaled score after the demographic variables were controlled. Table 8 details the unstandardized B scores and standardized β scores for each variable and the R^2 values for each model.

Table 8

Summary of Hierarchical Multiple Regression Analysis for RTI Implementation Level Predicting Mathematics Scaled Scores (N = 47)

	Model 1				Model 2			
Predictor	*B*	*SE B*	β	R^2	*B*	*SE B*	β	ΔR^2
Control Variables				.54				
% SpEd	.22	.77	.04		.35	.75	.06	
% Minority	-.19	.11	-.22		-.18	.11	-.21	
% FRL	-.66	.15	-.60**		-.69	.15	-.63**	
Exp. Variable								.04
Overall RTI Sum					-.19	.09	-.21*	

*$p < .05$ **$p < .001$

Tests for multicollinearity indicated a low level was present (VIF = 1.77 for % FRL, 1.48 for % SpEd, 1.61 for % Minority, and 1.02 for Overall RTI). The demographic variables, entered in block one, yielded a model that accounted for 54% of the variability in the outcome (F (3, 43) =16.87, $p < .001$, $R^2 = .54$). In model one, % FRL (-.60, $p < .001$) was the lone significant contributing variable while % SpEd (.04, $p = .78$) and % Minority (-.22, $p = .10$) were not significant contributors in predicting the variance observed in school-wide mathematics scores. In model two, the addition of Overall RTI increased predictability of the variance to 58%

of the outcome (F (4, 42) = 14.68, ΔR^2 = .042, p < .001). The contribution of Overall RTI Implementation as a variable significantly improved the model's ability to explain the variance in Mathematics SOL scaled scores (ΔR^2 = .042, p < .001). Free and reduced lunch percentages remained the highest significant β coefficient (-.63, p < .001) followed by Overall RTI sum scores (-.21, p = .045). The β coefficients for all other variables were insignificant. The inclusion of the Overall RTI variable into the regression equation yielded an increase of 4.2% to the predictability of the variance in school-wide reading scores. This influence was deemed significantly related to the Overall RTI variable compared to chance alone and suggests that for every increase of one standard deviation unit of Overall RTI, school-wide scaled scores in mathematics would decrease by .21 standard deviation units.

A separate hierarchical multiple regression analysis was conducted to determine how the number of years a school has implemented RTI explained the variance of scaled mathematics scores. The need for a separate analysis arose from five schools not completing that question on the survey. Tests for multicollinearity indicated a low level was present (VIF = 1.89 for % free and reduced lunch, 1.68 for % Special Education, 1.64 for % minority, and 1.07 for Years Implementing RTI). Table 9 details the unstandardized B scores and standardized β scores for each variable and R^2 values for each model.

Table 9

Summary of Hierarchical Multiple Regression Analysis for Years of Implementing RTI Predicting Mathematics Scaled Scores (N = 42)

	Model 1				Model 2			
Predictor	*B*	*SE B*	β	R^2	*B*	*SE B*	β	ΔR^2
Control Variables				.61				
% Special Education	.62	.80	.10		.63	.84	.10	
% Minority	-.24	.11	-.28*		-.24	.11	-.28*	
% Free / Reduced Lunch	-.70	.15	-.64**		-.70	.15	-.64**	
Exp. Variable								.001
Years RTI					-.03	.79	-.004	

*p < .05 **p < .001

In this smaller population (N = 42), block one accounted for nearly 61% of the variability in reading scaled scores (F (3, 38) = 20.01, p < .001, R^2 = .61). Significant β coefficients were observed with the percentage of minority students (-.28, p = .04) and the percentage of free and

reduced lunch students (-.64, p < .001). The inclusion of years of experience implementing RTI into the model failed to add significant predictability in explaining the variance in scaled reading scores (F (4, 37) = 14.61, R^2 = .61, ΔR^2 = .001, p = .97). Free and reduced lunch percentages remained a significant β coefficient (-.64, p < .001) followed by minority student percentage (-.28, p = .04) suggesting that increases in those demographic variables have a predicted negative influence on school-wide achievement in mathematics. All other β coefficients were insignificant. The inclusion of the Years of RTI variable into the regression equation yielded an increase of 0.1% to the predictability of the variance in school-wide reading scores. This small influence was not deemed significant compared to chance alone.

Summary

The purpose of this study was to measure the association between school-wide student achievement on the English and mathematics SOL tests and the degree of implementation and length of time implementing RTI in Virginia middle schools. This study sought to expand the body of research examining the effect RTI has on student achievement. Specifically, this study builds upon Shores and Chester's (2009) suggestion that RTI hold promise as a school improvement model and Fisher and Frey's (2011) secondary school case study of a high school's implementation.

Virginia middle schools serving grades 6 through 8 exclusively were surveyed electronically using an adapted version of the Self Assessment of Problem Solving Implementation (Castillo et al., 2010), a measure of RTI implementation, that was regressed against school-wide scaled scores on the SOL tests, a measure of student achievement, in English: Reading and mathematics to determine the impact, if any, RTI holds for student achievement. A total of 274 middle schools serving grades 6-8 exclusively from 90 school divisions across Virginia were targeted for participation in the study. Ultimately, 37 school divisions (42%) approved participation for this study that yielded 94 potential schools. Surveys were submitted by 56 (60%) schools; however, nine surveys contained incomplete responses and were excluded from the analysis resulting in 47 schools being studies. An additional five schools failed to include information to determine the length of time their schools had been implementing RTI. Therefore the analysis for this variable was derived from a smaller population (N = 42). School sizes ranged from 224 to 1472 students (M = 743.89, SD = 249.77).

Data regarding the percentage of students receiving free or reduced prices lunches (M = 42.22, SD = 18.99), percentage of students identified as African-American or Hispanic (M = 27.75, SD = 24.48), and percentage of students receiving special education services (M = 11.71, SD = 3.38) were obtained from the Virginia Department of Education and utilized in the hierarchical multiple regression analysis to control for these factors' potential impact on school-wide achievement.

