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The Impact of Response to Intervention in a High School Mathematics Setting

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Abstract

The purpose of this thesis is to examine the impact of response to intervention (RTI) in a high school mathematics setting. A major concern in the literature related to the fact that majority of RTI research focused on students at the elementary level and in reading. Therefore in this study RTI was implemented in a high school mathematics classroom and the effects were analyzed. This study is focused on a sample of ninth and tenth grade students from two classes and taught by one teacher in the same high school in an action research setting. Quantitative and qualitative methods of data were collected using documents/artifacts, observations, surveys and interviews. The data was analyzed using both descriptive statistics and the constant comparative method. Validating the results of this study included member checking, pilot testing and triangulation. Over a six-week data collection period, themes were noted that included how Tier 2 interventions are implemented in a high school mathematics setting as well as students' perceptions of these Tier 2 interventions. The researcher found three limitations including limited access, measures used to collect data as well as a small sample size. Additionally, the research recommended three implications of practice. These implications included that the teacher of the interventions outside of the regular education classroom should be a different teacher then the teacher in the regular education classroom, interventions outside of the regular education classroom should be kept to a smaller group of students, and finally, there should be a high frequency of Tier 2 interventions made inside the regular education classroom.

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Chapter 1

Background

In the Disabilities Education Improvement Act of 2004 (IDEIA), the United States Department of Education, §§ 300 – 307 suggested a systematic process for screening, intervening and monitoring to determine a child's response to scientific, research-based intervention (Stuart & Higgins-Averill, 2011). This systematic process is known today as response to intervention (RTI). RTI is a multi-tier approach, where a screening process takes place, followed by various interventions and a monitoring progress of students in need of academic and behavioral needs. The current reauthorization of the IDEIA of 2004 recognized RTI as an alternative way to identify students as having learning disabilities, making sure that students who struggled were not misidentified as disabled when different and/or more intensive instruction addressed their needs (Fisher & Frey, 2013).

The hope was that RTI would ensure that all students receive high-quality instruction and intervention before being referred to special education services. RTI was suggested as it may be an effective way of identifying students for special education at an earlier time and as a result there may be fewer referrals to special education in the future (Barnett, Daly, Jones, & Lentz, 2004; Dorn & Shubert, 2008; O'Connor, 2000).

Statement of the Problem

Concern with RTI relates to the fact that the majority of RTI research focuses on students at the elementary level (Fisher & Frey, 2013; Johnson et al., 2013; Vaughn & Fletcher, 2012). Implementation of RTI at the secondary level presents challenges due to the structure and organization of secondary schools (Johnson et al., 2013). There are a number of reports and recommendations focused on what high schools could do with RTI (e.g., Ehren, Deshler, &

Graner, 2010; Torgesen, 2003), but little evidence for its effectiveness or how it can be implemented (Brozo, 2009–2010). Despite the implementation challenges, there are compelling reasons for high schools to consider RTI models (Johnson et al., 2013). Currently, much of the literature and research regarding RTI has focused on the area of reading instruction. However, RTI is not limited to just reading, rather it can be applied to all academic areas (Pool et al., 2013). Students who fail to develop proficiency and automaticity in computational skills (e.g., addition, subtraction, multiplication, and division) and problem solving in the primary grades are more likely to experience difficulties in math curriculum later (Miller, Stringfellow, Kaffar, Ferreira, & Mancl, 2011). "The goal is to ensure that *all* students learn mathematics through high-quality instruction using evidence-based instructional and intervention methods, products and practices" (Gresham & Little, 2012, p. 22, emphasis in original). RTI in mathematics focuses on the effective use of evidence-based instructional approaches, resources, and strategies within the classroom while continuously monitoring student learning. The benefit of implementing RTI in mathematics are plentiful: providing support in the general education setting, identifying who are not succeeding within the general education curriculum, and offering early interventions to struggling students as well as to those who need a challenge (Fuchs & Deshler, 2007; Riccomini & Witzel 2010).

Thesis Study

The purpose of this thesis is to examine the impact of RTI in a high school mathematics setting. A major concern in the literature related to the fact that majority of RTI research focused on students at the elementary level and in reading. Therefore, I am interested in observing and implementing RTI in a high school mathematics classroom and analyzing effects. This general purpose leads to the following research questions:

1. How are Tier 2 interventions implemented in a high school mathematics setting?
2. What are the students' perceptions of the instruction strategies that are employed as Tier 2 interventions in a mathematics classroom?

