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Coordinated Instruction in Tier 2 Response to Intervention (RTI): An Examination of the Association Between Coordinated Math Instruction for Tier 2 RTI and the General Education Classroom at the Secondary Level

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Abstract
Legislative and policy initiatives to implement Response to Intervention (RTI) at the secondary level, as both a general education initiative and a method for determining special education classification, have created a need for research supporting the best mechanism for implementation. Without research to support the best mechanism for implementation of RTI at the secondary level, school districts are applying a framework designed to be used at the elementary level. The structural, content, and scheduling needs of secondary school students are different from elementary school children, and because of this, research studies are essential to the determination of best practices for secondary schools. This secondary data analysis of a naturally occurring quasi-experimental study examined the association between coordinated math instruction for Tier 2 RTI and student performance and engagement. Through the constructivist lens, this study examined if there is an association between coordinated Tier 2 RTI and student performance and engagement. Performance was measured by analyzing a pre-test, midterm assessment, posttest, and student grades. Engagement was measured through an examination of student attendance. Coordination of classroom instruction was investigated by comparing student performance and engagement when the same teacher was responsible for delivering the general education classroom instruction and Tier 2 intervention services, as opposed to different teachers. Understanding the mechanisms for delivering Tier 2 RTI has implications for districts meeting the needs of students. Additionally, the findings from this study include implications for future research, state education departments, and school districts. When education becomes more restrictive for students it is the responsibility of educators to ensure students are in the least restrictive environment and the interventions, both structural and instructional, are research-based and effective in meeting the needs of the individual student. The interventions studied through this research found statistically significant higher performance for students in algebra when students had different teachers for their classroom and the Tier 2 intervention. This supports the reduction of structural barriers faced by this district, and increases student opportunities to take fuller advantage of the comprehensive course offerings. Through engaging in research at the secondary level the full promise of RTI and its impact on student performance will be experienced.

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Coordinated Instruction in Tier 2 Response to Intervention (RTI): An Examination of the Association Between Coordinated Math Instruction for Tier 2 RTI and the General Education Classroom at the Secondary Level

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Dedication

This dissertation is dedicated to my family; without whose support this would not have been possible. My incredible wife Audrey provided love, patience, and support that ensured I would complete this journey. I appreciate all of the additional work you did to allow me the opportunity to pursue this. You were always there for me during every step of this journey. To my children Payton, Declan, and Keely, you are an inspiration to me regarding the power of love. My hope for you is that this provides an example of lifelong learning that will become embedded in who you are. Persistence, dedication, and a desire to always learn and grow will serve you well in life. To my parents, Dr. John Shafer and the Reverend Susan Shafer, thank you for your encouragement and support as I have moved through this journey. The values and beliefs you instilled in me provided the foundation for this work.

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Biographical Sketch

Timothy R. Shafer is currently the Director of Academic Services for the Rush-Henrietta Central School District. Mr. Shafer completed his undergraduate studies at Ohio Wesleyan University earning a Bachelor of Arts degree, majoring in History with a minor in Education. In 1997, Mr. Shafer began his teaching career at Dake Jr. High School in the West Irondequoit School District, teaching seventh and eighth grade social studies. During his time teaching social studies he returned to school at the State University of New York College at Brockport to earn his Master of Sciences Degree in School Counseling. Mr. Shafer began his work as a school counselor in 2003 working at the same school he taught social studies. While working as a school counselor, he continued his education at the Massachusetts College of Liberal Arts, Leadership Academy to earn his School District Administrator Certification. Prior to assuming his role as Director of Academic Services, Mr. Shafer served as the Assistant Principal for Irondequoit High School.

Mr. Shafer began his doctoral studies in the Ed.D. Program in Executive Leadership at St. John Fisher College in the summer of 2012. He completed the program of studies in 2015 under the direction of Dr. Guillermo Montes and Dr. Jeanette C. Silvers.

Abstract

Legislative and policy initiatives to implement Response to Intervention (RTI) at the secondary level, as both a general education initiative and a method for determining special education classification, have created a need for research supporting the best mechanism for implementation. Without research to support the best mechanism for implementation of RTI at the secondary level, school districts are applying a framework designed to be used at the elementary level. The structural, content, and scheduling needs of secondary school students are different from elementary school children, and because of this, research studies are essential to the determination of best practices for secondary schools. This secondary data analysis of a naturally occurring quasi-experimental study examined the association between coordinated math instruction for Tier 2 RTI and student performance and engagement. Through the constructivist lens, this study examined if there is an association between coordinated Tier 2 RTI and student performance and engagement. Performance was measured by analyzing a pre-test, midterm assessment, posttest, and student grades. Engagement was measured through an examination of student attendance. Coordination of classroom instruction was investigated by comparing student performance and engagement when the same teacher was responsible for delivering the general education classroom instruction and Tier 2 intervention services, as opposed to different teachers. Understanding the mechanisms for delivering Tier 2 RTI has implications for districts meeting the needs of students. Additionally, the findings from this study include implications for future research, state

education departments, and school districts. When education becomes more restrictive for students it is the responsibility of educators to ensure students are in the least restrictive environment and the interventions, both structural and instructional, are research-based and effective in meeting the needs of the individual student. The interventions studied through this research found statistically significant higher performance for students in algebra when students had different teachers for their classroom and the Tier 2 intervention. This supports the reduction of structural barriers faced by this district, and increases student opportunities to take fuller advantage of the comprehensive course offerings. Through engaging in research at the secondary level the full promise of RTI and its impact on student performance will be experienced.

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Chapter 1: Introduction

Introduction

The moral imperative to ensure all students have access to high-quality public education is essential for the future success of all children (Buffum, Mattos, & Weber, 2012). Swanson (2010) cited that more than 1.3 million students dropped out of school in 2008. The mean earnings for these individuals was approximately $10,386 per year less than a high school graduate's salary at $36,424, which is less than an individual with a bachelor's degree (U.S. Census Bureau, 2012). According to the National Center for Education Statistics (2009), for 18-24 year olds, high school dropouts are more than twice as likely to live in poverty as opposed to college graduates or those with higher level of education (U.S. Dept. of Education, 2011). "To prepare for a successful adult life in a competitive global marketplace, today's students must learn more than the three Rs; they must also master the higher level thinking skills required to continue to learn beyond high school" (Buffum et al., 2012, p.1). Response to Intervention (RTI) has consistently demonstrated, through research, an increase in student achievement, support to facilitate student learning at high levels, a decrease in referrals and placement in special education programs, and increased proficiency on state tests (Buffum et al., 2012; Burns, 2008; Fuchs, Mock, Morgan, & Young, 2003). RTI represents a framework to support student success, and its implementation at the secondary level is the focus of this dissertation. Specifically, the research sought to understand how the mechanism for implementation of RTI, at Tier 2, is associated with student performance and provides the

foundation for meeting the moral imperative of public education. Placing RTI in the historical context of its inception is important to fully conceptualizing RTI as a general education initiative.

History of response to intervention. Currently, RTI functions as both a method of determining the Special Education classification and a framework for meeting students' needs in the general education classroom (Fuchs et al., 2003). RTI's implementation, as a method for determining students' need for special education support, has increased the focus of education on research-based interventions or evidence-based practices. Shifting from a discrepancy model, based on psycho-educational testing, to utilizing student performance data and students' responses to targeted interventions, has increased the focus of education to supporting students in the general education classroom. In order for educators to meet the needs of these students through targeted interventions, evidence-based practices are essential. Through the utilization of these practices, the vast majority of students' academic and behavioral needs can now be met in the general education setting, thus ensuring students are in the least restrictive environment. Schools are required by law, through the Individuals with Disabilities Education Act (IDEA) (2004), to provide an appropriate education in the least restrictive environment that best supports the individual student. This empowers individuals with the legal right to be educated with their peers and have access to the general education curriculum. Through RTI, the mandate of a least restrictive environment is matched to a framework that is grounded in evidence-based instructional practices that are delivered in the general education setting. This is the shift created by the framework—a shift from special education support improving student performance—

to meeting the needs of all learners through high-quality instruction and evidence-based interventions. Response to Intervention is a framework focused on the general education classroom that creates a "comprehensive, systemic approach to teaching and learning designed to address learning problems for all students through increasingly differentiated and intensified assessment and instruction" (Wixson, 2011, p. 503).

Assessment is an integral aspect of RTI, and it is through the use of formative assessments that instruction is best matched to the needs of the learner. Formative assessments in this context include the use of universal screening or pre-assessment tools to determine underperforming populations and the progress monitoring of interventions at all levels. The concept of utilizing formative assessments to better understand the academic and behavioral needs of students, to inform instruction, is not new to education. Formative assessments are those measures used by educators before, during, and after instruction to gather data regarding student learning to make instructional decisions. At the heart of these decisions is the instructional data, and the data is at the center of the RTI framework. The process of using data from formative assessments is integral in the use of screening tools and progress monitoring to inform instructional decisions, determine the appropriate level of tiered support, and special education determination ("The Essentials for RTI," n.d.). It is within the framework of RTI that this data is used to match interventions to students' greatest area of need, on the individual level, and systemically, at the building and district levels.

RTI is a framework or systematic approach to the implementation of data-driven instruction supporting success for all students. Martinez and Young (2011) described the focus of RTI as the application of interventions matched to student needs to support

success in the general education classroom. Canter, Klotz, and Cowan (2008) defined RTI as "a tiered process of implementing evidence-based instructional strategies in the regular education setting and frequently measuring the student's progress to determine whether these strategies are effective" (p. 12). Commonalities regarding RTI, in practice, are determining a student's area of need, matching a research-based intervention for that specific student, applying the intervention with fidelity, and monitoring progress to determine the student's response to the intervention (Martinez & Young, 2011).

Originally, RTI was intended to support students identified for special education support because of reading needs at the elementary level. RTI focused on early intervention targeting students' reading needs. The policy makers supporting RTI were the same group that was instrumental in Reading First, which was a major component of the No Child Left Behind legislation (2002). Critical to this legislation was the utilization of research-based core curricula, valid universal screening measures, and progress monitoring (Fuchs & Fuchs, 2006). However, RTI moved beyond only supporting reading needs to include core academic, behavioral, and communication needs of students (Hazelkorn, Bucholz, Goodman, Duffy, & Brady, 2011). The RTI framework that was initially established to support student reading needs was generalized to all areas of academic and behavioral needs of students. This was then legislated through the reauthorization of IDEA (2004), and it was given incentive by allowing money designated for special education be used in the implementation of RTI (Fuchs, Fuchs, & Stecker, 2010).

RTI is composed of three tiers of support. Tier 1 refers to the general education setting where student needs are met by the teacher through high-quality instruction.

Universal assessments are used alongside student work to monitor progress. Those students who are not responding to the differentiated instruction or who are not making adequate progress would qualify for Tier 2 interventions. Tier 2 was designed to support students by providing supplemental or academic intervention service (AIS) supports that teach specific skills or strategies based on progress monitoring in Tier 1. While the specific skills and strategies are taught in small groups or one-on-one settings, students in Tier 2 work to implement these new skills and strategies in the general education classroom. For this to be effective, service coordination is an essential component. This is especially true in the highly departmentalized structure of secondary education. In the elementary level, there are fewer adults who need to coordinate the direct teaching of skills through guided and independent practice of those skills in the general education classroom. At the secondary level, those skills being taught in Tier 2 must be coordinated with multiple teachers. Students must transfer these skills in multiple settings, while simultaneously learning content. Finally, Tier 2I represents those students whose needs require highly specialized instruction, including special education support (Bradley, Danielson, & Doolittle, 2007; Brozo, 2009; Fuchs, Fuchs, & Compton, 2010; Hoover & Love, 2011; Lenski, 2011). This systematic approach utilizes assessments and instruction to monitor progress to help ensure that students who need specific intervention or skill development receive those supports early in their educational lives, and in turn, reduce the number of students requiring special education services.

In assessing best practices to meet the needs of all students and determining eligibility for special education support, RTI has become a research-based alternative to the discrepancy model (Shinn, 2007). "RtI represents a fundamental shift in how

educators respond to and make decisions about students experiencing academic or behavioral difficulties" (Daly III, Martens, Barnett, Witt, & Olson, 2007, p. 575). The President's Commission on Excellence in Special Education (2002) found that the IQ-discrepant model for identifying and supporting increased literacy had not been effective, especially in light of the increased literacy demands in modern society. Brozo (2009) further illustrated this through specific data:

> Approximately two thirds of 8th and 12th grade students read at less than the "proficient" level on the National Assessment of Educational Progress. Nearly 32% of high school graduates are not adequately prepared for college-level English composition courses (ACT, 2005). Approximately 40% of high school graduates lack the literacy skills employers seek. About ½ million students drop out annually and their literacy skills are lower than most industrialized nations. (p. 277)

It is against this backdrop that school districts have implemented RTI based on the reauthorization of IDEA (2004).

According to Schatschneider, Wagner, and Crawford (2008), the move away from the discrepancy model was to ensure students received effective research-based instruction and intervention in the general education classroom. In addition, by implementing RTI, struggling learners would be identified earlier through the screening of all students to determine areas of need and to match interventions to those needs. Students not responding to interventions would move along the continuum of increasing support. The shift to this structure would enable school districts to identify those students needing additional intervention earlier, avoiding the "wait to fail" approach used under

the discrepancy model (Schatschneider et al., 2008, p. 313). However, Schatschneider et al. (2008) felt that this criticism of the discrepancy model also applied to RTI. In order for a student to be identified and classified as having a disability, the school staff must first determine that the student has not respond to the differentiated instruction and evidence-based practices implemented in Tier 1, and not responded to the supplemental research-based interventions applied in Tier 2. Similar to the discrepancy model, students must first demonstrate they are being successful before increased services and the expertise of special education teachers are implemented. A major flaw in this thinking is in not examining the difference between "wait and fail" and the implementation of research-based differentiation and interventions used while continuing to monitor the progress of the student (Fuchs et al., 2010). It is in the systematic implementation and continuous monitoring of student progress that the opportunity for students to move in either direction through the different tiers is created. In the discrepancy model, there must be a gap between student potential, as measured by an IQ test, and achievement. It is not until a pattern of failure has been established that discrepancy is determined. In contrast, RTI utilizes universal screening and student performance data to determine the appropriate level of intervention. Schatschneider et al. (2008) cited the, "multiple measures collected over an extensive time period, and performance across multiple measures" as a strength regarding RTI's ability to use data to support instructional decisions (p. 313). It is RTI's use of multiple data sources in instructional decisions that provide the framework for successfully meeting student needs.

According to Barnes and Harlacher (2008), RTI is composed of five principles that provide the foundation for the systematic approach while simultaneously ensuring the flexibility to guarantee the needs of students are met. These five principles are: "(1) a proactive and preventative approach to education; (2) ensuring an instructional match between students skills, curriculum, and instruction; (3) a problem-solving orientation and data-based decision making; (4) use of effective practices; and (5) a systems-level approach" (Barnes & Harlacher, 2008, p. 419). Through utilization of RTI, educators are able to be proactive in addressing student needs, identify students with disabilities, and matching evidenced-based interventions with student needs. In approaching RTI through this lens, educators are able to meet the needs of all students and use data to purposefully differentiate instruction. In addition, RTI provides the framework to change the paradigm in education from what evidence is needed to support special education placement to empowering teachers with data to match student needs and interventions. This change helps to ensure the focus is on "reducing and eliminating already existing, sizable academic deficits . . . [and] monitoring response to intervention to determine when important academic bench-marks have been achieved" (Fuchs et al., 2010, p. 26). Barnes and Harlacher (2008) further posited RTI's philosophical change in the locus of control. "Here, the focus is therefore on monitoring response to intervention to determine when important academic benchmarks have been achieved for the purpose of transitioning students down the RTI pyramid" (Fuchs et al., 2010, p. 26). Educators utilizing the RTI framework are focused on interventions and evidence-based practices that are supported by a highly effective core curriculum—not on factors outside of their control.