Descriptive statistics of the schools indicate that, although broad in their implementation levels (M = 82.15, SD = 22.70) and years practicing RTI (M = 3.62, SD = 2.86), participating schools were attempting to implement Response to Intervention practices. Only one school indicated not implementing RTI while 63.9% of schools reported implementing RTI for 1 – 4 years in the spring of 2014. Scores on the RTI implementation scale ranged from 38 to 118 with the potential range being a low of 30 to a high of 120.

The primary purpose of this study was to determine the effects implementing RTI had on predicting student achievement in reading and mathematics. Secondarily, do schools improve in their practice of implementing RTI resulting in increased student achievement in reading and mathematics? The results of a hierarchical multiple regression analysis failed to reveal a significant relationship between the level of implementation of RTI and student achievement in reading. The examination of student achievement in reading and the number of years a school had been implementing RTI, the regression models failed to find significance in the relationship between those two variables. The examination of RTI implementation and student achievement in mathematics did reveal Overall RTI Implementation to be a significant predictor variable in explaining the variance in student achievement in mathematics (F (4, 42) = 14.68, R^2 = .58, ΔR^2 = .042, $p < .001$, β = -.21, p = .045). The negative standardized regression coefficient indicates a reduction of .21 standard deviations for each unit of increase in RTI implementation suggesting that as levels of RTI implementation increase, student achievement in mathematics decrease. The examination of student achievement in mathematics and the number of years a school had been implementing RTI, the regression models failed to find significance in the relationship between those two variables. These results suggest that, at best, increased levels of RTI holds no impact on improving the reading scores for all students in middle schools and, at worst, may contribute to lower school-wide performance in mathematics. Results from this study contribute to existing research linking family income levels and ethnicity to school performance.

Chapter 5
Summary and Conclusions

The purpose of the study was to determine the impact Response to Intervention has in influencing the reading and mathematics skills of middle school students. This study analyzed the levels of RTI implementation and the years of RTI implementation reported by the participating school principals against the scaled reading and mathematics scores for each school. To better understand the relationship between RTI and school-wide achievement in middle school, an ex post facto non-experimental study was used to assess two measures, overall level of implementation and years of implementation, of RTI. The following two research questions were investigated:

1. What is the relationship between the level of RTI implementation and years of RTI implementation in middle schools and student achievement in reading as measured by the overall scaled scores on the English: Reading Standards of Learning assessments given in grades 6 through 8?
2. What is the relationship between the level of RTI implementation and years of RTI implementation in middle schools and student achievement in mathematics as measured by the overall scaled scores on the mathematics Standards of Learning assessments given in grades 6 through 8?

A hierarchical multiple regression analysis was conducted to determine the predicted impact each measure of RTI had on the school-wide student achievement in reading and mathematics in 47 middle schools across Virginia. Understanding that multiple factors influence school performance, the design and analysis attempted to control for multiple demographic factors to reveal the influence RTI alone played in predicting the reading and mathematics achievement for all students in schools practicing RTI. In the search for solutions to meet the instructional needs of students in the battle against high school dropouts, closing achievement gaps among student populations and increasing competitiveness globally, secondary school leaders have sought solutions in expanding Response to Intervention from its success at the elementary level. If RTI holds promise as a school improvement model, practitioners of RTI in secondary schools must be able to implement it effectively and realize significant, observable improvements in student achievement in reading and mathematics on state assessments regardless of the economic or ethnographic composition of the school.

This study examined two factors related to the implementation of RTI in 47 middle schools across Virginia in an attempt to determine RTI's potential impact on school-wide student achievement in reading and mathematics. The two RTI factors, Overall Level of RTI implementation and Years Implementing RTI, were derived from surveys of building principals alone. Findings revealed no significant relationship between the number of years a school reported to be implementing RTI and its thoroughness in implementing the complex process. Although demographic factors related to student income levels, minority populations, and special education populations were controlled in the analysis, findings from the hierarchical multiple regression revealed no significant impact from RTI implementation on the school-wide performance on the English: Reading SOL tests in 2014. School leaders should interpret these results with caution due to the small number of schools that participated in this study. This chapter reviews and reflects upon the data gathered to provide findings and implications from this study to guide educational leaders in their application of RTI as a school improvement model.

Summary of Findings

The analysis of the data gathered in this study revealed several findings related to Response to Intervention's implementation practices and its potential effectiveness in influencing the reading and mathematics achievement of middle school students. The findings and implications of each research question are presented below.

***Finding One*: The implementation of Response to Intervention is widespread among surveyed Virginia Middle Schools.** Middle schools across Virginia were surveyed to assess the level of implementation of Response to Intervention being practiced in their schools. Surveys were returned from 56 principals of middle schools serving grades 6 through 8 exclusively (20%); however, nine surveys contained incomplete responses regarding their RTI implementation and were excluded from the study leaving a total number of participating schools of $N = 47$ (17%). Results of the SAPSI, found in Table 2, revealed that 46 of the 47 (98%) of the schools with complete data were practicing some level of RTI. The mean implementation score of 82.15 on a range of 38 to 118 suggested that at least half of the schools were beyond their initial phase of implementing RTI. With implementation of RTI as a commonality, the profile of the participating schools demonstrated RTI's broad appeal to schools of differing sizes ($M =$

743.89, *SD* = 249.77), student wealth (*M* = 42.22, *SD* = 18.99), and ethnic and racial composition (*M* = 27.75, *SD* = 24.48).

Results from this survey indicate RTI is continuing to expand from the pilot programs established by the VDOE in 2008. The initial pilot schools were all elementary schools; however, the second pilot program, initiated two years later, included 25 secondary schools across the state. The expansion of RTI in Virginia is in line with data cited by Castillo and Batsche (2012) from the Response to Intervention Adoption Survey (Spectrum K12/CASE, 2011) that indicated a 12% increase to 94% implementation in 2011. Furthermore, Zirkel and Thomas (2010) noted the expansion of states allowing RTI data to be used in SLD identification in accordance with the federal guidelines in the reauthorization of IDEA in 2004, opening regulations for the inclusion of RTI practices in the identification of students needing special education services.