The study is focused on a sample of ninth and tenth grade students from two classes and taught by one teacher in the same high school, as such action research is the most appropriate methodology to explore implementation of RTI at this site. Craig (2009) indicated, "one of the key characteristics of action research is that it involves a limited number of subjects of one particular group within one specific environment and may involve multiple research cites or classrooms" (p. 9). In addition, action research is being used more in schools as an attempt to further professional growth in teachers (Craig, 2009; Glanz, 2014; Sullivan & Glanz 2013). Action research was chosen for this study because the researcher has the ability to directly control outcomes in the setting.

Summary

Chapter One provided a brief overview of the background of RTI, the current issues of RTI, and the rationale for why this action research was needed. It also provided a brief introduction of the study including the purpose, research questions, and the methodology used. Finally, Chapter One informed the reader of the location of the study and background information on the study participants.

Chapter Two provides a more in-depth look at RTI, including a current outline of the current literature relating to response to intervention. The literature review starts with the definition and design of RTI. Next, the researcher describes how to plan for RTI. Following this the researcher details the importance of data collection while implementing RTI. Afterward,

there is a summary of how gifted students are of importance with RTI and finally, the research explains how RTI can be implemented in different areas of focus.

Chapter Three explains the design of the case. The study is focused on a sample of ninth and tenth grade students from two classes and taught by one teacher in the same high school, as such action research is the most appropriate methodology to explore implementation of RTI at this site. Next, the chapter provides more depth information about the case. Data collection methods are also discussed with a focus on documents/artifacts, observations, surveys and interviews. Following that information, Chapter Three also reviews the method used to analyze the data. A quantitative analysis and qualitative analysis are utilized. Lastly, the chapter addresses the issue of reliability and validity.

Chapter Four explores the results while interweaving discussion. An analysis of how Tier 2 interventions were implemented RTI in a high school mathematics setting, the students' perceptions of the Tier 2 interventions implemented, as well as data from this research is organized by each of the research questions probed. For each research question two themes were reported with evidence from the data collected through the four forms of data collection: observations, documents/artifacts, surveys, and interviews. The data was also supported with current research from the literature review.

Chapter Five first discusses conclusions that are drawn. Next, three limitations were noted including limited access, the measures used to collect data, as well as a small sample size. Following, three implications of practice were stated suggesting alternate teachers for the interventions being made inside and outside the regular education classroom setting, a small class size for the interventions being made outside the regular education classroom setting, as

well as an increased frequency of Tier 2 interventions. Lastly, two suggestions were made for future research.

Definition of Terms

Response to Intervention (RTI): An educational design to prevent students from failing in school by using instructional and behavioral systems (National Center on Response to Intervention, 2010).

Progress Monitoring: A formative process to assess student academic performance and evaluate the effectiveness of instruction (Vannest et al., 2012).

Data-Based Individualization (DBI): An empirically proven method for individually tailoring instruction for students with significant learning problems (Fuchs & Fuchs, 1998)

Chapter 2

Introduction

In the past few years, our high school has been under the microscope for what teachers are doing to support special education students. In the beginning our new superintendent took a few steps to clear the misconception that we are not here for our special education students. First, he hired more special education staff for more support. Second, he arranged for more professional development with regular education teachers to meet with individual case managers about individual students to figure out how the teachers as a team can be there for that particular student. Third, he arranged for leaders to be in charge of each special education student. These leaders include assistant principals, guidance counselors, or special service employees, and would reach out to the special education student's family every other week with updates about this student.

We have many students placed in special education, but we don't have a process for tracking data on these students to show what modifications they are being given and what accommodations they are receiving. Additionally, we don't have a system in place for students who are not identified as special education, but still struggle with learning at increasing levels of intensity at the secondary level.