Problem Statement

The majority of the research surrounding RTI has been done in the elementary level as a reading intervention (Hazelkorn et al., 2011). Brozo (2009) emphasized the disparity in research with RTI stating, "although research around RTI at the elementary level has been ongoing, studies into the best ways of implementing the process for secondary students are scant" (p. 278). The focus on early intervention and skill remediation has further reinforced RTI research in elementary schools. "Many researchers avoid middle and high schools entirely because of the scheduling problems and compliance issues often encountered when working with adolescents" (Fuchs et al., 2010, p. 22). However, without the research to support the best mechanisms for implementation of RTI at the secondary level, school districts are implementing a framework designed to be used at the elementary level. The structures of elementary and secondary education are very different, and with the increased content, educators, and other scheduling needs, research is essential to support implementation.

Even with the lack of research, middle and high schools have implemented RTI models for instructional intervention in support of all students. Utilizing this multi-tiered model, in combination with evidence-based practices, student needs are assessed through universal screening, and other performance data, in an effort to determine the best level of support.

Sansosti, Telzrow, and Noltemeyer (2010) highlighted this lack of research regarding the implementation of RTI at the secondary level, with some unique exceptions. These exceptions demonstrated RTI effectiveness in addressing reading and math concerns, in addition to vocabulary initiatives utilizing the tiered model. The first

study, done in two Minnesota secondary schools, suggested support of the tiered model to specifically remediate students' reading and math needs. In order for the tiered model to be applied in these two secondary schools, specific building adjustments to schedules and interventions were necessary. In addition, Sansosti et al. (2010) stated, "Despite these optimistic findings, unique challenges were also revealed through these investigations, and there remains a limited evidence base of field-based applications of RTI in secondary settings" (p.2). It is in the absence of the research that the questions of RTI's application in the secondary setting are found and suggest the need for additional research at the secondary level.

Theoretical Rationale

Harris & Graham (1994) chronicled the changing role of the teacher from one of teaching subject matter to that of teaching children. This move, from teaching as a process of supporting knowledge acquisition to that of growth and the development of the individual learner to live successfully in a democracy, shifts the focus of responsibility from the teacher to the learner. At the secondary level, this also adds the need for faculty to be more than just content experts. Teachers need to support student acquisition of the skills that facilitate independent learning. These skills include the critical thinking, literacy, and numeracy that support student construction of knowledge. For those students not demonstrating proficiency, acquisition of these skills through targeted instruction is essential. In their meta-analysis of intervention studies, Edmonds, Vaughn, Wexler, Reutebuch, Cable, Tackett, and Schnakenberg (2009) identified the positive impact of specific skill instruction on student performance as a key component of effective interventions. "Seemingly obvious, this phenomenon is quite significant

because many struggling readers in older grades (6-12) are not provided [with] effective instruction in reading comprehension" (Edmonds et al., 2009, p. 292). In doing this, the function of the teacher is to facilitate student independence through learning how to learn or teach themselves. It is in the explicit teaching of these skills embedded in the content that RTI at the secondary level must live.

These ideas were posited in Miller, Courtis, & Watters' (1931) book demonstrating a need "for a complete reversal of viewpoint in regard to the aims and methods of teaching" (p. 5). Specifically, this quote addresses that content expertise and direct instruction regarding content is not all that matters in teaching. Content knowledge and expertise are important but not in the absence of skill instruction and learner engagement to construct meaning. Further, this quote demonstrates the antecedents for the concepts and principles that underlie constructivism. These principles and concepts are found in the works of Bruner (1966), Dewey (1916), Piaget (1954), Vygotsky (1962), and other educational researchers, and while constructivism encompasses varied meanings, the core principles and concepts stay cogent.

Constructivist theory posits that individuals construct their own knowledge or mental models by actively creating, interpreting, and organizing this knowledge with prior learning or experiences (Applefield, Huber, & Moallem, 2001; Harlow, Cummings, & Aberasturi, 2006; Gordon, 2009; Harris & Graham, 1994; Hyslop-Margison & Strobel, 2008). "Constructivism is an epistemological view of knowledge acquisition emphasizing knowledge construction rather than knowledge transmission and the recording of information conveyed by others" (Applefield et al., 2001, p. 37). Core principles that are essential to constructivist theory are: (1) active construction of

knowledge by the individual learner; (2) children are seen as inherently active, self-regulating learners who construct knowledge in developmentally appropriate ways while interacting with a perceived world; (3) prior knowledge and experiences are starting points for new learning; (4) only occurs when the learner fully participates (this promotes access to, and application of, what has been learned); (5) perceive learning as a socially situated activity that is enhanced in functional, meaningful, and authentic contexts; (6) growth vs. acquisition theory where teachers function as assisting performance and construction of knowledge, as opposed to explicitly providing knowledge (Harris & Graham, 1994).

The impact of these principles on instruction is through the creation of learning experiences and a learning environment that fosters active construction of knowledge. "Only when the learner senses disequilibrium and confronts experiences that cannot be assimilated easily is he or she forced to accommodate the new information and construct new schema" (Harlow et al., 2006, p. 45-46). For this to occur at high levels, the use of formative assessments to drive instruction, based on a thorough understanding of the individual learner's strengths and needs, is critical. Harris & Graham (1994) elicited Vygotsky's (1962) premise, "that mature thought develops in social contexts, as mature thinkers model thinking and problem solving and provide cues and guidance to children as needed" (p. 236). It is the child's response to instruction that informs the instructional experience. "Explicitness and structure need not equate with decontextualized learning of meaningless skills, passive learning, or the teaching of gradually accruing basic skills as a prerequisite to higher order thinking and learning" (Harris & Graham, 1994, p. 238). Authentic instruction hinges upon the individual learners understanding of the purpose,

context, and generalization or transferability of the skills learned. "In this view, teaching should promote experiences that require students to become active, scholarly participators in the learning process" (Gordon, 2009, p. 39). This is where the coordination of Tier 2 RTI is established in the constructivist paradigm, and it is essential to a student's ability to generalize and transfer skills learned.

Some advocates of constructivism would argue that teaching explicitly is not necessary. Students will develop the skills needed through immersion in meaningful authentic learning experiences. However, this view of constructivism does not capture its true nature, and it is "a fundamental issue regarding the definition, meaning, and translation into practice of constructivism" (Harris & Graham, 1994, p. 238). "When remediation of deficits is discarded, we disallow students the opportunity to acquire the skills that may help them become accepted by and acceptable to other significant persons in the world" (Kronick, 1990, p. 6). The view that skill acquisition will happen automatically during typical development and immersion in authentic learning experiences, incorporating meaningful text, has concerned educators, especially those working with students who are at risk or diagnosed with disabilities. Structured, purposeful instruction targeted to the needs of students provides the entry point to access the learning, and when done authentically in context, facilitates the learning. Kronick (1990) further argued, "Good remediation neither is repetitive [n]or boring nor flogs a student's weaknesses and ignores his or her strengths" (p. 6). The teaching of these skills in context, with students having a clear understanding of the purpose of the skill instruction and transparent connections to the learning experiences, supports the construction of knowledge. Through coordinated Tier 2 instruction, students are

empowered with the skills to be more independent in the classroom, and teachers are empowered to better support student independence with appropriate compensatory strategies, which ensure high levels of thinking, while skills are being developed (Harris & Graham, 1994). The RTI framework supports all students' construction of knowledge in the least restrictive environment. Utilizing student data to inform instruction enables educators to provide a learning environment that facilitates construction of knowledge and student independence. Those students whose responses to targeted interventions support a higher level of service are able to use the explicit skill development to better engage in the learning.

Statement of Purpose

The purpose of this study is to explore how the integration and coordination of classroom instruction and Tier 2 RTI are associated with student performance and engagement. An essential element is to determine if there is an association between coordinated Tier 2 implementation and student performance. Through the constructivist lens, examining how to best deliver specific skill instruction, which is embedded in the content of secondary education, is essential. In order to do this, performance is measured through pre-assessments, post-assessments, and parallel assessments (first-quarter check point). Student engagement is measured by analyzing attendance and quarterly grades. Integration and coordination of classroom instruction is investigated by comparing student performance and engagement when the same teacher is responsible for delivering the general education classroom instruction and Tier 2 intervention service, as opposed to different teachers delivering the general education classroom instruction and Tier 2 intervention service.

Research Questions

The research questions that guided this quantitative study are:

1. Does integrated coordination of classroom instruction and Tier 2 RTI delivery positively associate with student performance as measured by pre-assessments, post-assessments, and progress monitoring (through parallel assessments)?

2. Does integrated coordination of classroom instruction and Tier 2 RTI delivery associate with increased student engagement as measured by student attendance and quarterly grades?

Significance of the Study

The reauthorization of IDEA (2004) legislated the use of RTI as an alternative method for determining learning disabilities for students experiencing academic underachievement (Fuchs & Fuchs, 2006; Lenski, 2011; McDaniel, Albritton, & Roach, 2013). Additionally, RTI is a framework focused on prevention with the ultimate goal of meeting the needs of learners in the general education classroom. Lenksi (2011) argued that RTI provides students with multiple opportunities for targeted evidence-based interventions to improve areas of need. RTI developed from the notion that, "struggling readers have not had sufficient opportunities for learning . . . [and] the legislation is designed to give students multiple opportunities to learn before referring them for special education testing" (p. 277). Students' progress through tiers of increasing intervention intensity is dependent on their response to evidence-based practices, which are designed to address the specific deficit areas of the individual student. Decisions are made by an interdisciplinary team utilizing multiple sources of student data through progress monitoring to determine if students are not making academic or behavioral progress with

the evidence-based interventions implemented at less intensive tiers. "The logic of the three-tiered approach implies that if a student cannot make academic gains using procedures that are evidence-based and shown to be effective with the majority of students, then the student could benefit from additional support" (McDaniel et al., 2013, p. 202). This logic is also used in the reverse, which was posited that if students are making progress, they are able to increase their independence and move to less intensive supports. However, research regarding the best mechanism for delivering this framework at the secondary level is needed.

Bolt (2005) highlighted the impact of the use of RTI as an alternative approach to special education determination and the subsequent implementation of an RTI framework in many school districts as a result of IDEA (2004). "Although information is available on changes in the percentages of students receiving special education services that are associated with RTI approaches, there has been relatively little evaluation to date of effects of RTI model implementation on student achievement outcomes" (p. 65). While research into the effectiveness of RTI at the elementary level is rich, the implementation of the three-tiered system used at the elementary level into the secondary level has garnered criticism, especially surrounding the amount of empirical research (Brozo, 2009; Lenski, 2012). Lenski (2012) further posited that RTI at the secondary level has the additional goals of supporting capacity building for students to reach graduation requirements, ensuring fidelity of instruction and interventions, and creating a framework for continuous school improvement. Brozo (2009) stated, "If content teachers fail to offer responsive literacy instruction to benefit every student and differentiate assistance for those in need of extra help, then the preventive potential of RTI is lost" (p. 280). In

order for implantation of RTI at the secondary level to realize its full potential, further research is needed. McDaniel et al. (2013) found in their systematic review of empirical RTI research that "additional research and information dissemination focusing on RTI applied in general education" is vital. "Although RTI frameworks encourage educators to seek out and adopt evidence-based practices, the research to guide general educators in RTI implantation is scant at best" (p. 207). This research adds to this scant body of research to better understand the impact of coordinated Tier 2 intervention on student performance and engagement.

Chapter Summary

The remainder of the document is organized into four distinct chapters. The next chapter (Chapter 2) is a review of the literature regarding RTI at the secondary level. This literature review focuses on the perception of key figures in the implementation of RTI, and it includes principals, school psychologists, and special education directors in addition to standard protocol and problem solving approaches to RTI implementation. The literature review also explores the history and framework of RTI. Chapter 3 provides a detailed plan of the research methods, context, participants, instruments used in data collection, and the data analysis. Chapter 4 presents the research findings, and Chapter 5 discusses the interpretations of those findings.

Chapter 2: Review of the Literature

Introduction and Purpose

Implementation of RTI was legislated as an alternative for special education classification to address the disproportionate number of minority students, low socio-economic students, and English-language learners (ELLs) who were classified as learning disabled. Additionally, RTI built on the ideas of the President's Commission on Excellence in Special Education (2002) to move from a framework, which is dependent on student failure to determine academic and behavioral need, to one focused on prevention. In order to fully utilize RTI as a preventive framework it is imperative to first recognize students as part of the general education classroom (Greenwood & Kim, 2012; Wixson, 2011). "While RTI began as a response to addressing student outcomes for special education students, it quickly emerged as a general education system that does not operate as two distinct entities" (McDaniel et al., 2013). Integrating both special education and general education provides the framework for early intervention and prevention of academic and behavioral difficulties. "From this prospective, RTI is a process that cuts across general, compensatory, and special education and is not exclusively a general or special education initiative" (Wixson, 2011, p. 504). For this to occur, it is essential to have research supporting the mechanisms for implementation. Glover, DiPerna, and Vaughn (2007) stated that, "research and scholarship pertaining to the delivery of services required to appropriately implement RTI is limited" (p. 523). To

best inform this study, a thorough review of the empirical literature pertaining to RTI was completed.

This paper begins with a brief introduction to RTI, including the history and framework. An examination of the empirical literature follows. The parameters for the review were peer reviewed journals utilizing EBSCO, Education Source, and ProQuest Educational Journals databases. The key words used in the search were "response to intervention," "secondary education," and "method." Eleven empirical articles were found using this search. One of those articles was not included in this review because it discussed how technology could be integrated with evidence-based practices, and it was not specifically used within an RTI framework. Other search terms employed were: "response to intervention," "standard protocol, and "secondary education," "response to intervention," "problem solving," and "secondary education." Exclusionary terms were used to prevent the inclusion of mental health or health care literature in the search. The terms used were "mental health" and "health care." Studies including mental health and health care did not present as relevant to this specific research, and because of this, did not warrant including in the literature review. Using the key words "Response to Intervention," "secondary education" and "method," 150 empirical articles were found. When the search included "standard protocol," four empirical articles were found, and when "standard protocol" was replaced with "problem solving," 81 empirical articles were found. One of these studies led to the discovery of replicated research regarding the perception of key constituencies. Sansoti et al. (2011) did a qualitative focus group study with Special Education directors. This same study was then replicated with school psychologists and principals, and it was included in this review.

From a review of the literature, the researcher organized his findings around the implementation of RTI, perceptions of key constituents to the implementation of RTI (principals, special education directors, and school psychologists), and two approaches to the implementation of RTI (standard protocol and problem solving). In addition to the empirical literature, frequently cited research was also included, because it was needed to contextualize the history and essential aspects of RTI. Time was not a limiting factor in this review. An analysis of gaps and future research conclude this chapter.

History of response to intervention. With the pressure of federal legislation to increase accountability, coupled with educators' frustration with wait and fail approach to special education classification, the RTI framework has created a way to meet both needs (Barnes & Harlacher, 2008; Torgesen, 2009). Torgesen referred to the term RTI as applying to both "(a) a method for increasing the capacity of schools to respond effectively to the diverse learning and behavioral support needs of their students, and (b) a new way of determining eligibility for special education services" (p.38). Initially, RTI was presented as an alternative and more accurate way to diagnose students with learning disabilities, and it has evolved into a preventative model that helps educators determine the best service delivery mechanism for students (Flover & DiPerna, 2007; Fuchs & Fuchs, 2006; McDaniel et al., 2013).

Legal basis. RTI was initially intended to support students who were identified for special education support because of reading needs at the elementary level. RTI focused on early intervention targeting student's reading needs. The policy makers supporting RTI were the same group that was instrumental in Reading First, which was a major component of No Child Left Behind legislation (2002). Central to this legislation

was the utilization of research-based core curricula, valid universal screening measures, and progress monitoring (Fuchs & Fuchs, 2006). This standards-driven general education policy has been the focus of education since the early 1990s. The reauthorization of Title I of the Elementary and Secondary Education Act (ESEA, 1994), and the further strengthening of standards driven education in the 2001 reauthorization of ESEA, better known as No Child Left Behind (NCLB), have legislated policies aimed at closing the achievement gap for all students. This includes those traditionally disenfranchised groups that have become over represented in special education programs (Fuchs et al., 2010). Key components of this standards-driven reform are uniformly rigorous standards for all children, assessments that are aligned to the standards, participation of virtually all students in the assessments, and school accountability is determined by student performance (Fuchs et al., 2010). These ideas were further reinforced with the reauthorization of IDEA in 2004.