***Finding Two*: Response to Intervention implementation levels failed to demonstrate a significant impact on the school-wide reading scores of middle school students in the surveyed middle schools.** Among the participating schools, English: Reading scaled scores were significantly correlated with each of the following demographic independent variables: percentage of Special Education students ($r = -.46$, $p < .001$), percentage of students receiving free or reduced priced meals ($r = -.85$, $p < .001$) and the percentage of students identified as a minority ($r = -.62$, $p < .001$). However, no significant correlation was found between the level of Overall RTI implementation and any of the other demographic variables nor with English: Reading scaled scores for the school. Closer examination of the results of the hierarchical multiple regression, found in Table 7, revealed RTI's contribution alone (F (4, 42) = 30.86, R^2 = .746, ΔR^2 = .002, p = .29) failed to significantly influence reading scores yielding an increase of 0.2% to the predictability of the variance in school-wide reading scores after demographic variables were controlled.

Although the research on secondary school RTI implementation remains limited, findings have suggested that RTI holds promise for improving the performance of middle school readers (Vaughn et al., 2010; Graves et al., 2011; Wanzek et al., 2011). Wanzek et al. (2011), Graves et al. (2011), and Vaughn et al. (2010) identified growth made by students receiving Tier 2 or Tier 3 interventions. Furthermore, Fisher and Frey's (2011) high school RTI implementation case study documented gains in student achievement, improvements in attendance and a reduction of

referrals to Special Education. However, Vaughn et al. (2010) and Wanzek et al. (2011) both noted that while intervention students made progress in some of the sub-skills that make students good readers, their experimental groups failed to close the gaps in achievement with their grade-level counter parts. Additionally, the findings by Fisher and Frey (2011), while encouraging, were not found to be statistically significant and the authors admitted that the documented gains could not solely be attributed to RTI. Finding two in this study is similar to the findings by Gleason (2014) and Fitch (2013) in their separate dissertation studies examining middle school RTI effects on reading. As in this study, Gleason's examination of RTI implementation and reading achievement scores among Pennsylvania middle schools and Fitch's study of high performing middle schools in Missouri failed to reveal significant predictability in the percentage of students passing state assessments. While Response to Intervention practices have been shown to be beneficial in aiding struggling adolescent learners (Ardoin et al., 2013; Fisher & Frey, 2011; Graves et al., 2011; Prewett et al., 2012; Roberts et al., 2013; Vaughn et al., 2008; Vaughn et al., 2010; Wanzek et al., 2011) the results of this study suggest that RTI's promise for improved school-wide achievement in reading remains unmet as there was no evidence to suggest higher student achievement in reading was related to higher levels of RTI implementation.

***Finding Three*: Response to Intervention implementation levels were negatively associated with school-wide mathematics scores in middle schools after controlling for specific demographic variables.** No significant correlation was found between Overall RTI implementation and any of the demographic variables nor with the mathematics scaled scores for the school. Closer examination of the results of the hierarchical multiple regression, found in Table 9, revealed RTI's contribution after other demographic variables were controlled alone (F (4, 42) = 14.68, R^2 = .58, ΔR^2 = .042, p < .001) significantly influenced mathematics scores by yielding an increase of 4.0% to the predictability of the variance in school-wide reading scores after demographic variables were controlled. The significant findings (β = -.09, ΔR^2 = .002, p = .29), suggest overall implementation levels of RTI weakens student success in mathematics.

Although less research has been conducted on Response to Intervention in meeting the needs of struggling learners in mathematics (Lembke, Hampton, & Beyers, 2012), existing research suggests the use of tiered interventions in supporting students with mathematics difficulties (Gersten et al., 2009; Lembke et al., 2012; Methe, Kilgus, Neiman, & Riley-Tillman,

2012). Gersten et al.'s (2009) report for the Institute of Education Sciences on assisting students with difficulties in mathematics suggests interventions provided in an RTI context in middle and elementary schools to be beneficial in remediating mathematics deficits. While Response to Intervention practices have been shown to be beneficial in aiding struggling adolescent learners in reading and mathematics (Ardoin et al., 2013; Fisher & Frey, 2011; Graves et al., 2011; Prewett et al., 2012; Roberts et al., 2013; Vaughn et al., 2008; Vaughn et al., 2010; Wanzek et al., 2011), the results from this study revealed a negative association between RTI implementation levels and school-wide achievement in mathematics. The results from this research question suggest RTI holds deleterious effects for mathematics performance; however, this finding should be interpreted cautiously as it is born from a small population of middle schools in Virginia.

***Finding Four*: The number of years a school implements RTI has no significant influence on school-wide reading or math achievement.** Middle schools across Virginia were surveyed to assess the level of implementation of Response to Intervention being practiced in their schools. Surveys were returned from 56 principals of the 274 middle schools serving grades 6 through 8 exclusively (20%); however, nine surveys contained incomplete responses regarding their RTI implementation and were excluded from the study leaving a population of $N = 47$ (17%). An additional five surveys failed to include the year RTI was implemented in their school resulting in a smaller population ($N = 42$, 45%) from which to draw conclusions. Results of the survey, found in Table 3, indicated that 98% of the responding schools reported practicing some level of RTI while the mean for years implementing RTI 3.62 years ($SD = 2.86$) with a low of 0 years and a high of 14 years. No significant correlations were found between the number of years a school implemented RTI and their overall level of RTI implementation. Additionally, no correlations were found between either RTI variable and the following variables: English: Reading scaled scores, mathematics scaled scores, and any of the demographic variables. A hierarchical multiple regression was used to examine more closely the potential relationship between a school's years of experience and their school-wide achievement in reading when controlling for known demographic influences on student achievement. Results of the hierarchical multiple regression, found in Table 7, revealed RTI's contribution alone (F (4, 37) = 29.09, $R^2 = .73$, $\Delta R^2 = .002$, $p = .60$) failed to significantly influence reading scores by yielding only an increase of 0.2% to the predictability of the variance in school-wide reading scores.