Therefore, to start my literature search, I decided to begin with exploring peer reviewed items that included the words 'response to intervention' in the *Education Resources Information Center* (*ERIC*) database. This search outputted 1,459 items, which was a very broad range of items. I modified this search to give me items from only the past ten years (i.e., 2005-15), but that still put my search to 1,266 items, which was still very broad in range. I decided that I needed to narrow my search, so I opened up the thesaurus in *ERIC* and typed in 'scientific

research based intervention' and clicked on the option 'relevancy ranked.' From there I chose the items: 'response to intervention' (RTI) or 'scientific research.' When the search generated articles, instead of less items, more were generated – 4,469 items. As I am currently a math teacher, I decided to add 'and math.' This addition narrowed the results to only 32 items. Of those 32 items, I determined that only 15 were applicable to my research interests.

As my interests also appeared in RTI at the secondary level, I searched 'and secondary' and 'not elementary.' This gave me an output of 17 items. Of these 17, 11 were found useful and not repeated from prior searches. Throughout reading these various pieces of research, some research articles I found were not applicable to my particular interest and topic, while others, generated more articles to read that were noted inside the texts. I found myself writing lists of more articles to look up and research. This process has given me a broad range of research articles that has lead me to the following literature review about RTI.

This review starts with the definition of RTI as well as the design and implementation of the three tiers of RTI. Next, the key factors of success while planning for implementation of RTI are discussed. Following is a discussion of the importance of data collection during an RTI model. Afterward, is an argument that some researchers have made about the exclusion of gifted students during the RTI process, and what can be done so that these students are included in the process. Finally, is a debate of whether RTI is used more in an elementary setting vs. a secondary setting as well as the importance of using RTI in a mathematics classroom vs. other content areas.

Definition and Design of RTI

RTI is an educational design to prevent students from failing in school by using instructional and behavioral systems (National Center on Response to Intervention, 2010).

> RTI models are one of the most common initiatives being implemented today to address concerns about all U.S. students having equitable access to general education, including students with disabilities, students from diverse cultural backgrounds, and students who speak English as a second language. (Stuart, Rinaldi, & Higgins, 2011, p. 55)

Although not mandated by federal regulation, RTI approaches are included in the Individuals with Disabilities Education Improvement Act of 2004 (IDEIA), United States Department of Education, §§ 300 – 307, which suggested a systematic process for screening, intervening and monitoring to determine a child's response to scientific, research-based intervention (Stuart et al., 2011). The current reauthorization of the IDEIA of 2004 recognized RTI as an alternative way to identify students as having learning disabilities, making sure that students who struggled were not misidentified as disabled when different and/or more intensive instruction addressed their needs (Fisher & Frey, 2013).

A learner's RTI has been used in special education for decades (Fuchs, Deno, & Mirkin, 1985). The need to address the academic needs of children at an earlier point in school has resulted in an alternative intervention and assessment method called RTI (Dunn & Browning, 2012). The hope was that RTI would ensure that all students receive high-quality instruction and intervention before being referred to special education services. Research evidence suggested that RTI might be an effective way of identifying students, in terms of both allocating additional instruction and qualifying for special education services (Barnett, Daly, Jones, & Lentz, 2004; Dorn & Shubert, 2008; O'Connor, 2000). The result, it was theorized, might be fewer referrals to special education, fewer students identified as disabled, and a way to address the overrepresentation of students of color in special education. However, as noted by Johnston (2010), these dual purposes of RTI – measurement and instruction – have caused confusion in

the field. In some cases, measurement has overshadowed instructional purposes of RTI (Dunn & Browning, 2012).

A number of leading national organizations and coalition groups, including the National Research Center on Learning Disabilities and the 14 organizations forming the 2004 Learning Disabilities (LD) Roundtable coalition, have outlined the core features of an RTI process as follows:

1. high quality, research-based instruction and behavioral support in general education,
2. universal (i.e., school-wide or district-wide) screening of academics and behavior in order to determine which students need closer monitoring or additional interventions,
3. multiple tiers of increasingly intense scientific, research-based interventions that are matched to student need,
4. use of a collaborative approach by school staff for development, implementation, and monitoring of the intervention process,
5. continuous monitoring of student progress during the interventions, using objective information to determine if students are meeting goals,
6. follow-up measures providing information that the intervention was implemented as intended and with appropriate consistency,
7. documentation of parent involvement throughout the process, and,
8. documentation that the special education evaluation timelines specified in IDEIA of 2004 and in the state regulations is followed unless both the parents and the school team agree to an extension. (Stuart et al., 2011, p. 55)