The reauthorization of IDEA 2004 legislated a shift in determining Specific Learning Disability (SLD) for students. This law explicitly states that districts did not need to use the discrepancy model to diagnose a Learning Disability (LD). Districts were able to use students' responses to research-based interventions as a diagnostic tool, and specifically named RTI, as an alternative method. In order to further enhance early identification of students at risk of failure and support implementation of RTI, IDEA also established that up to 15% of special education funds could be used to support early-intervention activities (Fuchs & Fuchs, 2006). The stage for these changes was set in 2001. The Office of Special Education Programs (OSEP) held a conference discussing LD practice and policy. During this conference, Dr. Gresham (2001) presented a model

determining LD diagnosis based on student's response to the implementation of research validated interventions. Students would only be identified as LD based on their response to the intervention (RTI). Once a research validated intervention was implemented, the lack of improvement in the problem behavior was indicative of the LD diagnosis (Burns & Ysseldyke, 2005). During this same year, the President's Commission on Excellence in Special Education (PCESE, 2001) endorsed the utilization of an RTI model for LD determination. Since that time, "RTI has become the prominent alternative to the discrepancy model" (Burns & Ysseldyke, 2005, p. 9). To better understand RTI as an alternative to the discrepancy model, it is important to understand that model.

Discrepancy model. The discrepancy model for determining SLD was established to help identify children with a learning disability as part of the Education for All Handicapped Children Act (1975), which was renamed IDEA in 1990. This was done in part because of successful lobbying done in the mid-1970s to include children with learning disabilities as a unique group to be included in the law (Fuchs et al., 2003). Fuchs et al. (2003) stated that advocates used research from physicians in the 1890s that was further documented by Dr. Samuel Orton, in the 1920s and 1930s, describing "the seemingly paradoxical inability of some children of average and superior intelligence to master academic concepts" (Fuchs et al, 2003, p. 157). This research was coupled with Rutter and colleague's (1964-1974) epidemiological studies to establish unexpected and specific learning failure as features of a learning disability to be protected under the law. Rutter and colleagues did their research using 9 and 14 year olds on the Isle of Wight. The researchers measured the IQ and reading performance of the children, and "regressed the IQ scores on their reading scores to produce a distribution of IQ-predicted reading

performance" (Fuchs et al., 2003, p. 157). The researchers analyzed the scores based on the assumption that scores above the mean would represent overachievement, and scores below the mean would be representative of underachievement. The distribution of these scores should resemble Gaussian or normal distribution curve; however, Rutter and colleagues "reported a hump at the lower end of the distribution, which, they said, indicated that extreme degrees of reading underachievement occur at a greater rate than should be expected" (p.157). Rutter and colleague's analysis of the research determined differences in the underachievers and those children whose low reading performance was commensurate with their low IQ scores (low achievers). These finding led Rutter and colleagues to determine that underachievers were a unique group with an unexpected and specific learning disability. From this research, the use of a severe discrepancy between IQ score and student performance on achievement tests was used as the primary method of LD determination.

> Government officials wrote more specifically that educators may identify children as LD if the children receive appropriate learning experiences for their age and ability and still do not achieve commensurate with their age and ability in oral expression, listening comprehension, written expression, basic reading skills, reading comprehension, mathematics education, or mathematics reasoning (Fuchs et al., 2003, p. 158).

According to Burns and Ysseldyke (2005), the OSEP in the U.S. Department of Education funded the Institute for Research on Learning Disabilities (IRLD). The IRLD, in combination with other scholars' research, did not support the discrepancy model in determining LD. In addition, utilization of the discrepancy model misses a fundamental

aspect of SLD determination, which is grounded in the research-based curriculum and evidence-based learning experiences. These two characteristics are essential aspects of both NCLB and IDEA legislation, and the RTI framework.

RTI framework. Even though RTI developed from the research in supporting reading, it has moved beyond only supporting reading needs to include core academic, behavioral, and communication needs of students (Hazelkorn et al., 2011). RTI is composed of three tiers of support. To better conceptualize the three tiers of RTI, a visual model is included, here, from the New York State Education Department (NYSED) website.

Figure 2.1 is a visual model of the three tiers in RTI. Each segment in the triangle represents the essential features of RTI and the concept that as a child moves through the RTI framework, the size of the instructional group or number of children decreases, and the level of intensity of progress monitoring and intervention increase. The essential features of Tier 1 include research-based core instruction, evidence-based strategies, classroom management, universal screening of all students, and progress monitoring of at-risk students. Tier 1 core instruction happens in the general education classroom and is meant to be preventive and proactive. In Tier 2, the essential features include effective research-based interventions matched to student needs, increased frequency of progress monitoring, small group instruction, and the use of data to adjust instruction and interventions. Tier 2I represents the most intensive interventions with the smallest population of students. At this level of support, also called Tertiary Interventions, instruction is individualized, it is assessment-based, and it is high intensity.

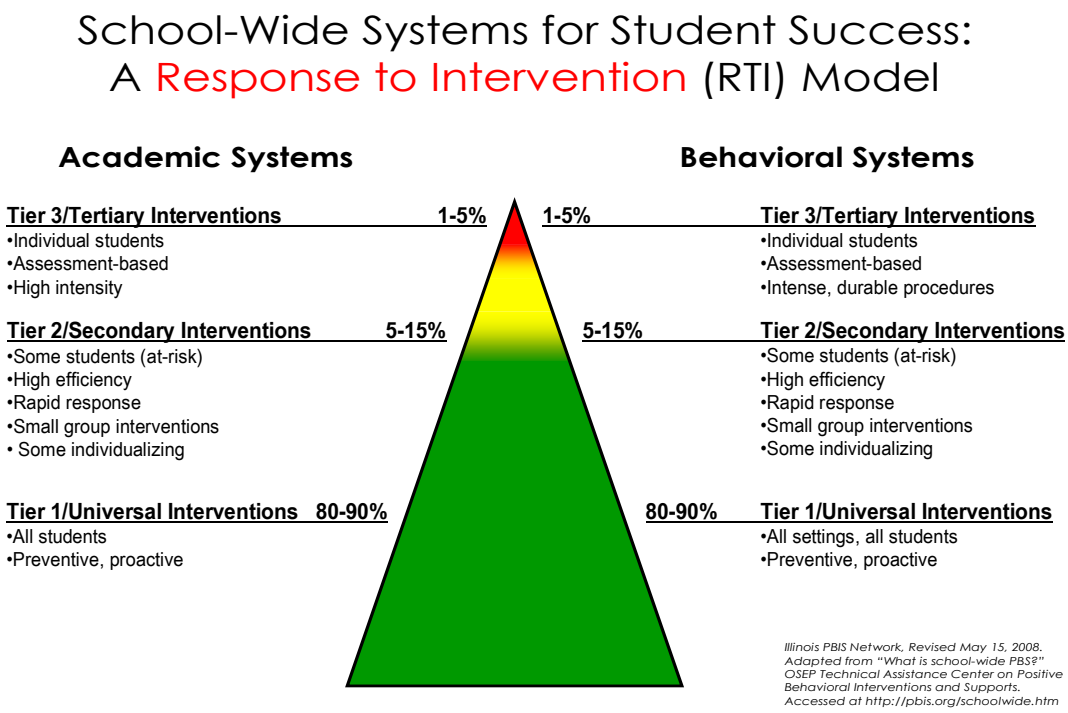

Figure 2.1. RTI Model. Descriptive, three-tiered RTI model that addresses academic and behavioral skills for all students. Retrieved from NYSED/P-12: EMSC at http://www.p12.nysed.gov/specialed/RTI/guidance/appropriate.htm

Implementation of RTI. Research supporting the implementation of RTI at the elementary level has been ongoing with a multitude of studies indicating best practices. This is in stark contrast to research at the secondary level. Fuchs et al. (2010) posited that doing research regarding RTI, at the secondary level, presents difficulties with scheduling, in conjunction with compliance issues that are often associated with working with adolescents. Brozo (2009) argued that in the absence of research and documented success at the secondary level, middle schools and high schools have been forced to establish and implement their own intervention systems, often using the elementary RTI framework. However, research has conceptualized common features of RTI models. These features include universal screening to identify at-risk populations, use of data to

inform instructional and placement decisions, standards-driven core curriculum and evidence-based instruction matched to the needs of students, and progress monitoring of proficiency to determine the effectiveness of the instruction and interventions for students (Fuchs & Fuchs, 2007; Kupzyk, Daly, Ihlo, & Young, 2012). Barnes and Harlacher (2008) supported similar characteristics through their literature and classified them as the principles of RTI.

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

These principles and characteristics of RTI are consistent through the literature and provide the foundation of implementation of a multi-tiered system for prevention and identification (Fuchs & Fuchs, 2007). Prevention focuses on both the identification of at-risk populations through universal screening and the capacity for educators to implement instruction and interventions matched to the needs of learners. Identification of students with SLD is based in progress monitoring data of students not responding to evidence-based interventions that are effective with general education students (Barnes & Harlacher, 2008; Fuchs & Fuchs, 2007; Kupzyk et al., 2012). "The overarching goal of RTI is to create a fluid and flexible continuum of services to maximize all students' progress" (Kupzyk et al., 2012, p. 219). This allows students to move in either direction along the RTI pyramid of increasing or decreasing intensity of services to best match intervention to student need and provide students with the opportunity for the highest

level of independence. This also means that if students are not making adequate progress at a certain tier, they move to a higher tier that includes more intensive instruction and may ultimately require special education support through identification as a student with an SLD (Bradley et al., 2007; Fuchs & Fuchs, 2007; Kupzyk et al., 2012).

Bradley et al. (2007) posited that the implementation of RTI across all grade levels and academic areas with few models is a major challenge. Prior to large-scale implementation of RTI, significant research into the implementation would be ideal; however, in the case of RTI—especially at the secondary level—legislation and policy have driven implementation. Even though policy has driven implementation, extensive research-based models of implementation exist for the elementary level. "The greatest challenge of scaling-up RTI could rest largely in the general education arena" (Bradley et al., 2007, p. 11). Ensuring all educators have the professional development to support all students accessing the general education curriculum is essential to district-wide implementation. Kupzyk et al. (2012) examined best practices for educators in remediating basic skills of students. "One might say that the assessment results diagnose not the child, but the effectiveness of instruction itself" (p. 220). What this quote emphasized, regarding RTI, is that educators control the instruction and interventions used to support student success. The data informs instructional practice and provides the progress monitoring that is essential to adjusting the interventions matched to student needs. In examining current instructional implications, Kupzyk et al. (2012) found that educators need to examine the skills targeted for instruction, or educators need to complete a task analysis, check-guided practice that determines the level of independence for the student with instruction that is implemented with fidelity, and that examines

motivating conditions. "Providing quality, evidence-based instruction matched to student needs is a key feature of RTI" (p. 228). Through an examination of content, instruction, and motivation, teachers are better able to modify instruction for those students not making progress within one of the tiers. This, coupled with an analysis of progress-monitoring data, formative and summative assessments, engagement, and attendance, educators are empowered to increase student success by having a better understanding of the effectiveness of the instruction. In conjunction with this, it is also important to examine some of the differences that occur when RTI is implemented at the secondary level.

The preventive and proactive nature of RTI positions it for implementation at the elementary level. However, policy and legislative action have established RTI as a P-12 initiative. Fuchs et al. (2010) examined three assumptions of elementary RTI that may not be applicable to secondary education: (a) universal screening to identify academic deficits, (b) determination of responsiveness to less-intensive intervention prior to moving to more intensive interventions, and (c) the extent to which effective interventions are the same across the grades. One of the difficulties of universal screening is determining which students qualify for increased intensity of services. Fuchs et al. used the example of quantity discrimination as an index of numerosity to determine student success with math at the start of first grade. "Quantity discrimination accounts for 25-63% of variance in year-end math outcomes" (p. 24). These measures also produced a large percentage of false positives, which indicate the students who failed the screen, but met proficiency without secondary prevention. Having to service false positive individuals stresses the resources that are available to support students in making

adequate progress. Based on the issue of false positives, additional data and assessment is needed to determine students at risk. Fortunately, students in secondary schooling come with multiple years of data. By the time middle and high school academic deficits are well established. Utilizing the already-established assessments and classroom data to identify students who need more intensive support is a better use of resources (Fuchs et al. 2010). This data may also be used to more specifically place students in the appropriate level of intensity as opposed to having students demonstrate non-responsiveness prior to moving them to increased levels of support. This would allow secondary educators to more accurately diagnose academic needs and provision resources more efficiently.

Students who have experienced many years of serious academic deficiency often are resistant to Tier 2 remedial instruction. These students, "frequently demonstrate low motivation and poor academic self-confidence, further complicating and compromising the success of secondary prevention tutoring" (Fuchs et al., 2010, p. 26). The effectiveness and efficiency of Tier 2 resources are better served through inclusion of at-risk students for whom the data supports being successful. Students for whom the data suggest need a more intensive and tertiary level of support, based on large academic deficits, would then be better served by being moved directly to the more intensive tier. However, further research regarding the mechanisms of delivery is essential to support this suggestion.

The delivery of secondary, Tier 2, intervention must also be developmentally matched to the student. Fuchs et al. (2010) argued that the differing needs of adolescents make traditional strategy work inappropriate when the evaluators are faced with

increased knowledge and vocabulary deficits. "Moreover, effective intervention must be contextualized within a delivery model that motivates the adolescent, creatively engaging the peer group to support effectiveness" (p. 26). Programmatic research is needed to answer the questions regarding best practices for Tier 2 intervention and implementation of RTI at the secondary level. Brozo (2009) highlighted the differences between elementary and secondary students in his work that was specific to adolescent literacy.

A major difference in literacy from elementary to secondary education is in the use of reading. In elementary schools, students are learning to read. Following third grade and fourth grade, content demands begin to change, and with that, the need is for students to use reading to learn. "The typical demands of secondary school curriculum require students to possess sophisticated language tools to explore information and concepts in content area subjects, such as history, mathematics, science, and literature" (Brozo, 2009, p. 278). Brozo (2009) explored three essential questions to be asked by secondary education professionals when implementing the RTI framework for adolescents. These questions are: (1) Is RTI a feasible structure for secondary literacy? (2) Is RTI the most effective model for a comprehensive secondary literacy program? (3) Can RTI provide responsive literacy instruction for all students? (p. 278-279). Citing the International Reading Association's Commission on RTI (2009), Brozo cautioned schools against implementation of RTI based on the primary and elementary frameworks. These cautions were based on the lack of research at the secondary level, the structure and culture of secondary schools, and the structure of the secondary-level school day. In the absence of scientific evidence-based interventions applied to adolescent literacy, schools should be cautious. Lenski (2011) framed the goal of content experts at the

secondary level not as reading or literacy teachers, but for the teachers to use literacy as a tool to support content instruction.

While research has proven the effectiveness of the RTI tiered interventions for the early grades, this significant absence of research at the secondary level is of concern to implantation. In addition, secondary teachers often see themselves as content experts first. The demands of covering content standards and grade-level expectations take precedent over literacy needs, and the secondary educator may only have a superficial knowledge base regarding literacy strategies. This is different from elementary-level educators who often have self-contained classrooms where the expectation is that whole-group, small-group, and individualized reading instruction is the delivered (Brozo, 2009; Lenski, 2011). The last challenge to implementation is the secondary schedule and space in school buildings. "If space cannot be found or created within the school day for deserving students to receive appropriate instructional supports, then the foundation upon which RTI rests—that is, the flexibility to create tiered interventional contexts for students depending upon their responses to the instruction provided within each—is undermined" (Brozo, 2009, p. 279).

Questions regarding RTI as the appropriate framework for adolescents' literacy needs focus on the idea that secondary students need more than skill in decoding words or fluency. These students are required to use sophisticated literacy strategies; however, according to Brozo (2009), the emphasis on research-based scientific practice leads to the use of surface-level, progress-monitoring tools, such as oral reading fluency, which is determined by the numbers of words read correctly per minute. Lenski (2011) supported Brozo (2009) in arguing that contextualized learning is essential for secondary students.