Results of the hierarchical multiple regression when substituting mathematics scaled scores for reading, found in Table 9, revealed RTI's contribution alone (F (4, 37) = 14.61, R^2 = .61, ΔR^2 = .001, p = .97) again failed to significantly influence mathematics scores yielding only an increase of 0.1% to the predictability of the variance in school-wide mathematics scores.

The finding four from this study contradicts existing research on school change in that no significant difference in implementation scores was found between schools with under four years of RTI experience and schools with over four years of experience implementing the complex process. Fixsen et al. (2007) assert that implementation is, "the missing link between research and practice" (p. 4). Unlike other industries where research yields innovations in the form of actual products, the authors explain, in the human services industry, changes to the practitioner constitutes the innovation. But because changes to education professionals cannot be completed in environmentally controlled settings like computers or cars, implementation of new innovations requires two to fours years to complete. Furthermore, the authors argue, successful implementation is the result of a continual, cyclical process of the following six stages: exploration, installation, initial implementation, full implementation, innovation, and sustainability.

Additional Findings

***Finding Five*: A significant positive correlation existed between school-wide achievement in reading and school-wide achievement in mathematics.** Within the schools examined for this study, a significant positive correlation existed between the school-wide scaled scores in English: Reading and the school-wide scaled scores in mathematics ($r = .86$, $p < .001$). This result indicated the presence of a relationship within the participating schools where school-wide student performance on one assessment suggested a similar performance on the other assessment. Among all the variables examined for intercorrelations (Table 5), the strongest correlation observed was between a school's scaled score in mathematics and their scaled score in reading.

The findings from this study are consistent with findings from Grimm (2008) who showed that 3rd grade reading ability was a significant predictor of growth in mathematics skills over time. Higgins (2006), in his analysis of the relationship between reading and mathematics

achievement, found that achievement in reading and mathematics were highly correlated among income levels, race, and gender.

***Finding Six*: Among the surveyed schools, a significant negative relationship existed between the percentage of students receiving free or reduced priced lunches and school-wide performance in reading and mathematics**. Among the participating schools, the percentage of students receiving free or reduced priced lunch meals ranged from a low of 3.14% to a high of 83.54% ($M = 42.22$, $SD = 18.99$). The percentage of students who received free or reduced price meals was significantly correlated with each demographic variable (% SpEd, $r = .53$, $p < .001$; % Minority, $r = .59$, $p < .001$). The correlation between the percentage of students receiving free and reduced priced meals and school-wide performance in reading ($r = -.85$, $p < .001$) and mathematics ($r = -.71$, $p < .001$) is only slightly less than the observed relationship between school-wide scaled scores in reading and mathematics. Additionally, the percentage of students receiving free and reduced priced lunches was the dominant variable in predicting the variance of school-wide performance in English: Reading (Table 6, Table 7) and mathematics (Table 8, Table 9). The findings of this study are consistent with findings from the 2008 NAEP that showed an achievement gap among economic levels in fourth grade mathematics articulated by Gonzalez et al. (2009)

Implications

The findings from this study lead to the following implications for education leaders when considering the implementation and evaluation of Response to Intervention as a school improvement model for middle schools. The implications from this study are as follows:

***Implication one*: Leaders of secondary schools should increase their knowledge of Response to Intervention in order to adapt it to the needs of adolescent learners.** Results from this study reinforce the belief that the use of Response to Intervention is growing across Virginia's middle schools. While no current accounting of the number of schools implementing RTI exists in Virginia, a 98% RTI implementation rate among the participating schools in this study portends continued expansion from the pilot programs conducted a few years earlier. As middle school principals face the prospect of implementing or improving RTI practices in their buildings, they must first increase their understanding of the practice and the challenges inherent to adapting it to fit in secondary schools. This implication echoes King, Lemons, and Hill's

(2012) recommendation that administrators and school leaders, being crucial to the successful implementation of RTI, become informed leaders. As middle school leaders look for strategies to successfully adapt elementary school RTI models to secondary school models (Figure 2), they must employ interventions for at-risk readers that aid in building skills and content acquisition. Essential to their implementation efforts, school leaders must plan for alterations to the master schedule for the delivery of interventions to at-risk learners (Fuchs, L. et al., 2010; King et al., 2012). As middle schools implement the problem-solving model version of RTI, finding appropriate interventions for secondary students that balance the learners need to master basic skills while acquiring new and more challenging content is a critical decision for the members of the school RTI team. Additionally, determining the best methods to monitor student progress within them poses significant questions that school leaders must be able to answer (Sansosti, Noltemeyer, & Goss, 2010).

***Implication two*: Middle school leaders implementing a Response to Intervention model should continually monitor the adaptation and effectiveness of RTI in their schools.** The results of this study failed to demonstrate positive associations between two measures of RTI implementation and school-wide achievement; however, the results may indicate more about the school's implementation of RTI than of RTI itself. Specifically, the analysis of the participating schools for this study showed no significant difference in reported implementation levels between schools implementing RTI for 1-3 years and schools implementing RTI longer. This finding may be the result of two issues:

- An overestimation of implementation levels on the part of the respondents (Castillo & Batsche, 2012; Cone, 2001; Noell et al., 2005)
- A lack of fidelity in the implementation of interventions (Kovaleski & Glew, 2006; Noell & Gansle, 2006).

Furthermore, Fixsen et al. (2007) in their review of implementation efforts of research-based initiatives make two essential claims: implementation takes two to four years and successful implementation requires innovation and sustainability. School leaders must accurately assess the ability of their RTI systems to meet the needs of all students and make adjustments when data indicate a lack of responsiveness for students.