Klotz (2007) argued that these core features might be grouped under three essential aims of a RTI approach:

1. the provision of scientific, research-based instruction and interventions in general education,
2. monitoring and measurement of student progress in response to the instruction and interventions, and
3. use of these measures of student progress to shape instruction and made educational decisions. (as cited in Stuart et al., 2011, p. 55)

Regardless of the RTI approach used, schools must be prepared to offer a variety of instructional strategies; staff must be trained to measure student performance; and parents must be kept informed of these new procedures and made partners in the process (Klotz, 2007).

RTI was designed to improve the academic performance of struggling students with and without disabilities and to provide practitioners with a more valid means of disability identification (Fuchs, Fuchs, & Vaughn, 2014). RTI is the practice of:

1. providing high-quality instruction or intervention matched to student needs
2. using learning rate over time and level of performance to
3. make important educational decisions to guide instruction. (Gresham & Little, 2012, p. 22)

RTI is a preventative framework patterned on a public-health model, in which instruction is delivered with increasing intensity to meet the needs of all learners (Mellard & Johnson, 2008). When implemented effectively RTI identifies students reforming at low levels compared with peers and presumably helps target needed interventions (McCallum, Bell, Coles, Miller, Hopkins, & Hilton-Prillhart, 2013).

A foundational component of RTI is the use of data as the basis for making decisions about the intensity of instruction that students are required to meet their learning needs (Pool, Carter, Johnson, & Carter, 2013). Data collected continuously at each tier and are used to make instructional decisions to determine if students are responding to instruction or interventions (Gresham & Little, 2012). This data may be in the form of quizzes, tests, formative assessments etc. It is important that this data is collected frequently and on an ongoing basis. The ongoing collection of data is also known as progress monitoring.

Progress monitoring is an efficient tool for gauging the effectiveness of instruction on a regular basis and can assist school teams in making decisions about appropriate instruction and intervention for students. The main purpose of progress monitoring is to determine whether the intervention(s) provided is/are effective and successful (Johnson, Mellard, Fuchs, & McKnight, 2006). Progress monitoring is a formative process to assess student academic performance and evaluate the effectiveness of instruction, involves repeated samples of student performance data over time (e.g., weekly quiz grades or twice-weekly lab assignments). It can quickly provide feedback for teachers on student learning (Vannest, Soares, Smith, & Williams, 2012), which can be useful to make decisions on future interventions.

RTI prevention systems are designed in dramatically different ways, with schools incorporating two to seven tiers of intervention (Berkeley, Bender, Gregg Peaster, & Saunders, 2009). However, one school's Tier 2 may be another school's Tier 6. Most often conceptualized as a three-tiered model (Fuchs, Compton, Fuchs, Hollenbeck, Hamlett, & Seethaler, 2011), with Tier 1 representing the general education program, Tier 2 representing a system of interventions designed to meet the needs of students who are struggling to learn, and Tier 3 representing special education (Vaughn & Fuchs, 2003). A discussion of each of these tiers follows.

Tier 1

Tier 1 refers to general instruction that all students receive in a mainstream classroom (Fuchs et al., 2014; Pool et al., 2013; Robins, 2013). Eighty percent of students are identified to benefit from solely Tier 1 instruction (Cheney, 2007) – that is majority of students who learn from core instruction (Vaughn, 2003). Therefore, this first level of RTI prevention framework is primary prevention. It comprises the instructional practices that general education teachers conduct with all students:

1. the core instructional program along with
2. classroom routines that provide opportunities for instructional differentiation,
3. accommodations that permit access to the primary prevention program for all students, and,
4. problem-solving strategies designed to address students' motivational problems that interfere with them performing the academic skills they possess. (Fuchs et al., 2011, pp. 372-373)

This lesson should correlate to the state curriculum requirements. Additionally, the lesson should address the state standards, should be challenging, engaging, and developmentally appropriate (Herrelko, 2013). Achievement is assessed through universal screening that is conducted periodically throughout school year (Dunn & Browning, 2012; Fuchs et al., 2011; McCallum et al., 2013; Pool et al., 2013; Vaughn & Fletcher 2012). Afterwards, core instructional changes are made when screening data reveals a group deficit in skills. Students that are unable to make gains without additional support are moved to Tier 2 (Dobbins, Gagnon, & Ulrich, 2014).