For this to be an effective content area, teachers must communicate with those professionals who are implementing the Tier 2 instruction to ensure there is no confusion regarding content and learning expectations. Having students use the content as a vehicle to embed skills work both supports students' ability to function in the content area and transfer learned skills to the classroom and increasing their independence. "These kinds of literacy strategies would help students learn both the content that they need to learn and how to appropriate that content through literacy" (Lenski, 2011, p. 281). This responsive literacy instruction must first happen in Tier 1 to avoid the difficulties with structure, time, and the stigma often associated with remedial instruction, further emphasizing RTI as a general education initiative. For the implementation of RTI to be successful at the secondary level, content-area teachers need to provide disciplinary-specific literacy instruction, and use the data to determine which students need more intensive support to ensure they have the skills to read deeply and think critically. Key constituents are essential, then, to ensure appropriate implementation of the RTI framework.

Perceptions of key constituents. Key constituents to the implementation of RTI are principals, special education directors, and psychologists. In three separate studies, Sansosti, Noltemeyer, and Goss (2011, 2010) and Sansosti et al. (2010) examined the perceptions of these key constituents. Two of the studies focused on special education directors and school psychologists using a qualitative focus-group methodology, and a quantitative methodology to examine the perspectives and perceptions of these school leaders regarding RTI at the secondary level.

Understanding the perceptions of the principals with regard to the perceived importance of RTI practices at the secondary level, and if current practices were being implemented in their schools, was the work of Sansosti et al. (2010). In their study, secondary school principals were surveyed by utilizing an email distribution list from across the United States. This distribution list was created by using a company specializing in educational database management, and was inclusive of members of the National Association of Secondary School Principals. An informational email was sent to a random sample of 2,000 members of the National Association of Secondary School Principals. Of the 2,000 emails sent, only 1,049 members of the National Association of Secondary School Principals received the initial email. The response rate from the initial email was 46%, which means from the 1,049 members who received the email 482 usable responses were received. Of the 482 participants who completed the survey, 467 were secondary principals (97%), nine were assistant principals (1.9%), two were district-level administrators (.4%), and four were categorized as other (.8%). Given that the nature of this study was to investigate the perceptions of high school principals, only those responses indicating secondary principal and assistant principal were analyzed, n = 476 (45% response rate).

The authors designed an instrument to assess the importance and availability of RTI related practices and beliefs. Two major dimensions of interest were identified in the creation of this instrument: (a) Perceived Importance, and (b) Actual Availability. From these dimensions of successful implementation of new practices, eight scales were created to represent domains that were critical to RTI implementation. The scales were: (1) belief of key stakeholders, (2) knowledge/skill of stakeholders, (3)

scheduling/structural factors, (4) availability of intervention programs, (5) district policy/factors, (6) accountability methods, (7) existence of collaborative teams, and (8) communication (Sansosti et al., 2010).

The results of this study suggested that, "secondary principals perceive a discrepancy between the importance and implementation of several critical components of RTI in their schools" (Sansosti et al., 2010, p. 292). In all eight scales, importance of RTI was assessed higher than the availability of RTI at their respective schools. This data provides the basis for Sansosti et al. (2010) to have concluded that barriers at the secondary level make implementation of RTI difficult, even though the framework was perceived as important. In addition, through examination of the individual scales, both accountability and intervention had significantly high-perceived importance, but were they rated "as two of the more unavailable components within raters' schools" (p. 292). Sansosti et al. (2010) found support in their research to demonstrate scheduling and structural factors at the secondary level that were barriers to the implementation of RTI. These same barriers were discussed previously in the works of Brozo (2009), Lenski (2011), and Fuchs et al. (2010), and they are also further illuminated in the qualitative work of Sansosti, Goss, and Noltemeyer (2011) and Sansosti et al. (2010).

Sansosti et al. (2011) utilized a qualitative focus-group methodology to study the perceptions of special education directors regarding the barriers and facilitators of RTI in secondary schools. Special education directors were chosen because of their unique position of leadership that spans P-12 education and encompasses multiple stakeholders who impact the implementation of RTI. In addition, when focusing on system-wide change, administrative leadership is crucial. The participants for the study were selected

from four counties in a Midwestern state by randomly choosing 20 public, secondary (9-12) schools out of a total of 85 public secondary schools. The 20 special education directors were invited, through email, to attend one of three focus-group sessions, and 19 of those 20 indicated that they would attend. Demographic data was collected about the school that was represented by the director, and the demographic data was obtained from the state education website. Generally, the data demonstrated lower percentages of economically disadvantaged students, students with disabilities, ELLs, African American, Hispanic, Asian/Pacific Islander, and Multiracial students. These schools also had larger percentages of Caucasian students, students-per-teacher ratio, and graduation rate. The survey data revealed that, "professional background, involvement with RTI, and opinions on RTI" (Sansosti et al. 2011, p. 11). Of the 12 special education directors that completed the survey, the mean responses were 17 years of experience (a range of 3-25 years), and backgrounds varied from general and special education teachers to school psychologists (Sansosti et al., 2011).

Through the data-analysis process, overarching themes evolved. These themes were constructed by following the questioning route and utilizing the codes assigned to the text. Four unique themes were agreed upon based on the data analysis, "(a) systems structures, (b) roles and attitudes, (c) evidence-based practices, and (d) training and professional development" (Sansosti et al., 2011, p. 13).

The results of the focus group regarding system structures demonstrated the perception that secondary structures were mainly viewed as barriers to the implementation of RTI. Specifically, student schedules lacked the flexibility to provide interventions outside the classroom setting without impacting the students' ability to

participate in courses that could support humanities and art. Additionally, teacher schedules presented barriers to "planning time, collaborative problem-solving meetings, and data collection" (Sansosti et al., 2011, p. 13). Funds to support RTI implementation were also presented as barriers. Special education directors noted that most funds designated for RTI were spent in the elementary level; however, no one noted the allotment of 15% of special education funds which could be spent for early intervention through IDEA legislation (Sansosti et al., 2011).

Roles and attitudes of professionals, parents, and community were also perceived as barriers to the implementation of RTI. Special education directors discussed the need for greater collaboration among administrators to support implementation of RTI, especially with curriculum directors. Secondary teachers' beliefs regarding being content-area specialists were viewed in direct conflict with RTI's student-centered framework. The idea of teachers being content-area specialists was seen as problematic, because many times, a student needs can manifest across multiple areas and the perceived need to "cover" the content as opposed to meeting the needs of the individual student create a barrier to implementation of RTI (Sansosti et al., 2011). In addition, this was also seen as a barrier because the teachers defined themselves as content experts not literacy or numeracy teachers. Focusing on the content and not the skills the specific student needs to be successful in the content area impedes students' abilities to access the content. Supporting secondary teachers, in shifting from solely being content experts to viewing their role as also literacy and numeracy instructors, is a shift that will help remove a barrier to RTI as a general education initiative (Lenski, 2011).

The last barrier to implementation of RTI was seen in the beliefs of parents and outside community agencies. These groups often believe that obtaining an Individualized Education Plan is the goal to support the student. This presents an obstacle to utilizing RTI's tiered approach to supporting students in the general education setting. Educating parents and outside agencies is essential if this barrier is to be removed (Sansosti et al., 2011). It is imperative that schools have data to support meeting the student's needs in the least-restrictive setting to help educate families and community groups on the feasibility of RTI. Professional development and community outreach are essential to the implementation of RTI and the removal of barriers.

When specifically asked what was needed for RTI at the secondary level, participants noted "data-driven decision making, universal screening, intervention integrity, effective interventions, and better data collection methods" (Sansosti et al., 2011, p. 15). In addition to evidence-based practices, special education directors also noted the importance of professional development to support all stakeholders who are currently working in the education system, added college training, and teacher selection that supports the core components of RTI.

This study does provide a deeper understanding of the barriers and needs that must be addressed in order to implement RTI at the secondary level. To better address and understand the perceptions of educators regarding barriers and facilitators to RTI implementation, Sansosti (2010), teaming with other researchers, examined the perceptions of school psychologists.

Sansosti et al. (2010) utilized a qualitative methodology to examine the implementation of RTI at the secondary level. Specifically focusing on school

psychologist's perceptions of RTI as they relate to barriers, facilitators, roles, and practices in relation to implementation. Similar to the study focusing on special education directors, participants were chosen from twenty public high schools (9-12). These high schools were chosen randomly from 85 public high schools in a four counties in a Midwestern state. The schools that participated in the study were chosen by the researchers because of the convenience and familiarity of RTI initiatives already in place. Twenty school psychologists were invited to participate in one of the three focus groups. Demographic information was collected using www.schoolmatters.com and compared to the state mean.

School psychologists noted their greatest involvement with RTI centered on problem solving/Instructional Assistance Team (IAT), and attending RTI professional development. However, less than half of the school psychologists reported involvement in leading the professional development (Sansosti et al., 2010). This demographic information helped to contextualize the findings from the research. Additionally, this demographic data matched that from previous research done regarding barriers and facilitators to the implementation of RTI in secondary schools (Sansosti et al., 2011; Sansosti et al., 2010; Sansosti et al., 2010).

Data analysis was done through a review of the transcribed focus-group discussions. This stage of the analysis was focused on specific content questions that asked about implementation at the secondary level and concentrated on barriers, the role of school psychologists, and asked participants to imagine RTI if resources were unlimited.

The results of the data analysis demonstrated participants' perception of greater barriers to implementation of RTI at the secondary level than that of facilitators. With regard to system characteristics, participants noted the difficulty with the departmentalization and content-specific courses at the secondary level, which created barriers to collaboration. Teachers' perceptions regarding the effectiveness and reluctance to implement interventions to support students were also noted. The belief that once a teacher requested an evaluation, special education support was needed, and RTI was viewed as having hoops that needed to be jumped through in order to get a student an IEP. In addition, participants in the research also noted the increased emotional and behavioral needs of secondary level students that make tiered intervention difficult (Sansosti et al., 2010). This, too, mirrored the work of Fuchs et al. (2010). In addition to the skill deficits presented by struggling adolescents, motivation and engagement presented further barriers to successful implementation of RTI and increased student growth. The participants also noted facilitators and barriers concerning human and procedural structures (Sansosti et al., 2010). Administrators were seen as essential facilitators to promoting RTI at the secondary level, and there was a need for collaboration with school psychologists to support the changes needed to implement RTI at the secondary level. Procedural practices that were fundamental to RTI included universal screening measures, standards-based assessments, and school-based problem-solving teams. These, too, mirrored the research regarding implementation of RTI (Barnes & Harlacher, 2008; Fuchs & Fuchs, 2007; Kupzyk et al., 2012). Increased use of these practices was discussed, but further development was indicated as a need.

Procedural barriers were noted in the areas of scheduling and credit attainment in the area of difficulty scheduling interventions into students' days and ensuring that the students had the courses they needed to accumulate enough credits to graduate. Students being scheduled into academic supports may miss the opportunity to engage in credit-bearing courses that support on-time graduation. While school psychologists noted the importance of the fundamental aspects of the implementation of RTI, they also noted that RTI was difficult to implement because of stakeholders' lack of knowledge or uncertainty regarding how to match to student needs (Sansosti et al., 2010).

The theme of professional development and training was seen as integral to effective implementation of RTI. Specifically, the participants felt the core features of RTI, collaborative problem-solving teams, and tiered interventions needed to be reinforced with all stakeholders. In addition how RTI was used for special education eligibility decisions was needed to be reinforced with all stakeholders (Sansosti et al., 2010; Torgesen, 2009).

Based on the perceptions of secondary principals, special education directors, and school psychologists in these three studies, there was agreement regarding the importance of RTI and the essential characteristics to its implementation. However, the barriers to the implementation of RTI with fidelity impact the effectiveness of the model at the secondary level to effect change and improve student achievement. Martinez and Young (2011) supported the findings in these studies, discussing the essential role school leaders must take to encourage those aspects that facilitate RTI implementation, and they should help to remove barriers through professional development and systems that support teachers in the implementation of best practices.

Standard protocol and problem-solving model. The two general models for implementation of RTI are the standard protocol and problem-solving models. Both models are similar in how they move through the different tiers and the increased intensity of services as students' progress through the multi-tiered model. "Increasing intensity is achieved by (a) using more teacher-centered, systematic, and explicit instruction; (b) conducting it more frequently; (c) adding to its duration; (d) creating smaller and more homogenous student groupings; or (e) relying on instructors with greater expertise" (Fuchs & Fuchs, 2006). Fuchs and Fuchs continued by aligning the two general models with practitioners and researchers. Researchers tended to support a standard protocol approach that involved a trial of a specific duration. This treatment followed a specific protocol and was typically delivered in small groups or in one-to-one meetings depending of the intensity of the tier. In contrast, the problem-solving model was specific to the individual student and not implemented based on a standardized protocol.

> At each problem-solving level, the process is meant to be the same; practitioners determine the magnitude of the problem, analyze it causes, design a goal-directed intervention, conduct it as planned, monitor student progress, modify the intervention as needed, and evaluate it effectiveness and plot future actions. (Fuchs & Fuchs, 2006, p. 95)

Regardless of the intervention model, problem solving, or standard protocol, its goals were the same, to "provide struggling students with early, effective instruction and to provide a valid means of assessing learner needs" (Fuchs & Fuchs, 2006, p. 95).

Standard protocol. Edmonds et al. (2010), Dufrene et al. (2010), and Graves, Brandon, Duesbery, McIntosh, and Pyle (2011) utilized a standard protocol approach to examine the effectiveness of RTI at the sixth-grade or middle-level education specific to Tier 2 reading support. The hallmark of the standard protocol approach to RTI was empirically validated treatment for all students (Fuchs & Fuchs, 2006). Vaughn et al. (2010) cited research regarding the interventions implemented by researchers and the association of increased effect size. "Interventions implemented by researchers were associated with higher effect sizes than those implemented by teachers; and effects were higher for middle-grade students than for students in high school" (p. 2). In each study, students were screened to determine an "at-risk" subgroup. In a standard protocol approach, Tier 2 interventions are scientifically validated programs that reflect the importance of fidelity of implementation and the use of explicit empirically based protocols (Fuchs et al., 2010).

Dufrene et al. (2010) examined the "degree to which peer tutors could (a) implement a fluency-based intervention with integrity, and (b) reliably conduct assessments on trained passages and untrained progress, monitoring probes using Curriculum Based Measures (CBM) procedures" (Dufrene et al., 2010, p. 243). Additionally, Durfrene et al. (2010) designed their study to replicate the positive effects of Listening Passage Preview (LPP) and Repeated Reading (RR) on students' oral reading rate. Vaughn et al. (2010) conducted their research to try to address a gap in the literature regarding Tier 2 interventions in middle school with students who presented with reading difficulties. All students also benefited from their teachers' participation in professional development to enhance Tier 1, the general education classroom, and

instruction specific to reading instruction. Graves et al. (2011) similarly focused their research on sixth graders. Through the creation of a quasi-experimental research study investigating the effectiveness of Tier 2 RTI interventions on struggling readers, with "one group receiving Tier 2 intervention and the other receiving business-as-usual language arts instruction" (Graves et al., 2011, p. 74). Each of these employed a standard protocol model of Tier 2 implementation.

Vaughn et al. (2010) reported that students who received the intervention out performed those in the control group. Through the implementation of a standard protocol treatment, students made gains in closing reading gaps; however, over the course of a full year, the changes were not substantial. Fuchs et al. (2010), in a commentary on the research, posited that the "complexities associated with middle and high school may help explain Vaughn et al.'s (2010) disappointing findings" (p. 22). The median effect size across all measures was 0.16. While Vaughn et al. recognized the small effect size, they also noted that no regression in reading was noted for these struggling readers over the year of implementation. "It was clear from the evaluation of pre-test to post-test means of raw score data within groups that the students' proficiency increased in these domains" (Vaughn et al., 2010, p. 17). This research supported increased understanding of effective remediation at the secondary level, and supports further research regarding the duration of Tier 2 interventions. Additionally, this research provides a model for school-wide implementation of Tier 2 interventions across content areas.