***Implication three.* Instructional leaders should monitor the effectiveness of the reading interventions being provided to their students.** The results of this study failed to

demonstrate a significant link between variables related to RTI implementation (Overall RTI implementation and years of experience implementing RTI) and scaled scores on the Virginia Standards of Learning assessment in English: Reading. RTI is a complex instructional and assessment process whose key elements have been linked to improved student achievement in various settings across elementary and secondary schools. However, results from this study suggest school leaders seeking a school improvement model to improve reading skills for all learners should proceed with caution. The findings, at least at first glance, showed that RTI implementation levels and years implementing RTI had no significant association with higher reading achievement scores. While research has demonstrated positive impacts from RTI in improving reading skills for older struggling readers (Ardoin, 2005; Graves et al., 2011; Prewett et al., Pyle & Vaughn, 2012; Roberts et al., 2013; Vaughn et al., 2010), it has not been shown to close existing achievement gaps between struggling learners and typical learners (Ardoin, 2005; Roberts et al., 2013; Vaughn et al., 2010). Ultimately, school leaders must recognize Kovaleski, Gickling, Morrow, and Swank's (1999) assertion that, "half-hearted efforts at IST (Instructional Support Teams) are no better for at-risk students than what is traditionally practiced in non-IST schools" (p. 180) and ensure high fidelity of implementation and effectiveness of the reading interventions provided to students.

***Implication four*. Instructional leaders should monitor the effectiveness of the mathematics interventions being provided to their students.** The results of this study revealed a negative impact on mathematics achievement from reported levels of RTI implementation. Unlike reading, where an abundance of research-based intervention programs exist, options for interventions in mathematics are limited in number and further challenges school leaders attempting to find strategies that meet the needs of struggling math students. Roberts et al. (2013) warned that, "in the absence of evidence-based intervention, providing greater instructional intensity during the school day may be counterproductive and even wasteful" (p. 251). Therefore, it is critical that schools monitor the progress of students receiving interventions and adjust program treatments when responsiveness is not observed.

***Implication five*. Instructional leaders should find a solution that mitigates the effects of poverty on student regardless of RTI implementation**. Results from this study revealed negative associations between the percentage of students receiving free and reduced lunches, an indicator of student poverty, and school-wide achievement in reading, and mathematics. Student

poverty was also significantly correlated with rates of students receiving special education services and students identified as a minority. Student poverty was the single-most influential variable in predicting school-wide achievement. As school leaders seek ways to improve school-wide achievement, their efforts must address the impact poverty plays in student success in school.

Considerations for Future Research

The purpose of this study was to measure the association between school-wide student achievement in reading and mathematics and a school's overall implementation and years of implementing Response to Intervention in an effort to gain insight in to RTI's potential as a school improvement model. Based on a review of the available literature and analysis obtained from this study the following considerations are made for future research related to the application of Response to Intervention for improving secondary schools:

- Additional studies using a mixed-methods approach are recommended to follow a secondary school's journey in implementing RTI and the potential growth experienced within that school. A mixed-methods approach would provide qualitative insight to the challenges posed by implementing Response to Intervention while also providing a quantitative analysis of the impact of RTI's implementation.
- The purpose of this study was to measure the potential impact Response to Intervention has in influencing school-wide outcomes in reading and mathematics. For this study, outcomes in reading and mathematics were measured by the end-of-year state assessments. For future research, a comparison study that examines the rate of school-wide growth over two or more years between RTI and non-RTI schools would provide useful information regarding RTI's effectiveness in improving schools.
- Response to Intervention is a complex process. Recognizing that every school is different, the look and implementation of RTI by each practicing school molds it to fit the school. Currently, assessing the implementation of RTI in schools is difficult with few models in existence that are efficient and accurate. The SAPSI, used for this study, was modified from its original design to fit the needs for this study. Additional

research is recommended to develop an efficient and accurate instrument to measure RTI and guide its practitioners in the process.

- While more recent studies examining RTI's effectiveness have focused on practitioner implementation within schools, most studies detailing RTI's impact on student achievement have resulted from researcher-implemented programs within schools. Additional research into the challenges faced by practitioners, especially secondary schools, is warranted as RTI continues to spread into middle and high schools as they search for better methods to serve all students.

Reflections

The purpose of the study was to determine the impact Response to Intervention has in influencing the reading and mathematics skills of middle school students. By analyzing the levels of RTI implementation and the years of RTI implementation reported by the participating school principals against the scaled reading and mathematics scores for each school, this study attempted to provide guidance to instructional leaders seeking to improve student achievement in their schools. More importantly, if RTI holds promise as a school improvement model, practitioners of RTI in secondary schools must be able to implement it effectively and realize significant, observable improvements in student achievement in reading and mathematics on state assessments regardless of the economic or ethnographic composition of the school. While the results of this study failed to demonstrate increased student achievement among schools with higher levels of RTI implementation, several positive outcomes can be made. Participation in this study along with other informal communications with prospective school divisions suggests interest in Response to Intervention in secondary schools is relatively strong. Although larger samples are always better, the number of participating schools was encouraging. Additionally, the variability within the participating schools with regards to school size, demographic composition, and geographic location suggests RTI currently holds a broad appeal across Virginia.

Two changes are recommended for researchers looking to replicate this study or parts of this study. First, further alterations to the SAPSI are suggested. Specifically, the range of responses to each item lied on a scale of 0 to 3 where: 0 = Not Started (the activity occurs less than 25% of the time); 1 = In Progress (the activity occurs approximately 25% to 74% of the

time); 2 = Achieved (the activity occurs approximately 75% to 100% of the time); and 3 = Maintaining (the activity has been achieved and continues to occur approximately 75% to 100% of the time). Altering the scale from four to five where: 0 = Not Started (the activity occurs less than 25% of the time); 1 = Growth in Progress (the activity occurs approximately 25% to 54% of the time); 2 = Gaining Proficiency (the activity occurs approximately 55% to 74% of the time); 3 = Achieved (the activity occurs approximately 75% to 100% of the time); and 4 = Maintaining (the activity has been achieved and continues to occur approximately 75% to 100% of the time) will increase the sensitivity of the evaluation instrument thereby creating greater variability in the describing the implementation of RTI in schools. Second, while the proclivity of the participating schools greatly favored implementing RTI was a positive sign, attracting more non-RTI schools to participate in the study would have been helpful in creating sharper delineations along the implementation range.