Tier 2

The goal of Tier 2 is to reduce current cases of academic failure to prevent student problems from escalating to an intensity that requires individualized intervention and support. (National Center on Response to Intervention [NCRTI], 2010). In other words, Tier 2 intervention is supplemental to Tier 1 instruction, with the goal of alleviating difficulties in the general education curriculum (Pool et al., 2013). Fisher and Frey (2013) reported, "the key to success is scheduling of intervention efforts to supplement, but not supplant, core instruction" (p. 112). Hallmark characteristics of Tier 2 are:

1. use of screening data and criteria for placement,
2. interventions based on strong instructional design principles, and
3. frequent progress monitoring. (NCRTI, 2010)

Tier 2, also known as the secondary group, where 15% of students are identified (Cheney, 2007), is for those students whom the instruction for the majority of students is insufficient (Herrelko, 2013). Tier 2 instruction is built for students who need more guided, personalized instruction that is given in the Tier 1. This more individualized instruction is given to students in small groups.

Tier 2 instruction is supplemental instruction provided to those students who are struggling, at risk, or otherwise not meeting grade-level benchmarks in Tier 1. Students who are not making progress and are struggling with the general education curriculum may be in need of more targeted intervention, or Tier 2 supports (Dobbins et al., 2014; Dunn & Browning, 2012; Fuchs et al., 2011; Fuchs et al., 2014; Pool et al., 2013; Robins, 2013). Fuchs et al. (2007) argued that,

> empirical research on the effect of Tier 2 has generally shown that when groups of 4-6 students are provided at least 30 minutes of intervention in addition to core instruction for

> 3-5 days of the week, there are significant increases in student performance. (as cited in Dobins et al., 2014, p. 19)

Fuchs et al. (2011), as well Fuchs et al. (2014), similarly reported that secondary prevention involved small-group instruction that relied on validated tutoring protocol (i.e., typically 10-15 weeks of 20-40 minute sessions in frequency of three or four times per week). Tier 2 instruction must provide a connection back to the core instructional curriculum in Tier 1. Additionally, it should increase the frequency and intensity of instruction in Tier 1, which is accomplished with providing students with increased exposure to material and additional opportunities to practice learned skills (Dobbins et al., 2014). Furthermore, Tier 2 instruction includes explicit and systematic instruction, guided and independent practice, and cumulative review of previously learned material (Fuchs, 2011). By incorporating these components into Tier 2 interventions students will have opportunities to increase conceptual knowledge of the subject area, which may further their ability to maintain and transfer learned concepts and skills (Witzel, Riccomini, & Schneider, 2008).

While Tier 1 relies heavily on whole class instruction, Tier 2 relies entirely on adult-led, small-group tutoring. Some researchers suggested secondary prevention was not the responsibility of the general education teacher, rather, professional support staff (e.g., reading and math coaches) implemented secondary prevention, sometimes directly and other times training and supervising paraprofessionals to serve as tutors (Fisher & Frey, 2013, Fuchs et al., 2011). Additionally, it is important to note that some researchers did not suggest student-to-student peer tutoring in Tier 2 (Dunn & Browning, 2012), whereas others recommended using peer-assisted learning strategies in the Tier 2 level (Kroeger & Kouche, 2006).

The students who are in Tier 2 need additional forms of support, which can take the forms of different strategies or methods, such as the use of additional manipulatives to reach curriculum benchmarks (Vaughn, 2003). The lesson could be modified by "content, process, or product according to the students' readiness, interests, or learning style" (National Council of Teachers of Mathematics, 2009, as cited in Herrelko, 2013, p. 417). Following these small group interventions, assessment at Tier 2 determines whether students have responded adequately to interventions. This assessment is usually based on progress-monitoring, testing following tutoring, or a combination of the two. Use this data to decide whether to continue Tier 2, return to Tier 1, or move to Tier 3 where more intensive instruction is needed (Fuchs et al., 2014).