Dufrene et al. (2010) had encouraging results for creative the use of resources to support Tier 2 interventions through the use of peer tutors. Based on the high integrity of implementation and increased scores for oral reading fluency, Dufrene et al. (2010)

posited peer tutoring as a primary Tier 2 intervention agent. This was seen as a method to overcoming barriers presented by limited resources to meet the demands of academic supports. "The expansion of RTI systems necessitates a feasible continuum of academic supports for struggling students" (p. 254). By accessing peer tutors to implement Tier 2 intervention, this study demonstrated a unique method of utilization of scarce resources, while ensuring treatment fidelity and enhancing student reading performance.

Graves et al. (2011) highlighted the difference between treatment and control groups for oral reading fluency (ORF). While recognizing the small effect size in ORF (d = .14), Graves et al. pointed to the gains in words per minute of students receiving the treatment in comparison to the rate expected based on the current research. Students receiving the treatment protocol gained an average of 10 wpm in 10 weeks. If the students continued with the same gains as they made during the study over the course of the year, they could gain 40 words per minute and continue to close the gap in reading fluency prior to entering 9th grade (Graves et al., 2011).

Standard protocol approaches to RTI have demonstrated a higher likelihood to ensure fidelity of the interventions. Fuchs et al. (2003) stated, "Researchers have demonstrated a cause and effect relationship between their standard protocols an improved academic performance" (p. 167). While this is true for elementary education, based on the studies at the secondary level further research is warranted.

Problem solving. In contrast to the standard protocol approach to RTI, the problem-solving approach involves utilizing building level teams working to individualize interventions based on specific student needs. Bolt (2005) framed the problem-solving model as utilizing a collaborative team approach to analysis student

data, including assessments, progress monitoring, and classroom performance, to match evidence-based interventions to the skill deficits of the individual. The interventions are selected based on the probability of success, and they are monitored by the team to determine if the student is responding to the intervention or needs a higher, more intense level of support. One example of this model is the Heartland Problem Solving Model (Heartland PSM). "The intent of this model is to match each student's academic and social-behavioral learning needs with the resources available through general education services (and special education services, if deemed necessary)" (Bolt, 2005, p.68). This model also analyzed school-wide systemic processes to support students. Through an analysis of curriculum, instruction, and environment, decisions were made at a district, building, small group, or individual level. In a case study of a student progressing through the Heartland PSM, it was evident that a continuum of services was implemented, based on an analysis of academic and behavioral needs. Additionally, when the student demonstrated improvement through progress monitoring, the team was able to examine other skill deficits and adjust interventions to ensure continued growth. Bolt (2005) found, in addition to supporting interventions for students, "the Heartland PSM provides a vehicle for the continued enhancement of general educator skills, knowledge, and decision-making processes." Fuchs et al. (2003) supported these finding through an examination of similar models in Minneapolis, Ohio, and Pennsylvania. The problem-solving model provided, "instructional support in a timely manner, and [identifies] students in need of special education services" (p. 166). The flexibility and individualization of the problem-solving model were characteristics that practitioners valued. "It is important to note that although RTI approaches appear promising, much

more research is needed to ensure the technical adequacy of the formative measures used, particularly in math, writing, social-behavior, and reading comprehension" (Bolt, 2005, p. 77).

Summary

The major gap in the literature regarding RTI is the absence of research regarding the implantation of the model at the secondary level, specifically, research-supported mechanisms for delivery of Tier 2 interventions. The three empirical based articles that focused on the implementation of Tier 2 RTI both did their research at the middle school level, specifically sixth grade. The findings in these articles bring to question the transferability to the high school setting. The structural difference between middle-level education and high-school level education, regarding the increased departmentalization and the course structure aimed at credit attainment to meet graduation requirements, is limited to the scope of those studies and further suggest the need to replicate the research to determine applicability. Additionally, the difference in perception of high school teachers as content experts, as stated in the research, makes transferability of findings difficult (Brozo, 2009; Fuchs et al., 2003; Sansosti et al., 2011; Sansosti et al., 2010). While qualitative data has focused on the perceptions of key constituents in the implementation, no studies were found in this literature review that researched at the 9-12 level regarding impact on student performance. Graves et al. (2011) provided evidence of the impact of Tier 2 intervention on oral reading fluency, but the study was done at a level with fewer barriers to successful implementation. Currently, an elementary model of early intervention is being implemented at the secondary level without the research to support how to implement it and for what students it is most effective (Brozo, 2009;

Fuchs & Fuchs, 2006; Fuchs et al., 2003). As a conceptual framework, RTI helps to change how students are supported and brings the focus to supporting all students in the general education classroom through research-based core curriculum and differentiated instruction that is matched to student need. For RTI to be an alternative framework for supporting students at the secondary level, research is needed to demonstrate its impact on student performance, especially for those students with academic deficits. "Whatever the cause, the paucity of RTI-focused scholarship in fields beyond special education and school psychology is a barrier to successful implementation and sustainability of RTI" (McDaniel et al., 2013).

Chapter Summary

Increased research regarding implementation and evidence-based practices are essential for RTI at the secondary level. RTI holds great promise for individualizing instruction to meet the needs of learners in the general education setting. Research regarding best practices, including data-based decision making, progress monitoring, interventions that are matched to student needs, and structural changes that provide greater flexibility at the secondary level, are essential to overcoming the barriers. It is paramount that research be done to examine how RTI is being implemented, the key characteristics to implementation, how high schools are overcoming barriers, and the impact on student achievement and graduation. This chapter explored the empirical literature regarding the implementation of RTI at the secondary level and demonstrated the need for increased research focused on 9-12 education.

Chapter 3: Research Design Methodology

Introduction

This chapter presents a quantitative study showing how the integration of classroom instruction and Tier 2 RTI are associated with student performance and engagement. Following the introduction, a discussion regarding the research context, research participants, instruments used in data collection, procedures used, and data analysis is provided for this secondary data analysis of a naturally occurring quasi-experiment (Creswell, 2009).

Research Context

The context for this study was a suburban 9-12 high school located in Western New York State. Student enrollment data used was from the 2011-2012, 2012-2013, and 2013-2014 school years. Historical data from the 2011-2012 and 2012-2013 school years was used to provide greater context and augment the sample size.

According to the New York State Report Card (n.d.), the population of the high school for the 2011-2012 and 2012-2013 school years was approximately 1,200 students. The average class size for the core subjects (English, math, science, and social studies) was approximately 25 students. The population of students eligible for a free lunch was around 15%, and the population eligible for a reduced-price lunch was 5%. The total percentage of the population who would qualify as in the low socio-economic status was about 20%. Additional student demographic information included that approximately 1% were limited in English proficiency, 10% were Black or African American and Hispanic

or Latino, 3% were Asian or native Hawaiian/other Pacific Islander, and around 80% were White.

Based on the school's student management system, enrollment for the 2013-2014 school year, including grades 9-12, was similar to recent years, but it had increased slightly to approximately 1,280 students. Using the New York State Regents exams as a measure of performance for the 2011-2012 and 2012-2013 school years:

- approximately 95% of students met the standard for Regents English
- 90% met the standard for the Global History Regents
- over 90% met the standard for the U.S. History Regents
- about 76% met the standard for the Earth Science Regents
- greater than 95% met the standard for the Living Environment Regents
- approximately 85% met the standard for the Chemistry Regents
- over 80% met the standard for the Physics Regents
- approximately 95% met the standard for the Integrated Algebra Regents
- over 80% met the standard for the Geometry Regents
- around 80% met the standard for the Algebra 2 Trigonometry Regents

Based on these scores and an unofficial graduation rate, which was consistently around 92% for each of the cohort groups, this high school could have been classified as a high-performing school.

The New York State Report Card (n.d.) also designated that none (0%) of the teachers were without a valid teaching certificate, none (0%) were teaching outside of their certification area, less than 5% had fewer than three years of experience, and about 10% had either a master's degrees plus 30 hours or a doctoral degree. The data suggested

that all of the teachers were qualified, based on the New York State certification process, and more than 95% of the teachers had been teaching at least three years. The three-year teaching mark is used because that is the standard time to determine tenure for teachers in New York State. Teachers that have earned the designation of tenure have gone through an evaluation process that is intended to ensure they are qualified teachers. For this study, the data suggested that the teachers implementing the interventions were qualified. Additionally, all of the math teachers had professional development opportunities that utilized the constructivist approach to instruction, which focused on content knowledge and process skills. The curriculum was aligned with national and New York State standards, as well as district-specific outcomes. Instruction was differentiated and student-centered to support student success and to align with constructivist theory. The focus of the math department was to develop mathematically literate students who were critical thinkers and problem solvers.

Students' data were selected based on the students qualifying for Tier 2 academic intervention services in math. This was determined by the students' performance during the prior school year in their eighth-grade math class and on the New York State Grade 8 Math Assessment (scoring a level 1 or 2), or their performance in Integrated Algebra and on the Integrated Algebra Regents exam. The secondary data analysis was of a naturally occurring quasi-experimental design, where participants were divided into two groups. Quasi-experimental group 1 had the same teacher for their classroom instruction, either Integrated Algebra or Geometry, and the group had AIS support in either math lab or in the math department center. The comparison students in group 2 had a different teacher for their classroom instruction, either Integrated Algebra or Geometry, and they had AIS

support that was either math supplemental or from a math department center. The total sample size of the Algebra group was 122 students (n = 122). The quasi-experimental group 1 for algebra was 40 students (n = 40), and the comparison group 2 for algebra was 82 students (n = 82). The total sample size of the geometry group was 78 students (n = 78). The quasi-experimental group 1 for geometry was 35 students (n = 35), and the comparison group 2 for geometry was 43 students (n = 43).

To obtain student assessment data for each of the school years, the researcher contacted the principal and the math department supervisor for the high school. . The participants' raw data were collected and each participants was assigned an identifying number to ensure confidentiality of their real identities. Based on student performance on either the New York State Grade 8 Math assessment or the Integrated Algebra Regents exam, along with their performance in the respective classes, decisions were made regarding the need for AIS support. The students who earned scores of level 1 or 2 were determined to be in need of AIS support. Within that subgroup of AIS students, their scale score on the assessments, performances in the previous year's class, and the previous year's AIS placement were used to determine the level of AIS (Tier 2 RTI) service. Those students scoring at a level 1 were placed in either Math Lab or Math Supplemental. Students with the lowest scale scores or those demonstrating the most need, based on past performance in their math classes, were placed in Math Lab, which was made up of the students in quasi-experimental group 1. These students were scheduled with the same teacher for AIS support and classroom instruction. The students who were scheduled in the Math Supplemental class were the in comparison group 2, and they were scheduled with different teachers for AIS support and classroom instruction.

These students typically had higher scores, but they were still within the level 1 range on their respective New York State test. Exceptions to these placements did happen when there were constraints of the master schedule.

Students scoring in the level 2 range received AIS services through either the math department center or in classroom monitoring. Based on the master scheduling constraints for the math department center, the level 2 students were divided into two groups. One group was scheduled with the same teacher for the AIS support and classroom instruction (quasi-experimental group 1), and the other group had different AIS support teachers and classroom instruction (comparison group 2). It is important to note that any student with an IEP was not included in this study; however, students with a 504 accommodation plan were included if they met the criteria for Tier 2 AIS. Table 3.1 shows a breakdown of the two groups, and the Tier 2 AIS supports that were in place for each group.

Table 3.1

Student Groups' Instruction Location

Quasi-Experimental Group 1	Comparison Group 2
Math Lab	Math Supplemental
Math Department Center	Math Department Center

A pre-assessment was administered to all students on September 9, 2013. This pre-assessment produced baseline data for all students to inform on their progress throughout the year. The pre-assessment was developed by all of the grade-level math teachers with support from the math department supervisor. For the purposes of this study the New York State Grade 8 Math assessment was used as the pretest. Utilization

of this assessment increased the number of students whose data was able to be analyzed. Additionally, it allowed for a common bench mark for the algebra and geometry students.

Progress monitoring occurred formally on a monthly basis in order gather information to help aid teachers' in their instructional decisions. Monitoring was based on student classwork, homework, in-class assessments, and performance in the AIS support class. The information was disclosed in a meeting with the math supervisor or grade-level administrator. In addition, quarterly parallel assessments were administered to help monitor students' progress. The parallel assessments were designed by the math teachers and mirrored the skill and content students' needed to demonstrate in order to meet the standards of the course. The data from these parallel assessments were used to further inform on instructional needs for the classroom and the AIS service through coordination with the classroom teacher and AIS provider.

At the end of June, all students were administered the post-test. The post-test for students taking the Algebra course was the Algebra Regents exam, and the students taking the Geometry course were administered the Geometry Regents exam.

Instruments Used in Data Collection

Data was collected using multiple measures for both performance and engagement. In order to remain consistent with New York State data, all enrollment data was adhered to the Basic Educational Data System (BEDS). Performance data were collected utilizing the New York State Grade 8 Math assessment as a pretest, a common midterm assessment administered at the end of January that paralleled the skills and content assessed on the final, the New York State Regents final examination (this will be

considered the posttest), and through an examination of course grades/credit attainment. Engagement was measured by attendance to both the Tier II AIS support and the course.

The pre-assessment was the New York State Grade 8 Math assessment. This assessment consists of multiple choice questions, short-response, and extended-response questions. The multiple choice questions require students to select the correct answer from four choices. For the short-response and extended-response questions, students must answer open-ended questions showing their work, and in some situations explain in words their answers. The assessment is administered over three days and consists of three different books (http://www.p12.nysed.gov/assessment/math/math-ei.html). The midterm examination was administered the last week in January, and it assessed both the first and second quarter content. This assessment was teacher created and consisted of 30 multiple choice questions, 12 part II questions, and 5 part III questions. For part II and III questions students were required to delineate all necessary steps in solving the problems. Students could not receive full credit without showing all of their work; however, they could receive partial credit. The post-assessment, final exam was the New York State Regents exam, either the Integrated Algebra exam or the Geometry exam (Office of State Assessment, n.d.). Both exams consist of four parts. Part I was multiple choice, and Parts 2, 2I, and IV were written in the test booklet. For the written problems, students were required to show their work in order to get full credit. They were, however, able to gain partial credit through the demonstration of their work.

Attendance was taken daily for each class and recorded by the teacher in the student management system. Course grades and credit attainment were gathered from student report cards and transcripts. This data, in conjunction with the assessment

measures, were used to analyze the association between the coordinated Tier 2 instruction and student performance and engagement.

Analysis of Data

The collected performance and engagement data was analyzed using descriptive statistics. Sample size, mean, and standard deviation were calculated for the quasi-experimental group and the comparison group, for both the Algebra and the Geometry groups. A t-test (t) was used to determine statistical significance. In addition, because the small sample size, which puts into questions the assumption of normality of distribution, the Mann-Whitney U test (U) was also incorporated. Through the use of Cohen's d (d) the study was better able to compare means between the two groups, which helped to interpret the magnitude of the difference (Huck, 2012).

Summary

This chapter described the initial process used for a secondary analysis of a naturally occurring quasi-experimental study examining the association on student performance and engagement of coordination of classroom instruction and Tier II AIS support in math.

Chapter 4: Results

Research Questions

The research questions that guided this quantitative study were:

1. Does integrated coordination of classroom instruction and Tier 2 RTI delivery positively associate with student performance as measured by pre-assessments, post-assessments, and progress monitoring (through parallel assessments)?

2. Does integrated coordination of classroom instruction and Tier 2 RTI delivery associate with increased student engagement as measured by student attendance and quarterly grades?