As I close, I look back fondly on the process and am proud of the personal growth gained through the discovery of new information related to Response to Intervention. At times, the dissertation process posed a struggle; however, the conclusions drawn from the existing literature and results of this study were enlightening to me as a practitioner of RTI. While the results of this study do not directly indicate a role for RTI in increasing school-wide student achievement, I believe better constructed studies, especially longitudinal studies, will support the role that a well-practiced RTI model can hold for student achievement.

I believe that learning, like perseverance, is a powerful trait. While I hope this study will provide at least a small amount of learning for a fellow practitioner or future researcher, it has been a great source of learning for me in two key areas. First, as the principal of an RTI schools for 8 years, I felt comfortable in my leadership of the process. The extensive examination of RTI required during this dissertation has sharpened my focus towards improving the practices in my building in the hopes of further increasing student achievement. Second, as a history major and social studies teacher, I believed studying the past revealed truths about our present and future. The growth of my understanding of statistics has shown me that a statistical analysis of the past reveals a truer picture of the future.

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Appendix A

SAPSI Use Approval

Hi David,

The Florida Problem Solving/Response to Intervention Project received your emailed form dated July 21, 2014, requesting permission to reproduce the Self Assessment of Problem Solving Implementation (SAPSI).

Permission is granted by the copyright holder to print and use for educational purposes with the following conditions:

- An appropriate acknowledgment of the Florida Problem Solving/Response to Intervention Project (a collaborative project between the Department of Education and the University of South Florida) is included.
- The material is not used for commercial purposes.

While it's fine for you to modify this tool, please keep in mind that modifications to the tool mean that any psychometric information we have available will not be valid for your revised version.

Thank you for your interest in this resource. Please contact me if you need further assistance.

Sincerely,

Judi Hyde

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Appendix B

Adapted Version of the Self-Assessment of Problem-Solving Implementation Survey

This version of the Self-Assessment of Problem-Solving Implementation (SAPSI) is adapted, with permission, from the Florida Problem Solving/Response to Intervention Project (a collaborative project between the Department of Education and the University of South Florida).

Your consent will be indicated by checking the box below indicating that you have read and agree to the conditions of this project
I agree to the terms of the project and wish to participate

For each item below, please select the number of the option (0, 1, 2, 3) that best represents your school's degree of implementation of Response to Intervention for the 2013-2014 school year

Q1 District level leadership provides active commitment and support (i.e. meets to review data and issues at least twice each year).

- ❍ 0 = Not Started (The activity occurs less than 24% of the time)
- ❍ 1 = In Progress (The activity occurs approximately 25% to 74% of the time)
- ❍ 2 = Achieved (The activity occurs approximately 75% to 100% of the time)
- ❍ 3 = Maintaining (The activity has been achieved and continues to occur 75% to 100% of the time

Q2 The school leadership provides training, support, and active involvement (e.g. principal is actively involved in School-Based PS/RTI Leadership Team meetings).

- ❍ 0 = Not Started (The activity occurs less than 24% of the time)
- ❍ 1 = In Progress (The activity occurs approximately 25% to 74% of the time)
- ❍ 2 = Achieved (The activity occurs approximately 75% to 100% of the time)
- ❍ 3 = Maintaining (The activity has been achieved and continues to occur 75% to 100% of the time

Q3 Faculty/staff support and are actively involved with problem solving/RtI (e.g. one of top 3 goals of the School Improvement Plan, 80% of faculty document support, 3 year timeline for implementation available).

- ❍ 0 = Not Started (The activity occurs less than 24% of the time)
- ❍ 1 = In Progress (The activity occurs approximately 25% to 74% of the time)
- ❍ 2 = Achieved (The activity occurs approximately 75% to 100% of the time)
- ❍ 3 = Maintaining (The activity has been achieved and continues to occur 75% to 100% of the time

Q4 A School-Based RtI Leadership Team is established and represents the roles of an administrator, facilitator, data mentor, content specialist, parent, and teacher from representative areas (e.g. general ed., special ed.).

- ❍ 0 = Not Started (The activity occurs less than 24% of the time)
- ❍ 1 = In Progress (The activity occurs approximately 25% to 74% of the time)
- ❍ 2 = Achieved (The activity occurs approximately 75% to 100% of the time)
- ❍ 3 = Maintaining (The activity has been achieved and continues to occur 75% to 100% of the time

Q5 Data are collected (e.g. beliefs survey, satisfaction survey) to assess level of commitment and impact of PS/RtI on faculty/staff.

- 0 = Not Started (The activity occurs less than 24% of the time)
- 1 = In Progress (The activity occurs approximately 25% to 74% of the time)
- 2 = Achieved (The activity occurs approximately 75% to 100% of the time)
- 3 = Maintaining (The activity has been achieved and continues to occur 75% to 100% of the time

Q6 School-wide data (e.g. DIBELS, Curriculum-Based Measures) are collected through an efficient and effective systematic process.

- 0 = Not Started (The activity occurs less than 24% of the time)
- 1 = In Progress (The activity occurs approximately 25% to 74% of the time)
- 2 = Achieved (The activity occurs approximately 75% to 100% of the time)
- 3 = Maintaining (The activity has been achieved and continues to occur 75% to 100% of the time

Q7 Statewide and other databases (e.g. Progress Monitoring and Reporting Network [PMRN], School-Wide Information System [SWIS]) are used to make data-based decisions.

- 0 = Not Started (The activity occurs less than 24% of the time)
- 1 = In Progress (The activity occurs approximately 25% to 74% of the time)
- 2 = Achieved (The activity occurs approximately 75% to 100% of the time)
- 3 = Maintaining (The activity has been achieved and continues to occur 75% to 100% of the time

Q8 School-wide data are presented to staff after each benchmarking session (e.g. staff meetings, team meetings, grade-level meetings).