Tier 3

Tier 3 involves the school's most effective teachers who provide intensive, individual or small group instruction for students who are not making sufficient growth toward grade level benchmarks with Tier 2 supports (Dobbins et al., 2014; Dunn & Browning, 2012; Robins, 2013). Students with an individual education plan that addresses specific content are usually identified as part of the tertiary group in the RTI program. Those students whose needs are not met in Tier 2 reside in this tier, and they may need more time to master a concept, more interactions with the teacher, more examples at the concrete level, or additional work to grasp the concept (Herrelko, 2013).

In some models this tier is considered to be for students who are with significant needs or disabilities (Pool et al., 2013), or are considered special education students (Dobbins et al., 2014). The group of students who fall into this tier are also known as the tertiary group. Approximately 5% of students fall into this group (Cheney, 2007), and the instruction of these

students is strategic, intense, and usually longer in duration than the first two tiers (Vaughn, 2003).

Planning for RTI

It has been found that if RTI is implemented in a high school setting, "it may be a way to reduce referrals to special education, decrease the numbers of students receiving special education services, and improve the achievement of students overall through responsive instruction" (Fisher & Frey, 2013, p. 110). Therefore having RTI implemented successfully, takes careful consideration and a great deal of planning. "As we consider the planning for RTI, we know that it is a model for effective practices for *all* learners, and supports *how* we educate all learners" (Gresham & Little, 2012, p. 23, emphasis in original). Like all new instructional practices that are being implemented, research must be done to find out what helps a successful rollout of RTI.

Throughout reading various pieces of literature factors have been noted for successful implementation (Dobbins et al., 2014; Dunn & Browning, 2012; Fisher & Frey, 2013; Fuchs et al., 2011; Gresham & Little, 2012; Johnson, Gallow, & Allenger, 2013; Krawec, Huang, Montague, Kressler, & de Alba, 2013; McCallum et al., 2013; Pool et al., 2013; Robins & Antrim, 2013; Stuart et al., 2011; Vannest et al., 2012; Vaughn & Fletcher, 2012). The first factor to success is school-wide commitment (Fisher & Frey, 2013; Robins & Antrim, 2013). Fisher and Frey (2013) conducted a study at Carver High School (a pseudonym) with 444 students and 23 teachers where they planned and slowly rolled out a RTI plan. One of their main findings was that "the whole school has to be involved with the effort for it to be successful" (p. 110). It takes every instructor to analyze various progress monitoring data, every teacher and

tutor to organize interventions, and full administrative commitment to give time for these interventions.

A second factor to successful implementation is professional development (Fisher & Frey, 2013; Gresham & Little, 2012; Krawec, Huang, Montague, Kressler, & de Alba, 2013; Stuart et al., 2011; Vaughn & Fletcher, 2012). Promoting professional learning is imperative for continuous improvement for teachers' instruction and students learning. Teachers need to be provided with the skills to provide interventions for their students. They need to know what instruction and learning looks like at Tier 1, Tier 2, and Tier 3. Kratochwill, Volpiansky, Clements, and Ball (2007) suggested, "as with other systemic school improvement efforts, implementing RTI requires change on many levels, with the most significant change pertaining to the professional practice of education and mental health professionals" (p. 619). Professional development is essential with any school change, especially a change that affects students, teachers, and staff.

Lastly, and most importantly, was the mention of how critical assessments were throughout the RTI process (Dobbins et al., 2014; Dunn & Browning, 2012; Fisher & Frey, 2013; Fuchs et al., 2011; Gresham & Little, 2012; Johnson, Gallow, & Allenger, 2013; McCallum et al., 2013; Pool et al., 2013; Vannest et al., 2012; Vaughn & Fletcher, 2012). "A foundational component of RTI is the use of data as the basis for making decisions about the intensity of instruction that students require to meet their learning needs" (NCRTI, 2010, as cited in Pool et al., 2013, p. 210). It has been found that the more data that are collected the more meaningful the intervention is that can take place which can then help make instructional decisions to determine if students are responding to instruction and the interventions (Fisher & Frey, 2013; Gresham & Little, 2012). Additionally, with assessing and evaluating student

learning, a teacher can assess a student's learning rate, level of performance, and adjust educational goals to maximize student achievement (Gresham & Little, 2012). Screening tools are essential and mentioned throughout various pieces of literature (Dunn & Browning, 2012; Fuchs et al., 2011; McCallum et al., 2013; Pool et al., 2013; Vaughn & Fletcher, 2012). However, screening tools are only the start. Progress monitoring throughout the intervention process is the key to the operation of a successful operation of an RTI framework (Fisher & Frey, 2013).