Determining research-based interventions for students who have not met state assessment standards is essential for closing academic gaps. The purpose of this research was to determine if there is an association between coordinated Tier 2 AIS and student performance and engagement through a secondary data analysis of a naturally occurring quasi-experiment. The Tier 2 structures for the specific school included two distinct groups. One group was purposefully scheduled into a Tier 2 AIS support class with the same teacher who taught them either Algebra or Geometry. The second group was taught two different teachers. One taught their math class and the other teacher taught their AIS support class. Coordinated services were determined by having the same teacher for the math course and Tier 2 AIS support class, as opposed to, a different teacher for the math course and Tier 2 AIS support class. Secondary data was collected for the 2010-2011, 2011-2012, 2012-2013, and 2013-2014 school years. The study focused on students

qualifying for Tier 2 RTI in Algebra and Geometry. Group 1 represented the quasi-experimental group of students who had the same teacher for both the course and the Tier 2 intervention. Group 2 represented the comparison group of students who had a different teacher for each the course and Tier 2 intervention. The pre-test for both the algebra and geometry groups was the New York State eighth grade assessment, and the post-test was their respective Regents exams. Progress monitoring was also measured by the common midterm assessment given in both courses. For the purpose of measuring engagement, student absences and credit attainment were analyzed. Final course grade were also used as a measure of performance. It is important to remember that the grades consisted of many different factors that included classwork, homework, quizzes, and tests. Final credit attainment was determined by having a course grade of 65 or above.

Data Analysis and Findings

The demographic data for the algebra group is represented in Table 4.1. Table 4.2 shows the data for the geometry group. The algebra group had a final sample of 122 (N = 122). There were 40 students in the quasi-experimental group 1 (n = 40) and 82 in the comparison group 2 (n = 82). There were higher percentages of males in both algebra groups (52.5% and 69.5%, respectively). These percentages were higher than the district data, which was about 49% male and 61% female; however, the group differences were not statistically significant.

Ethnicity was divided into Other, Black, Hispanic, and White. "Other" was used because of the low sample size of Asian and Multiracial groups, which are used as descriptors by the New York State Education Department. The ethnicity of group 1 was: 2.5% Other, 20% Black, 17.5% Hispanic, and 60% White. The ethnicity in group 2

consisted of 7.3% Other, 14.6% Black, 22.0% Hispanic, and 56.1% White. Similar to gender, there were no significant differences with regard to the ethnicity of the algebra groups.

Table 4.1

Algebra Group Gender and Ethnicity

	Group 1		Group 2		
	n	%	n	%	χ^2
Gender					3.374
Male	21	52.5	57	69.5	
Female	19	47.5	25	30.5	
Ethnicity					1.891
Other	1	2.5	6	7.3	
Black	8	20.0	12	14.6	
Hispanic	7	17.5	18	22.0	
White	24	60.0	46	56.1	
Total	40	100	82	100	

Note. *p < .05, **p < .01

The sample size for the geometry group was 78 (N = 78). The experimental group 1 had a sample size of 35 (n = 35). Group 2, the comparison group, had a sample size of 43 (n = 43). The gender make-up of group 1 was 68.6% males and 31.4% females, and comparison group 2 had a gender make-up of 60.5% males and 35.9% females. These differences were not statistically significant. The gender make-up for the geometry group was also higher for males than the district average. With regard to

ethnicity, group 1 consisted of 0% Other, 14.3% Black, 11.4% Hispanic, and 74.3% White. Comparison group 2 consisted of 9.3% Other, 11.6% Black, 23.3% Hispanic, and 55.8% White. The gender nor ethnicity differences were not statistically significant.

Table 4.2

Geometry Group Gender and Ethnicity

	Group 1		Group 2		
	n	%	n	%	χ^2
Gender					.155
Male	24	68.6	26	60.5	
Female	11	31.4	17	35.9	
Ethnicity					5.893
Other	0	0	4	9.3	
Black	5	14.3	5	11.6	
Hispanic	4	11.4	10	23.3	
White	26	74.3	24	55.8	
Total	35	100	43	100	

Note. *p < .05, **p < .01

The student performance data is represented in Tables 4.3 and 4.4. This data is presented to answer the research question regarding whether there is an association between coordinated Tier 2 RTI and student performance, as measured by a pre-test, the New York State Grade 8 Math assessment, and a post-test, the NYS Integrated Algebra Regents Exam. The final measures of performance were a common midterm assessment and credit attainment, which was measured by a final course grade. For each group and

assessment, the sample size, mean, and standard deviation were calculated. To determine statistical significance, a t-test (t) was used, and because of the small sample size, which puts into question the assumption of normality of the distribution, the Mann-Whitney U test (U) was also used (Huck, 2012). To help interpret the magnitude of difference between the two groups, Cohen's d (d) formula was also calculated as a measure of effect size. A standard interpretation for Cohen's d was used: 0.2 equals a small effect; 0.50 equals a medium effect, and 0.80 equals a large effect (Huck, 2012). Group 1, the quasi-experimental group, had the same teacher for both the math course and the Tier 2 intervention class. Group 2, the comparison group, had different teachers for the math course and Tier 2 intervention class.

For the algebra groups, the t-test only found a significant difference for the midterm assessment ($t = -2.08$, $p < .05$). However, the Mann-Whitney U test found significance in all three assessments: New York State Grade 8 Math assessment $U = 1594.5$ ($p < .05$); Midterm Assessment $U = 1922.5$ ($p < .05$); and NYS Integrated Algebra Regents $U = 1903.0$($p < .05$). The effect size, d, of the intervention was –0.16 for the New York State Grade 8 Math assessment, $d = -0.41$ for the midterm assessment, and $d = -0.37$ for the NYS Integrated Algebra Regents Exam. These scores show that comparison group 2 started with a higher mean ($d = -.16$), and that students in group 2 did better ($d = -.41$, $d = -.32$).

The total sample size for the algebra groups' course grade was 121 students, with the quasi-experimental group 1 having a sample of 39 ($n = 39$) students, and the comparison group 2 having a sample of 82 ($n = 82$) students. The mean course grade for group 1 was 69.1, with a standard deviation of 10.4. The mean course grade for group 2

was 69.6, with a standard deviation of 13.4. Both the t-test ($t = -.20$, $p < .05$) and the Mann Whitney U test ($U = 1686.0$, $p < .05$) do not suggest any significance between groups and course grade. Cohen's d formula ($d = -.04$) also reinforces that there was very little difference between the two groups and their attaining credit through measures of course grade in algebra.

Table 4.3

Algebra Group Performance

	Group 1(Quasi-Experimental)			Group 2 (Comparison)				
	n	M	SD	n	M	SD	t	U	d
Pretest	35	456.3	198.5	73	486.4	189.6	–.76	1594.5*	–.16
Midterm	39	45.6	16.3	80	52.1	16.0	–2.08*	1922.5*	–.41
Int. Alg.	38	67.0	10.6	78	71	10.8	–1.91	1903.0*	–.37
Course Grade	39	69.1	10.4	82	69.6	13.4	–.20	1686.0	–.04

Note. *p < .05, **p < .01

For the geometry group, the t-tests identified no significant differences: New York State Grade 8 Math assessment, $t = .015$ ($p < .05$); Integrated Algebra Regents Exam, $t = -0.536$ ($p < .05$); Geometry Midterm Assessment, $t = -1.221$ ($p < .05$); and the NYS Geometry Regents Exam $t = -0.738$ ($p < .05$). There were also no significant differences across groups using the Mann-Whitney U tests: New York State Grade 8 Math assessment, $U = 734.5$ ($p < .05$); Integrated Algebra Regents Exam, $U = 776.0$ ($p < .05$); Geometry Midterm Assessment, $U = 776.0$ ($p < .05$); and the NYS Geometry Regents Exam, $U = 836.5$ ($p < .05$). As to effect size, Cohen's d effect sizes were

calculated for the geometry groups. The results suggest small effects: New York State Grade 8 Math assessment, d = 0.0042; NYS Integrated Algebra Exam, d = –0.1224; Geometry Midterm Assessment, d = –0.28, and NYS Geometry Regents Exam, d = –0.1681). The negative sign indicates that the Comparison Group 2 had a higher performance.

The total sample for course grade was 76, with quasi-experimental Group 1 having a sample of 34 (n = 34) students and comparison Group 2 having a sample of 42 (n = 42) students. The mean (M) course grade for Group 1 was 68.4, with a standard deviation (SD) of 8.4. Group 2 had M = 70.9, with SD = 8.5. Both the t-test (t = –1.25, $p < .05$) and the Mann Whitney U text (U = 886.0, $p < .05$) did not indicate any significance (d = -.30).

Table 4.4

Geometry Group Performance

	Group 1			Group 2				
	n	M	SD	n	M	SD	t	U	d
Pretest	33	652.9	65.0	40	652.6	75.8	.015	734.5	$.00^{+}$
Int. Alg.	35	74.3	6.3	43	75.0	5.2	–.536	750.0	–.12
Geo. Mid.	34	60.7	10.4	41	62.7	13.0	–.738	836.5	–.17
Geo. Reg.	34	68.4	8.4	42	70.9	8.5	–1.25	886.0	–.30
Course Grade	33	652.9	65.0	40	652.6	75.8	.015	734.5	$.00^{+}$

Note. *p < .05, **p < .01, $^{+}$d = 0.0042 rounded.

In addition to the research question regarding performance, engagement was also analyzed. Engagement was measured by using student attendance, as measured by the

number of classes missed in both the math course and the Tier 2 intervention class. Similar to the performance measures, the Table 4.5 shows sample size, mean, and standard deviation. To determine significance, a t-test was used in conjunction with the Mann Whitney U test, which was used because of the small sample size and the questions regarding the normality of the distribution. Cohen's d formula for effect size was also calculated to compare means between the two groups.

For attendance, the total sample was 122 students. Group 1 had a sample size of 40 students for both the math course and the Tier 2 intervention class (n = 40), and Group 2 had a sample size of 82 students for both the math course and the Tier 2 intervention class (n = 82). The mean classes that were not attended (or "missed") for Group 1 was17.1, and for the Tier 2 intervention classes, the mean for classes not attended was 7.7, with a standard deviation of 19.2. The mean for the classes not attended for Group 2 was 13.0, and the mean for the Tier 2 intervention classes 6.3, with a standard deviation 15.5 and 9.2, respectively. Neither the t-test ($t = 1.25$ and $t = .75$, both $p < .05$, respectively) nor the Mann Whitney U text ($U = 1378.5$ and 1383.5, both $p < .05$, respectively) suggest statistical significance. Additionally, Cohen's d effect size ($d = .24$ and $d = .15$, respectively) for students missing more math courses and Tier 2 intervention classes was small when the same teacher taught both of the classes.

Table 4.5

Algebra Group Engagement

	Group 1			Group 2				
	n	M	SD	n	M	SD	t	U	d
Attendance									
Math	40	17.1	19.2	82	13.0	15.5	1.25	1378.5	.24
Tier 2	40	7.7	8.8	82	6.3	9.2	.75	1383.5	.15

*$p < .05$

The same measures for engagement were used for the geometry group as were used for the algebra group. The sample size for the quasi-experimental Group 1 was 35 students ($n = 35$) in the math course, and the Tier 2 intervention class also had 35 students ($n = 35$). The sample sizes for the Group 2 math course and Tier 2 intervention class consisted of 43 students ($n = 43$). The mean of the math courses not attended was 11.8 ($M = 11.8$), with a standard deviation 11.1 ($SD = 11.1$). The mean of the Tier 2 intervention classes not attended was 6.0 ($M = 6.0$), with a standard deviation of 5.6 ($SD = 5.6$). Neither the t-test ($t = .774$, $p < .05$) nor the Mann Whitney U test ($U = 707.0$, $p < .05$) indicated any statistical significance for the math course, and the same was true for the Tier 2 intervention class ($t = 1.744$ and $U = 570.5$, both $p < .05$). Cohen's d effect size suggested a small effect for both the math course ($d = .17$) and the Tier 2 intervention class ($d = .39$). Table 4.6 shows the attendance for the geometry groups, which was used to answer the research question regarding student engagement. Included in the table are sample size, mean, and standard deviation. Additionally, a t-test, Mann Whitney U test, and Cohen's d were reported.

Table 4.6

Geometry Group Engagement

	Group 1			Group 2				
	n	M	SD	n	M	SD	t	U	d
Attendance									
Math	35	14.1	15.8	43	11.8	11.1	.744	707.0	.17
Tier 2	35	8.5	7.2	43	6.0	5.6	1.744	570.5	.39

*$p < .05$

Figure 4.1 is included to illustrate the association between students passing the NYS Eighth-Grade Assessment Test and passing the Integrated Algebra Regents Exam. All of the students, except for four, who were in a Tier 2 AIS intervention class and scored above a 310, passed the NYS Integrated Algebra Regents Exam. Of the 42 students who scored below 310 on the NYS Eighth-Grade Assessment Test, 16 scored below a 65 and 26 scored a 65 or higher, which is a passing grade or meeting the standard on the NYS Integrated Algebra Regents. Within the group that scored below 310, both Groups 1and 2 had seven students who scored below 65 on the NYS Integrated Algebra Exam, and eight students from Group 1 scored a 65 or higher, while 17 from Group 2 scored a 65 or higher.

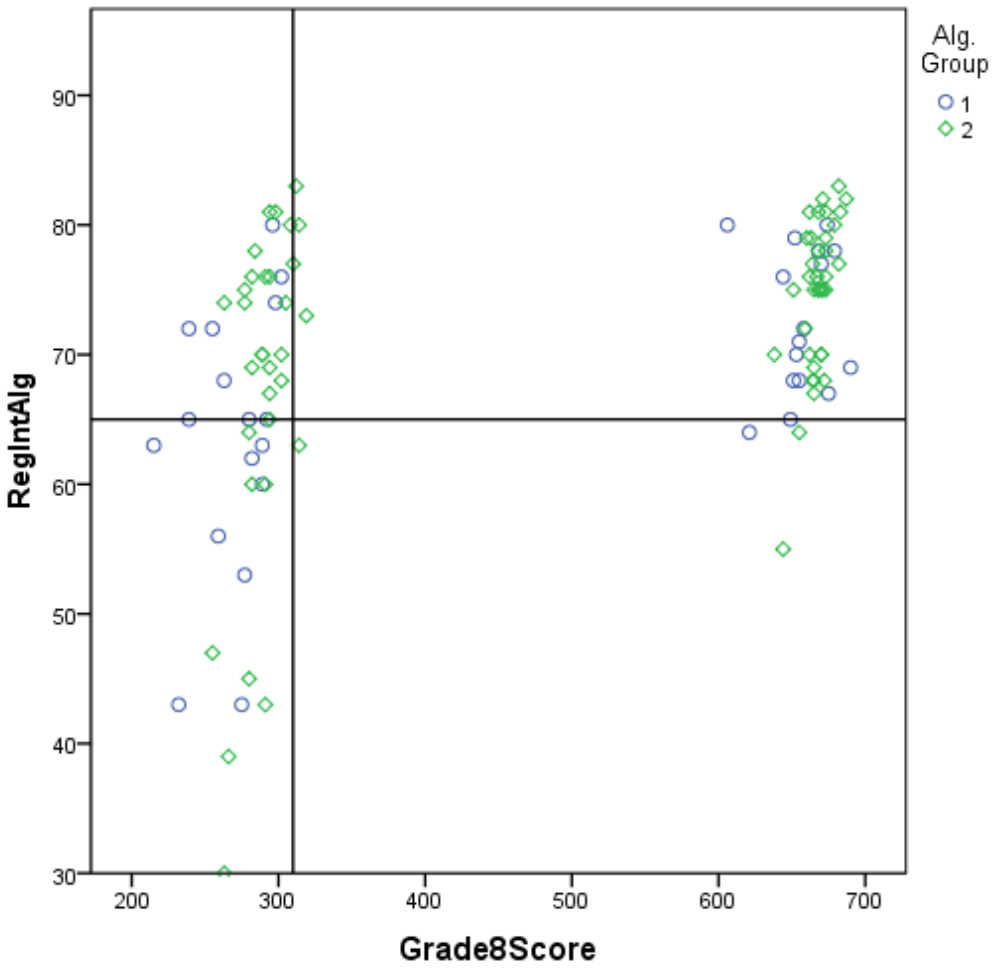

Figure 4.1. The scatterplot represents the relationship between New York State Grade 8 Math assessment scores and NYS Integrated Algebra Regents Exam scores. The horizontal line represents a score of 65, which is a passing grade on the Integrated Algebra Regents Exam. The vertical line, at 310, shows the score at which all but four students, who scored higher, passed the Regents Integrated Algebra Exam.