- 0 = Not Started (The activity occurs less than 24% of the time)
- 1 = In Progress (The activity occurs approximately 25% to 74% of the time)
- 2 = Achieved (The activity occurs approximately 75% to 100% of the time)
- 3 = Maintaining (The activity has been achieved and continues to occur 75% to 100% of the time

Q9 School-wide data are used to evaluate the effectiveness of core academic programs.

- 0 = Not Started (The activity occurs less than 24% of the time)
- 1 = In Progress (The activity occurs approximately 25% to 74% of the time)
- 2 = Achieved (The activity occurs approximately 75% to 100% of the time)
- 3 = Maintaining (The activity has been achieved and continues to occur 75% to 100% of the time

Q10 Curriculum-Based Measurement (e.g., DIBELS) data are used in conjunction with other data sources to identify students needing targeted group interventions and individualized interventions for academics.

- ❍ 0 = Not Started (The activity occurs less than 24% of the time)
- ❍ 1 = In Progress (The activity occurs approximately 25% to 74% of the time)
- ❍ 2 = Achieved (The activity occurs approximately 75% to 100% of the time)
- ❍ 3 = Maintaining (The activity has been achieved and continues to occur 75% to 100% of the time

Q11 Data are used to evaluate the effectiveness (RtI) of Tier 2 intervention programs.

- ❍ 0 = Not Started (The activity occurs less than 24% of the time)
- ❍ 1 = In Progress (The activity occurs approximately 25% to 74% of the time)
- ❍ 2 = Achieved (The activity occurs approximately 75% to 100% of the time)
- ❍ 3 = Maintaining (The activity has been achieved and continues to occur 75% to 100% of the time

Q12 Individual student data are utilized to determine response to Tier 3 interventions.

- ❍ 0 = Not Started (The activity occurs less than 24% of the time)
- ❍ 1 = In Progress (The activity occurs approximately 25% to 74% of the time)
- ❍ 2 = Achieved (The activity occurs approximately 75% to 100% of the time)
- ❍ 3 = Maintaining (The activity has been achieved and continues to occur 75% to 100% of the time

Q13 Education Eligibility determination is made using the RtI model for the following ESE programs:

	0 = Not started (The activity occurs less than 24% of the time)	1 = In Progress (The activity occurs approximately 25% to 74% of the time)	2 = Achieved (the activity occurs approximately 75% to 100% of the time)	3 = Maintaining (The activity has been achieved and continues to occur 75% to 100% of the time)
Emotional/Behavioral Disability	❍	❍	❍	❍
Specific Learning Disability	❍	❍	❍	❍

Q14 The School-Based RtI Leadership Team has a regular meeting schedule for problem-solving activities.

- ❍ 0 = Not Started (The activity occurs less than 24% of the time)
- ❍ 1 = In Progress (The activity occurs approximately 25% to 74% of the time)
- ❍ 2 = Achieved (The activity occurs approximately 75% to 100% of the time)
- ❍ 3 = Maintaining (The activity has been achieved and continues to occur 75% to 100% of the time

Q15 The School-Based RtI Leadership Team evaluates target student's/students' RtI at regular meetings.

- ❍ 0 = Not Started (The activity occurs less than 24% of the time)
- ❍ 1 = In Progress (The activity occurs approximately 25% to 74% of the time)
- ❍ 2 = Achieved (The activity occurs approximately 75% to 100% of the time)
- ❍ 3 = Maintaining (The activity has been achieved and continues to occur 75% to 100% of the time

Q16 The School-Based RtI Leadership Team involves parents.

- ❍ 0 = Not Started (The activity occurs less than 24% of the time)
- ❍ 1 = In Progress (The activity occurs approximately 25% to 74% of the time)
- ❍ 2 = Achieved (The activity occurs approximately 75% to 100% of the time)
- ❍ 3 = Maintaining (The activity has been achieved and continues to occur 75% to 100% of the time

Q17 The School-Based RtI Leadership Team has regularly schedule day meetings to evaluate Tier 1 and Tier 2 data.

- ❍ 0 = Not Started (The activity occurs less than 24% of the time)
- ❍ 1 = In Progress (The activity occurs approximately 25% to 74% of the time)
- ❍ 2 = Achieved (The activity occurs approximately 75% to 100% of the time)
- ❍ 3 = Maintaining (The activity has been achieved and continues to occur 75% to 100% of the time

Q18 The school has established a three-tiered system of service delivery.

	0=Not Started – the activity occurs less than 24% of the time	1= In Progress – the activity occurs approximately 25% to 74% of the time	2=Achieved – the activity occurs approximately 75% to 100% of the time	3= Maintaining – the activity has been achieved and continues to occur approximately 75% to 100% of the time
Tier 1 Academic Core Instruction clearly identified.	❍	❍	❍	❍
Tier 2 Academic Supplemental Instruction/Programs clearly identified.	❍	❍	❍	❍
Tier 3 Academic Intensive Strategies/Programs are evidence-based.	❍	❍	❍	❍

Q19 Teams (e.g., School-Based RtI Leadership Team, Problem-Solving Team, Intervention Assistance Team) implement effective problem solving procedures including:

	0=Not Started – the activity occurs less than 24% of the time	1= In Progress – the activity occurs approximately 25% to 74% of the time	2=Achieved – the activity occurs approximately 75% to 100% of the time	3= Maintaining – the activity has been achieved and continues to occur approximately 75% to 100% of the time
Problem is defined as a data-based discrepancy (GAP Analysis) between what is expected and what is occurring (includes peer and benchmark data).	❍	❍	❍	❍
Replacement behaviors (e.g., reading performance targets, homework completion targets) are clearly defined.	❍	❍	❍	❍
Problem analysis is conducted using available data and evidence-based hypotheses.	❍	❍	❍	❍
Intervention plans include evidence-based (e.g., research-based, data-based) strategies.	❍	❍	❍	❍
Intervention support personnel are identified and scheduled for all interventions.	❍	❍	❍	❍
Intervention integrity is documented.	❍	❍	❍	❍
Response to intervention is evaluated through systematic data collection.	❍	❍	❍	❍
Changes are made	❍	❍	❍	❍

to intervention based on student response.				
Parents are routinely involved in implementation of interventions.	❍	❍	❍	❍