Importance of Data Collection

Assessments are critical to the operation of an RTI framework (Dobbins et al., 2014; Dunn & Browning, 2012; Fisher & Frey, 2013; Fuchs et al., 2011; Gresham & Little, 2012; Johnson et al., 2013; Kratochwill et al., 2007; McCallum et al., 2013; Pool et al., 2013; Vannest et al., 2012; Vaughn & Fletcher, 2012). As Kratochwill et al. (2007) noted:

> successful implementation of RTI is multifaceted and involves knowledge of evidence-based interventions, multi-tiered intervention models, screening, assessment and progress monitoring, administering interventions with a high degree of integrity, support and coordinated efforts across all levels of staff and leadership within the school, and sustaining systems of prevention grounded in an RTI framework. (p. 624)

NCRTI (2010) reiterated this idea when noting that the essential components of an RTI model include screening, progress monitoring, multi-tiered intervention, and data-based decision making. Fisher and Frey (2013) found that "a lack of assessment information results in an inability to provide meaningful intervention" (p. 111).

> Within this RTI prevention framework, a first order issue is identifying students who are at risk for the serious and long-term negative consequences associated with poor

> academic achievement and who therefore need to enter secondary prevention. To identify those students, schools administer tests that forecast academic achievement and apply cut points to the resulting scores to distinguish students who are and are not at risk. (Fuchs et al., 2011, p. 373)

RTI involves a cycle of assessing, intervening, and reasoning (Robins & Antrim, 2013).

In Tier 1, student achievement is assessed through universal screening conducted periodically throughout the school year (Dobbins et al., 2014; Dunn & Browning, 2012; Fisher & Frey, 2013; Fuchs et al., 2011; McCallum et al., 2013; Pool et al., 2013; Vaughn & Fletcher, 2012). To help determine students' progress with the core curriculum, general education teachers administer short assessments for core skills (e.g., reading three times a year). These assessments are referred to as universal screening as every regular education student completes them. Student achievement is assessed through these universal screenings and core instructional changes are made when screening data reveals a group deficit in skills (Dobbins et al., 2014; Dunn & Browning, 2012). This screening process is a good way to identify students with learning needs after research-based classroom practices have been implemented (Vaughn & Fletcher, 2012). For example, Fuchs et al. (2011) did a study where they investigated the potential of a two stage screening process. The first stage involved a universal screen, the purpose of which was to eliminate high-scoring students from further consideration as risk. In the second stage of screening, the remaining students completed a dynamic assessment to discriminate true positives (i.e., children who failed the universal screen and were truly at risk) from false positives (i.e., children who failed the universal screen, but whose skills would have developed adequately without special intervention). Screening tools are important and generally available, but may not be regularly used to identify students in need of supplemental and intensive intervention. If

screening tools are not used, intervention is likely to be unfocused or unsuccessful. Screening tools are a great beginning step to the RTI process, however progress monitoring is key to the successful operation of an RTI framework (Fisher & Frey, 2013).

Progress monitoring is an efficient tool for gauging the effectiveness of instruction on a regular basis and can assist school teams in making decisions about appropriate instruction and intervention for students (Dobbins et al., 2014; Dunn & Browning, 2012; Fuchs et al., 2011; Johnson et al., 2013; Pool et al., 2013; Stuart et al., 2011; Vannest et al., 2012). More than 30 years of research has showed progress monitoring to be a reliable and valid predictor of future performance on outcome measures (Deno, 2003; Fuchs, Deno, & Mirkin, 1985; Good & Jefferson, 1998).