Figure 4.2 is included to illustrate the association between New York State Grade 8 Math assessment scores and the Regents Geometry Exam scores. The majority of the students in both the experimental group and the comparison group were not successful on the Regents Geometry Exam. Additionally, there does not seem to be a pattern of either group being more successful or earning proficiency on this exam. There were two

students who scored below 400 on their New York State Grade 8 Math assessment test, but they were also able to pass the geometry exam. No other students were included in Tier 2 intervention classes that scored below 400 on the New York State Grade 8 Math assessment test.

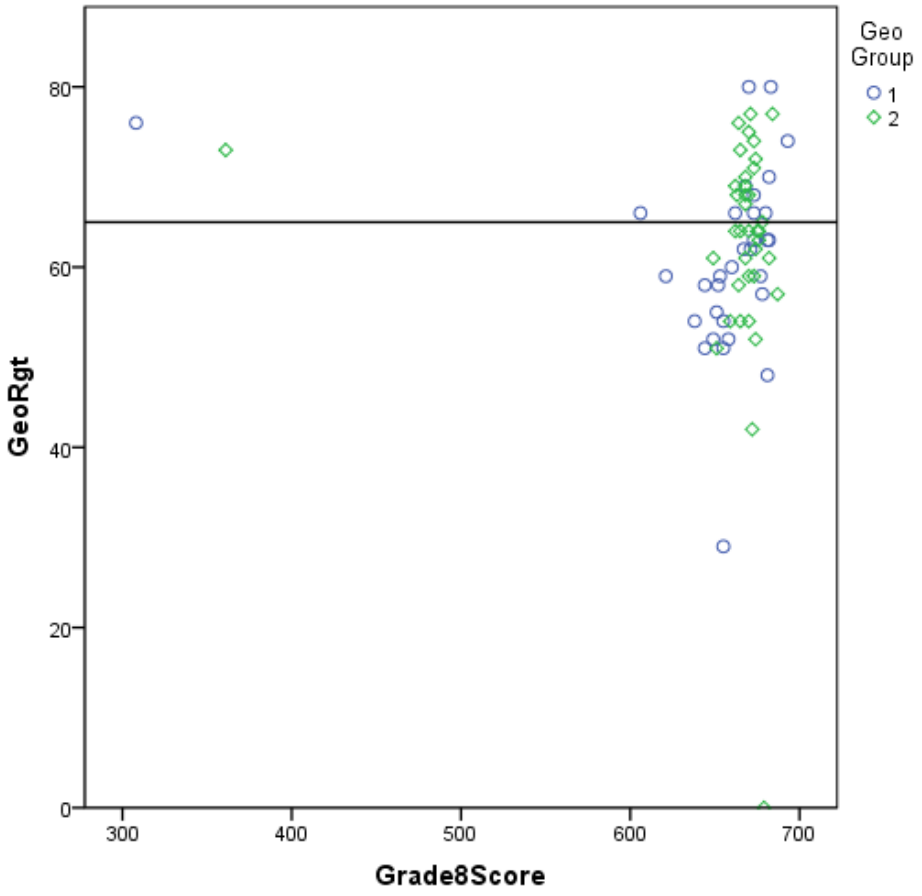

Figure 4.2. Relationship between NYS Grade 8 Math Assessment score and the NYS Geometry Regents score. The horizontal line represents a grade of 65, which is a passing grade on the Regents Geometry Exam. The Experimental Group 1 is represented by the circles, and the diamonds represent Comparison Group 2.

Summary of Results

Overall, the data from this study was composed primarily of students who were not proficient on the New York State Grade 8 Math assessment. To be considered

proficient or meet the standard, a student needs to achieve a score of 673. All public school students in New York State who do not score in the proficient range must have access to AIS interventions. For this study, all of the students were receiving Tier 2 AIS intervention classes. The demographic data indicated that more male students were accessing the intervention. This was also true for the ethnic classifications for the different groups. For the purposes of comparing the groups, gender and ethnic differences were not significant.

The significant differences were found for student performance in the algebra group. The greatest significant difference was found in the algebra midterm, which was also the only area that was found to be statistically significant using the t-test parametric measure. This suggests that student performance on the algebra midterm for the comparison group was stronger than that of the experimental group. The comparison group also showed the greatest effect size when using Cohen's d. A score of $d = -.41$ suggests a moderate effect size, which indicates that the students in Group 2 showed statistically significant growth from the pretest (New York State Grade 8 Math assessment) to the midterm when compared to Group 1. While Group 2 started with a higher mean score on the pretest, their growth from the pretest to the midterm was greater than that of quasi-experimental Group 1. When nonparametric measures were used, there was also a statistically significant difference between the algebra groups for the results of the New York State Grade 8 Math assessment and the Integrated Algebra Regents Final Exam. In both situations, the comparison group's data suggest greater gains. While the effect size for the New York State Grade 8 Math assessment was small, the effect size for the Integrated Algebra Regents Final Exam was small to moderate. This data suggest

that students receiving the AIS intervention class in the comparison group demonstrated greater performance than the students in the quasi-experimental group.

The data, when represented in the scatterplot, suggest that those students scoring above 310 on their New York State Grade 8 Math assessment had a higher likelihood of meeting the standard on the Integrated Algebra Regents Exam. Additionally, those students scoring below 310 did not show a strong pattern of passing or failing, and neither the quasi-experimental nor the comparison group demonstrated a strong tendency for improved performance.

The data for the algebra group's engagement, as measured by attendance was not statistically significant. When comparing the means, however, there was a small effect size with regard to classes not attended in the experimental group. The mean number of classes not attended was 17.1 for the quasi-experimental group, as opposed to 13.0 for the comparison group. While there was a greater tendency for students in the quasi-experimental group to not attend their class, this did not translate to the intervention class for either group.

In examining the data for the geometry group's performance there were no statistically significant differences. Both the quasi-experimental and the comparison groups' means were very similar. Only the midterm data suggested a small effect size. Again, the comparison group's data suggested improved performance. When presented on a scatter plot, a similar pattern was presented visually. The majority of the students were not successful on the Regents Geometry Exam, and neither the quasi-experimental group nor the comparison group had a stronger tendency toward success. Final course

average also did not show any statistical significance. However, there was a small to moderate effect size. Students in the comparison group had a higher final average.

The engagement of the geometry groups, as measured by attendance, did not demonstrate any significant differences. However, there was a small-to-moderate effect size for the interventions missed. Students in the comparison group missed fewer interventions classes.

Overall, students in the comparison groups demonstrated higher levels of performance and engagement. Significant differences were noted with the algebra group's performance, especially for the midterm exam.

Chapter 5: Discussion

Introduction

Response to Intervention is a framework focused on supporting the academic and behavioral needs of students through evidence-based interventions designed to meet the increasing demands of Common Core State standards, the stated goals of No Child Left Behind, and IDEA legislation (Sansosti et al., 2010; Sansoti et al., 2011). The goal of this framework is to both, "increase the capacity of schools to respond effectively to the diverse learning and behavioral support needs of their students and (b) a new way of determining eligibility for special education services" (Torgesen, 2009, p. 38). The focus of this study was to examine the association between Tier 2 RtI and student performance and engagement when service is coordinated. Additionally, this study was aimed at starting to fill the gap in research done at the secondary level regarding RtI (Brozo, 2009; Fuchs et al., 2010; Fuchs et al., 2012; Hazelkorn et al., 2011; McDaniel et al., 2013). Tier 2 interventions are focused on students who have not made progress with Tier 1 general education classroom interventions. "Failing grades, poor test scores, disruptive behavior, and poor attendance are all symptoms (Buffum, Mattos, & Weber, 2012, p.137)." These symptoms are indicators of skill deficits, either academic, socially, emotionally, or some combination. As opposed to treating or focusing on the symptoms, RtI is a systematic process of using data to determine the root cause of skill deficit. The intent of Tier 2 interventions is to match evidence-based interventions with the academic and behavioral needs of the student or groups of students based on analyzing the results

of interventions utilized at Tier 1, other assessment data, and progress monitoring data. The implementation of Race to the Top educational reforms in New York State has increased the accountability for closing achievement gaps of all students; however, these mandates do not provide the increased capacity, nor do they provide a framework for meeting the academic and behavioral needs of these students to help them meet these standards. Competitive funding such as this often leaves districts underfunded, needing to do more with less (Abbott, 2013). Through research that explores how to better utilize assessment data, interventions matched to student need, and structures that increase student performance, educators will be better able to close the achievement gap and support student success.

The purpose of this study was to explore how the integration and coordination of classroom instruction and Tier 2 RtI associated with student performance and engagement. Through the utilization of a naturally occurring structure of either having the same teacher for classroom instruction and Tier 2 AIS, or having a different teachers for the classroom instruction and Tier 2 AIS; this study analyzed student performance and engagement through a secondary data analysis of assessment data, course grade, and attendance. The following research questions guided this quantitative study.

R_1: Does integrated coordination of classroom instruction and Tier II RtI delivery positively associate with student performance as measured by pretest and posttest, and progress monitoring (through midterm and final course grade)?

R_2: Does integrated coordination of classroom instruction and Tier II RtI delivery positively associate with increased student engagement as measured by student attendance?

Chapter 5 includes a discussion and analysis of the results reported in chapter 4 of this dissertation. Included in this chapter of the dissertation will be four different sections. Section one focuses on the implications of the findings of the quantitative analysis of student performance and engagement. Section two presents a discussion of the limitations of this study. The third section will explore recommendations for future research and actions, both at the district level and for policy makers, and the final section will summarize this chapter, in addition to providing a conclusion for the dissertation.

Implications of Findings

The results of this study indicated that students in the comparison group demonstrated improved performance in algebra, and overall higher levels of performance and engagement as compared to the quasi-experimental group for both the algebra and geometry groups. The data used in this study was composed primarily of students who were not proficient on the New York State Grade 8 Math assessment. All of the students in this study received Tier 2 AIS support through additional instructional time. The quasi-experimental group received this instruction from the same teacher who taught them in the general education class, and the comparison group received instruction from a different NYS certified math instructor. All teachers in this study were considered highly qualified based on the New York State Education Department's BEDS information, which is reported by the school district. Based on the district's mathematics guiding principles (appendix A), a framework for student centered instruction aligned with a constructivist theoretical approach was used to develop students' critical thinking and problem solving skills. It is important to remember that "constructivism is an epistemological view of knowledge acquisition emphasizing knowledge construction

rather than knowledge transmission…"(Applefield et al., 2001, p. 37). Teachers are facilitators of student construction of knowledge or mental models by actively creating, interpreting, and organizing knowledge with prior learning or experiences. This authentic learning hinges upon the individual learners understanding of the purpose, context, and generalization or transferability of the skills learned. RTI is positioned in the constructivist paradigm through the application and generalization of skills learned, thus increasing independence and students ability to construct knowledge.

The demographic data for the Algebra group indicated a higher percentage of males in both the quasi-experimental and comparison groups (52.5% and 69.5%). This data is in contrast to the district data that indicates higher percentages of female students in the school (about 70% female). For the purposes of comparing the groups these differences were not significant. However, when examining needs in our educational system it is important to examine why higher percentages of male students are performing at a level requiring Tier 2 AIS. A similar pattern emerges when examining the demographic data for the geometry groups, which had even greater gender differences (68.6% and 60.5%). Again these differences were not significant when comparing the groups, but there are higher percentages of males as compared to the general population of the school. While this was outside the scope of this research study; research focused on determining if there are best instructional practices or interventions that are more effective for different groups is recommended.

When ethnicity was examined for the algebra groups a similar pattern emerges. There were higher percentages of Black and Hispanic students qualifying for Tier 2 AIS. While these differences did not impact the results of this study, an examination of why

underrepresented populations are represented at higher levels will impact educational practice through more targeted instruction and interventions aimed at closing the achievement gap. In the geometry groups, the representation of different ethnic groups closely mirrored the demographic data for the school as a whole. The percentage of Hispanic students was slightly higher than that of the school demographics as a whole however. Additional information is needed to examine the reasons for these differences and why there are changes in demographic distributions moving from algebra to geometry.

Gill (2014) cites research demonstrating higher percentages of African American males in special education, with disciplinary referrals, suspensions, and expulsion, while simultaneously less likely to be enrolled in rigorous course work. This data would suggest male and underrepresented populations also demonstrate an increased need for academic support with algebra and geometry at this specific school. Exploring beyond the symptoms of lack of success will be essential to better target instructional interventions for these students in the general education classroom to possibly prevent the need for additional Tier 2 interventions. With that being said, only seventeen of the one hundred twenty two students did not pass the algebra exam. These results indicate that current Tier 2 interventions are supporting student success on the NYS Integrated Algebra exam. Eighty six percent of the students engaged in Tier 2 AIS for algebra passed the exam. This number increases when examining students who scored better then 310, but still qualified for Tier 2 AIS. When this group is examined, only four students did not pass the algebra exam during the 2011-2012, 2012-2013, and 2013-2014 school years. Two of those students were in the quasi-experimental group, and two were

in the comparison group. Additionally, three of the students scored above a 62 on the exam. This data demonstrates that those students who are closer to proficiency benefit from the additional time to meet standard on the Integrated Algebra Regents exam. When examining students who scored 310 or below on the pretest there is not a strong pattern of passing or failing, and both groups had similar tendencies with regard to passing rates (group 1 = 53% & group 2 = 67%). For these groups further research is essential to determine interventions that will support the content and skill acquisition needed for successful completion of the course and exam. Using the New York State Grade Eight Math assessment as a predictive assessment would increase the efficient utilization of resources. Students scoring above 310 benefited from increased instructional time, regardless of who implemented the instruction. Changing the structural practice of scheduling students with the same teacher will increase flexibility of resources, and allow for increased focus on those students for whom increased instructional time alone is not increasing their success rate.

When geometry was examined, student performance was not as strong at the posttest. The mean score on the Regents Geometry exam was 60.7% for the quasi-experimental group and 62.7% for the comparison group. While the students in the comparison group performed slightly better, the majority still did not pass the assessment. Additionally, the data shows that only two students scoring below 400 on their NYS eighth grade assessment went on to challenge the Regents geometry exam as a part of Tier 2 AIS. There may have been students receiving more intensive services in Tier 3 that scored below 400 on their NYS eighth grade assessment, but they were not included in this study. The two students who did score below 400 were successful on their

Geometry Regents exam. All of this data suggests that further analysis of student needs and interventions matched to those needs is warranted to increase participation and success rates. Through increased delineation of skills needed in conjunction with instruction and interventions matched to students, leads to greater opportunities for challenging more rigorous curriculum. This in turn, increases numbers of students meeting college and career readiness standards, and provides greater post high school opportunities for students.

The RTI framework is grounded on the concept of proactively addressing student academic and behavioral needs based on data analysis. At the secondary level there is a multitude of student data that has the potential to inform instruction. Fuchs et al. (2010), suggest that at the secondary level screenings are not as essential to identifying students at risk of academic deficits. Students who are at the secondary level have established patterns of academic and behavioral struggles, in addition to multiple national, state, and local assessments that can be used in conjunction with classroom performance data that provides information to support identification of those students who demonstrate a need for a higher level of service. Martinez and Young (2011) posit, "a successful RTI process depends on whether schools have in place a method to identify students early; to intervene using various tiers of research based instruction; to collaborate among school personnel and parents; and a system to monitor the RTI process and student progress" (p.51). Burns (2008) further support this. "At the secondary level, these core components are data-based decision making with multiple sources of data (including state accountability tests); flexible small-group instruction in both skill strategies and content; and collaborative problem analysis" (p. 15). Based on the three years of data used in this

research, students who scored above 310 on the NYS eighth grade assessment have a high likely hood of being successful on the Integrated Algebra Regents with the current supports that are in place at this school. Based on this, the number of students that demonstrate a need for additional problem solving to help them be successful is now a smaller, which allows for more individualized instruction based on their specific needs. Buffum et al. (2012) states, that by linking universal screenings to specific learning targets, teachers are better able to use them to inform classroom and AIS instruction. Empowering teachers with the information to proactively teach content and skills students need to be successful increases the likelihood of student success in the general education classroom. "Screening information, when tightly aligned to essential skills and knowledge, will help teams to better understand how to create differentiated instruction for the learning success of all students" (p.83). Through analysis of the New York State Grade 8 Math assessment and other student performance data, teachers will be empowered to target specific skills and content essential for student success.