Q20 This school began implementing Response to Intervention in the during the following school year:

- ❍ 2004-2005
- ❍ 2005-2006
- ❍ 2006-2007
- ❍ 2007-2008
- ❍ 2008-2009
- ❍ 2009-2010
- ❍ 2010-2011
- ❍ 2011-2012
- ❍ 2012-2013
- ❍ 2013-2014
- ❍ Other _____

Appendix C

Certificate of Completion IRB Training in Human Subjects Training

Appendix D

Virginia Tech Institutional Review Board Approval

VirginiaTech

Office of Research Compliance
Institutional Review Board
North End Center, Suite 4120, Virginia Tech
300 Turner Street NW
Blacksburg, Virginia 24061
540/231-4606 Fax 540/231-0959
email irb@vt.edu
website http://www.irb.vt.edu

MEMORANDUM

DATE: November 6, 2014

TO: Ted S Price, David S Daniel

FROM: Virginia Tech Institutional Review Board (FWA00000572, expires April 25, 2018)

PROTOCOL TITLE: School Wide Effects of Implementing Response to Intervention in Virginia Middle Schools

IRB NUMBER: **14-1072**

Effective November 6, 2014, the Virginia Tech Institution Review Board (IRB) Chair, David M Moore, approved the New Application request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report within 5 business days to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at:

http://www.irb.vt.edu/pages/responsibilities.htm

(Please review responsibilities before the commencement of your research.)

PROTOCOL INFORMATION:

Approved As:	**Exempt, under 45 CFR 46.110 category(ies) 2,4**
Protocol Approval Date:	**November 6, 2014**
Protocol Expiration Date:	**N/A**
Continuing Review Due Date*:	**N/A**

*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals/work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

Appendix E

Letter Requesting Division Superintendent Approval

David Daniel
1040 Thompson Ave., West Point Virginia

«Title» «First_Name» «Middle» «Last_Name» «Suffix»
«Division_Name__»
«Address_» «Address_2_»
«City_», «State_» «Zip»

Dear «Title» «Last_Name»,

I am writing to request your permission to allow the middle school(s) within your division to participate in my doctoral dissertation study. The working title for my study is School Wide Effects of Implementing Response to Intervention in Virginia Middle Schools. The purpose of this survey study is to measure the association between school wide student achievement on the English and mathematics SOL tests and the degree of implementation and length of time implementing Response to Intervention in Virginia middle schools.

Should your permission be granted, the middle school principals in your division will be requested via email to complete a modified version of the Self Assessment of Problem Solving (Castillo, J., Batsche, G., Curtis, M., Stockslage, K., March, A., & Minch, D., 2010) developed at the University of South Florida for use in the Florida Statewide Problem Solving / Response to Intervention Project. Participation in the study entails school principals completing the one-time survey with an estimated completion time being under ten minutes. Completed surveys will be statistically analyzed with the overall English and mathematics performance for the school on the 2014 Standards of Learning assessments. Division, school, and principal's name will be coded to provide confidentiality in the final results.

A follow up email will be sent with a unique link that will allow you indicate your permission to move forward with requesting participation from the middle school principals in your school division. For each completed survey in this study, I will donate $1 to the American Cancer Society.

With Sincere Thanks,

David S. Daniel, M.A.Ed, Ed.S.
Principal, West Point Middle School
Doctoral Candidate, Virginia Tech
dsdaniel@vt.edu

Appendix F

Letter Requesting Principal Participation

David Daniel
1040 Thompson Ave., West Point Virginia

[Principal Name]
[Type the recipient address]

[Principal Name]

I am writing to request your participation in a doctoral dissertation research study on the school wide effects of implementing Response to Intervention (RTI) in Virginia middle schools. The purpose of this survey study is to measure the association between school wide student achievement on the English and mathematics SOL tests and the degree of implementation and length of time implementing RTI in Virginia middle schools.

As middle school principals, we oversee a critical time in the education of our commonwealth's students. Our students enter middle school leaving the structure and supports of elementary school and exit our buildings with the skills and knowledge to be successful in high school. By completing this 20 question survey, your ten minutes of time will help define the role, if any, RTI practices play in school wide achievement on the English and mathematics SOL tests in Virginia. Your responses, name, and school name will remain confidential. While your participation is requested, it remains completely voluntary. To pay forward your donation of time, I will donate $1 to the American Cancer Society for each completed survey.

To participate in the survey, please click on the link provided below. Should you have any questions regarding the survey or this doctoral dissertation research study, please contact me at dsdaniel@vt.edu.

Sincerely,

David Daniel
Principal
[Type the sender company name]

Appendix G

Follow-Up Letter Requesting Principal Participation

Dear [Principal Name],

I am following up on an email sent to you requesting your participation in a doctoral dissertation research study on the school wide effects of implementing Response to Intervention (RTI) in Virginia middle schools. The purpose of this survey study is to measure the association between school wide student achievement on the English and mathematics SOL tests and the degree of implementation and length of time implementing RTI in Virginia middle schools.

By completing this 20 question survey, your ten minutes of time will help define the role, if any, RTI practices play in school wide achievement on the English and mathematics SOL tests in Virginia. Your responses, name, and school name will remain confidential. While your participation is requested, it remains completely voluntary. To pay forward your donation of time, I will donate $1 to the American Cancer Society for each completed survey.

To participate in the survey, please click on the link provided below. If you have questions regarding the survey or with this doctoral dissertation research study, please feel free to contact me at dsdaniel@vt.edu.

Sincerely,

David Daniel
Principal
[Type the sender company name]