Implementation of the RTI framework at the secondary level presents unique challenges. Sansosti, Telzrow, and Noltemeyer (2010) did a qualitative study on the perspectives of school psychologists regarding the implementation of RTI in secondary schools. Two additional qualitative studies were done by Sansosti, Noltemeyer, and Gross (2010 & 2011) regarding the perspectives of Principals and Special Education Directors on the implementation of RTI at the secondary level. All three of these studies noted the structure of secondary schools as an obstacle to successful implementation of the RTI. The structures noted in these studies were the scheduling constraints for students and teachers, the highly departmentalized organization, which impedes

collaboration across content areas, and graduation requirements. While all groups believed in the importance of RTI, these obstacles were seen as preventing the successful implementation of RTI. In addition to structural obstacles these studies also noted the intensity of student achievement gaps, the increased severity of student behavioral problems, departmentalization and content specialization, time to implement interventions, and time for teachers to engage in collaborative problem solving were all obstacles to successful RTI implementation.

McInerney, Zumeta, Gandhi, and Gersten (2014) also found that "implementing these specially designed intervention programs is challenging because they conflict with existing delivery systems or other implementation structures within the school" (p. 54). Based on the data presented in this study, the time and structures to implement RTI do exist in the secondary level. Additionally, this data indicates that coordination of service between classroom teacher and AIS provider may not be as integral to student success. For this study coordinated service was determined by having the same teacher for the course and Tier 2 AIS support. In analyzing the data, student performance and engagement was stronger in the comparison group, which did not have as strong coordination because of the additional adults that were required to coordinate with. By re-elevating the need to schedule students with their same teacher there are increased opportunities for students to be scheduled into electives that may peek their interest, while still providing the targeted interventions students need for success (credit attainment and passing assessments needed for graduation). In addition, this would provide for greater flexibility within the students and adults schedule, which would address some of the obstacles indicated in the previous study. To fully implement RTI it

is paramount that administrators remove the structural obstacles that are seen as impediments. The research data is essential to refute beliefs regarding those obstacles, and in the case of this study create greater flexibility in the schedule, which supports student access to a comprehensive education.

In both the Algebra and Geometry groups the common midterm assessment either demonstrated the most statistical significance or the largest effect size, in the case of Geometry. An essential component of RTI is progress monitoring (Burns, 2008; Fuchs et al., 2003; Fuchs & Fuchs, 2007; Marinez & Young, 2011; McDaniel et al., 2013). "At the foundation of RtI is a belief that, as educators, we will make instructional decisions for students based on how they respond to our efforts" (Buffum et al., 2012, p. 90). In recognizing the instructional implications data generated by the midterm, teachers have an opportunity to use this piece of data to inform practice. Additionally, this will support continued use of the specific interventions, indicate a need to possibly change interventions or implement with a greater degree of fidelity, or even identify new students at risk of not being successful on the Regents exam. According to Buffum et al. (2012), teachers and schools often struggle with progress monitoring because of a lack of specificity with regard to student academic needs. Through an analysis of the midterm, teachers are able to identify specific skills and knowledge, based on learning targets, which students are not proficient with. Interventions are now able to be specific to the learning needs of the individual student. It is not that the student struggles with geometry, but that they need further instruction on proofs or finding slope. By increasing the specificity of the learning need, teachers are better able to match instruction and measure growth in that specific area. Further, teachers are able to use data from the tier 2

interventions to analyze student growth determining if there is a need to continue the intervention, change interventions, or change the level of service. The importance of knowing the significance of the data helps to maximize the limited time to analyze data that will help inform interventions, which in turn will support student success.

Limitations

Potential limitations of this study include the scope of the secondary data analysis, which was limited to one high performing suburban school district. While statistically significant findings were identified, care should be taken in generalizing these findings to districts with larger populations of underperforming students. Larger populations of students qualifying for Tier 2 AIS may impact the effectiveness of the intervention. Lager populations of underperforming students may also impact the staffing and structural needs of the school. Is the school financially able to provide staffing to meet the needs of larger numbers of students working in small groups at Tier 2 AIS? Additionally, because this secondary data analysis was done in one suburban school, replication in different contexts would increase the transferability of the findings from this study. Determining if different structures are used and how those different structures impact student performance when supported in Tier 2 AIS will help better inform practice for all districts.

The structure of this study was a secondary data analysis of a naturally occurring quasi-experiment. This is a potential limitation because the students were not randomized. Randomization of the students in the different groups would increase the validity of the study.

Conducting a secondary data analysis for Tier 2 AIS in urban and rural schools with larger populations of underperforming students would increase the ability to generalize these findings across settings. This type of study may also further support the need for targeted instructional interventions aimed at closing the achievement gap, and supporting student success as they move toward meeting graduation requirements. Even though all teachers in this study were aligned with state standards and followed research based district curriculum, difference in teaching style may have impacted student results. Observations and qualitative interviews would add to the depth of information regarding the association between coordinated Tier 2 AIS and student performance and engagement.

Recommendations

Future Research	State Education Department	School Districts
• Secondary Level best practices both Structural and Instructional • Qualitative or mixed method inquiry regarding the lived experiences (Students and Teachers)	• Financially support Secondary Data Analysis of Student assessment Data • Creation of Research Based Benchmarks to Reduce Assessment Costs (Universal Screening) and Free District Resources	• Use of Historical Student Data to Identify At Risk Populations • Research-Based Structures to Implement Tier 2 AIS that Increase Student Performance • Progress Monitoring Targeting Specific Learning Needs Matched to Learning Standards and Instruction

Figure 5.1. Summary of Recommendations.

Recommendations for Future Research

Based on the lack of research regarding RTI at the secondary level, and more specifically the implementation of Tier 2 RTI, further research is needed to inform best practices both structurally and instructionally. While the findings of this study provide important quantitative information, employing qualitative or mixed method inquiry regarding the lived experiences of both the students and teachers may uncover themes and factors essential to more fully understanding best practices for RTI delivery.

Through an examination of the quantitative findings of this study, interviewing those students who scored below 310 on their New York State Grade 8 Math assessment, but were successful on the NYS Integrated Algebra exam, may provide insight into what practices students found most helpful. Through interviews with these students, who have demonstrated resiliency with regard to math, researchers may uncover patterns that can be replicated to support increased student success. In addition to interviewing students, having similar interviews with teachers will provide insight into barriers and supports of Tier 2 RTI implementation. These interviews may support identification of data teachers see as most beneficial to plan instruction and specific interventions for students. Additional information regarding how students can be grouped to maximize instructional time may be uncovered. Regarding this specific study, research focusing on specific teachers that were most successful may uncover experts among the professional community that would be in the unique position to support colleagues in their professional practice. Were there teachers who worked best with struggling students,

how do they analyze data, plan instruction, implement interventions with fidelity, and determine next steps for student success.

Secondary data analysis of other assessment data would also be beneficial for the creation of benchmarks that would better identify students at risk of course or exam failure. From the research in this study a benchmark of 310 can be used on the New York State Grade 8 Math assessment to help inform what Tier 2 AIS supports need to be in place for students. Having research regarding other assessment data that students enter high school with would reduce the need for additional universal screens, which in turn would provide data supporting accessing to interventions from the first day of school. Additionally, the creation of research based benchmarks would reduce the assessment costs for districts and free resources for students.

Brozo (2009) states, "although research around RtI at the elementary level has been ongoing, studies into the best ways of implementing the process for secondary students are scant" (p. 278). For RTI to realize its potential of closing achievement gaps and supporting student success additional research is both warranted and essential.

Recommended Actions

RTI is a framework that when implemented with fidelity identifies student academic and behavioral needs early, allowing educators to intervene with targeted instruction aimed at improving achievement. "RTI has been codified into federal law as a method of LD identification (IDEA, 2004). It has been integrated into policy, with all 50 states permitting RTI in LD identification" (Fuchs & Vaughn, 2012, p.195). In addition, the essential components of RTI are being considered for inclusion in the reauthorization of the Elementary and Secondary Education Act (ESEA). According to

the National Longitudinal Transition Study – 2 (NLTS-2), students identified with a specific learning disability were more than 3 years behind in reading and math (3.4 years in reading & 3.2 years in math). "One quarter of the student with LD dropped out of school and only 46% of students with LD had paid employment 2 years later" (Fuchs, Fuchs, & Vaughn, 2014, p.13). These statistics demonstrate a need to close the achievement gap for our neediest students, and at the elementary levels RTI is a research supported framework of doing that.

The promise of RTI is to provide the framework that is inclusive of the essential elements to help districts and buildings meet increased accountability measures, while simultaneously supporting all students in meeting the increasingly rigorous standards. At its fundamental level, RTI was designed to improve student learning in all schools, but in particular those schools demonstrating large achievement gaps (McInerney & Elldege, 2013). In order to fulfill the promises of increased student performance, closing of critical achievement gaps, and enhancing the validity of LD identification all components of RTI must be implemented. Figure 5.1 is a visual representation of the essential elements of RTI. At the center or heart of RTI is data-based decision making. This drives all of the other components, which include screening, progress monitoring, and a multi-level prevention system. Linking data-based decision making to the other components are the evidence-based interventions that are culturally responsive, and lead to improved student performance (McInerney & Elldege, 2013; Fuchs et al., 2014; www.rti4success.org).

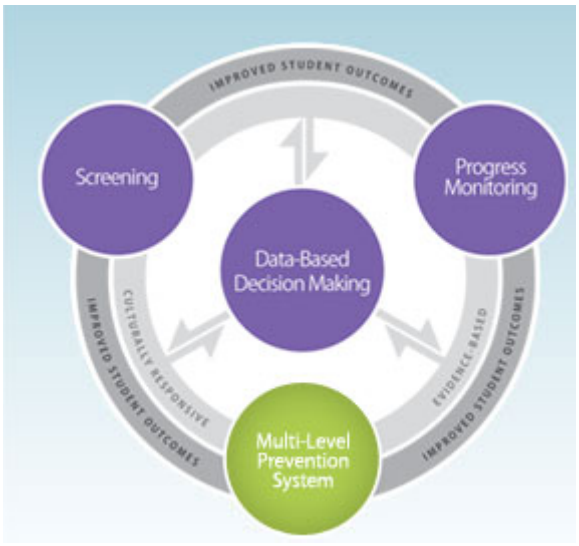

Figure 5.2. Essential Components of a Research-Based Framework.
Source: National Center on Response to Intervention, 2010. http//www.rti4success.org

This multi-level or tiered system uses student data to determine interventions for students not responding to core academic instruction, which is the foundation of Tier 1. Through the use of a tiered system, a continuum of instructional supports provide early identification of student's with academic and behavioral needs, and matching those needs to evidence-based interventions aimed at addressing the root cause of these deficits.

This study focused on a secondary data analysis of Tier 2 interventions for math. Tier 2 placement is decided based on student data regarding interventions used for students identified as at risk through universal screens, and whose progress is determined to be insufficient; even though a research-based core curriculum, and differentiated instruction have been implemented with fidelity. Students at the secondary level bring with them a rich history of assessment and student performance data. Through secondary data analysis, trends and benchmarks can be established to better identify at risk populations. This type of program analysis also reinforces structures and interventions that may be working for specific groups of students, while simultaneously identifying

those students who are not being successful with this type of intervention. In order for school districts to best use assessment data as a predictive analytic, state education departments need to fund research in this area. Through this research and the creation of benchmarks, districts will increase their ability to more efficiently use their limited resources for student's success. The results of this study indicate the structures for RTI at the secondary level do exist and are effective in supporting success. Additionally, the results indicate that districts have more flexibility in who implements these interventions, which frees resources, and provides strong evidence to support increased cost effectiveness.

Conclusion

This study makes an important contribution to the RTI literature by starting to fill the gap in research done at the secondary level. While RTI is being codified in federal and state legislation and policy, the dearth of research regarding implementation at the secondary level has created a need. Fuchs and Vaughn (2012), while optimistic about elementary research and the promise of RTI, express their concern regarding the implementation of an elementary model on a secondary structure absent the research. However, McInerney and Elledge (2013) posit that RTI provides "a structure for differentiating instruction based on student needs. Student screening and progress monitoring data provide empirical evidence that a student is (or is not) responding to prescribed instruction" (p.13). By linking assessment data to teacher practice and student performance through research, school districts will be better able to analyze existing structures and test different interventions aimed at closing achievement gaps and better matching interventions to student need. This research study demonstrated the ability of

this district to use the New York State Math 8 assessment as a predictive analytic to better identify students at risk of not being successful on the New York State Algebra Regents exam. This data enables districts to better target at risk populations, matching interventions to the needs of the individual student. Additionally, it found no differences in student performance and engagement when the same teacher delivers the Tier 2 AIS support and classroom instruction. In determining this, districts are able to more efficiently utilize their limited resources and remove barriers to the implementation of RTI at the secondary level.

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Appendix A

Mathematics Guiding Principles

Our Vision

Mathematics is a language necessary to successfully navigate an increasingly technological society. The _____ Mathematics Program provides a foundation in mathematics that encompasses content knowledge and process skills. This knowledge base is aligned with National and State Standards, as well as _____ outcomes, and serves to promote rigorous and transferable conceptual understandings with procedural fluency. Taking into consideration the diverse needs of the learners, instruction is differentiated and student-centered so that all students reach their maximum potential. As educators we are committed to developing critical thinkers and problem solvers who are mathematically literate citizens. To quote the mathematician Rene Descartes: "It is not enough to have a good mind. The main thing is to use it well."

Assessment	**Technology**
Mathematics assessment is an on-going process of evaluation which will provide targeted feedback leading to the continuous growth of ALL learners. Effective mathematics assessment should: • allow for student and teacher reflection through timely, targeted feedback. • provide data to inform and adjust instruction. • align with district and state outcomes. • be a critical part of the learning cycle and therefore must be multi-faceted in order to provide all students vehicles through which they can demonstrate their level of understanding.	*Technology engages students, enhances learning, and extends conceptual understanding of mathematical ideas*. Incorporating the use of educational technology in the mathematics classroom will: • engage students by tapping into their natural curiosity as it allows increased opportunity for exploration through inquiry. • enhance learning by increasing efficiency, thereby broadening the depth and breadth of mathematical ideas. • extend conceptual understanding by applying critical thinking

	skills, demonstrating multiple representations, and discovering mathematical connections. • prepare students to be active participants in our global community through diverse and authentic learning experiences.
<u>Planning and Instruction</u> *Effective planning and instruction ensures a balance among developing an understanding of broad mathematical concepts, problem-solving, and increasing procedural fluency in a student-centered learning environment.* Rich mathematical instruction should: • outcomes, current research, best practices, and student needs. • provide for acquiring, making meaning of, and transferring skills and knowledge across content and disciplines. • differentiate to support the needs of all students. • incorporate a variety of authentic experiences that foster critical thinking.	**<u>Communication</u>** *Communication promotes higher levels of cognitive, interpersonal and social development.* Mathematically literate students: • employ technical reading strategies to access and interpret a variety of mathematical data. • express mathematical information symbolically. • understand and extend their thinking through discourse. • critically reflect upon and evaluate their understanding through writing. • utilize feedback as a vehicle to move toward independence. • discover, analyze, and evaluate existing ideas, new concepts, and misconceptions through questioning.

	• are supported through on-going collaboration between school and home.

Classroom Culture

A positive classroom culture which fosters life-long curiosity, teamwork, and an appreciation for multiple approaches to problem-solving is essential for engaging and motivating students.

Students achieve success in a learning environment that is structured to:

- promote inquiry, risk-taking, reciprocal teaching, and a spirit of collaboration.
- enlist teachers in assuming flexible roles as facilitator, coach, and instructor.
- support all students in developing a positive mathematical self-concept and a productive disposition.