The main purpose of progress monitoring at Tier 2 is to determine whether the intervention provided is effective and successful (Johnson et al., 2006). Assessment at Tier 2 determines whether students have responded adequately to the interventions. This assessment is usually based on progress monitoring, testing following tutoring, or a combination of the two. Schools use this data to decide whether students should return to Tier 1 without additional Tier 2 support or whether more intensive intervention is necessary (Fuchs et al., 2014). During Tier 2, the teacher or instructional assistant progress monitors each student once a week or at the end of an instructional unit with short formative assessments to document student' progress over time to determine if follow-up instruction is needed (Hosp, Hosp, & Howell, 2007). Throughout each tier, student progress toward grade level benchmarks is continuously monitored with the frequency of monitoring increasing at each tier (Dobbins et al., 2014). By monitoring students' progress in a systematic fashion (i.e., universal screening three times per year; progress monitoring at least every one-two weeks), students' skill levels can be defined early in school

and monitored as teaching personnel provide intervention and curricula aimed at promoting children to grade-level ability (Dunn & Browning, 2012).

In Tier 3, school personnel may complete assessments in addition to collected progress monitoring data (e.g., academic achievement and/or cognitive processing skills) that can inform the next sequence of intervention programming. Conversely, Tier 3 may be the point at which school personnel complete further diagnostic testing such as intelligence and academic subtests so as to complement the intervention's data (Dunn & Browning, 2012). Progress monitoring within RTI must, "(a) be sensitive to student change, (b) be educationally meaningful, and (c) not monopolize instructional time" while providing comprehensive structure of decision for instructional planning (Stecker, Lembke, & Foegen, 2008, p. 49). A key component of RTI is the ongoing assessment of students' progress toward established goal (Burns & Gibbons, 2008; Riccomini & Witzel, 2010). For RTI to work well, screening tools must reliably identify students at risk of poor outcomes, and progress monitoring tools must be reliable, sensitive to student growth, and predictive of general performance in the construct of interest (Deno, 2003).

Progress monitoring is a formative process to assess student academic performance and evaluate the effectiveness of instruction. Progress monitoring involves repeated samples of student performance data over time (e.g., weekly quiz grades or twice-weekly lab assignments). When progress monitoring data is charted over time in a graph, it serves to create visual data for instructional design making and provides feedback for students on their performance (Vannest et al., 2012). In addition to the instructional details outlined in the sample lesson, it is recommended that teachers integrate progress monitoring throughout instruction (Dobbins et al., 2014). Progress monitoring data are well suited for documenting progress and, as such, can be useful in an individualized education program meeting, where student performance is discussed

for content area courses and progress monitoring data can supply more specific information. The graphing of progress monitoring data creates a ready source of visual information to share with parents and students. Progress monitoring data is more useful than single test scores or pre-test/post-test scores in determining how well students are learning material; add this to the visual accessibility of the data, the immediacy of the data for instruction, and the motivating quality of performance monitoring for students, and progress monitoring is one efficient and effective technique (Vannest et al., 2012). If a child does not improve after an intervention phase(s), the universal screening and progress monitoring assessments would provide the evidence needed for special education placement and long-term services (Dunn & Browning, 2012).

A foundational component of RTI is the use of data as the basis for making decisions about the intensity of instruction students require to meet their learning needs (NCRTI, 2010). Data are collected continuously at each tier and are used to make instructional decisions to determine if students are responding to instruction and interventions. By using assessment to determine a student's learning rate and level of performance, we can make decisions about changes in instruction or educational goals for maximizing each student's achievement (Gresham & Little, 2012). Detailed skill analysis of student performance on these measures can provide teachers with information related to specific areas of difficulty for each student (Riccomini & Witzel, 2010). For students who require more individualized instruction, data-based individualization (DBI) is designed to meet student's learning needs. DBI is an empirically proven method for individually tailoring instruction for students with significant learning problems (for detailed descriptions of DBI, see Fuchs & Fuchs [1998], Fuchs, Fuchs, & Stecker [2010], and Stecker [2005]; and for discussion of randomized control studies of DBI, see Stecker, Fuchs, & Fuchs [2005]).

The following is an outline of the process a teacher would likely follow while implementing DBI.

1. Begin with validated lesson of instruction.
2. Teacher chooses validated form of ongoing progress monitoring.
3. As teacher begins implementing the intensified instructional program, the teacher uses the progress monitoring measure to collect three initial scores on three consecutive days. The teacher uses the median score to characterize the student's initial level of performance (i.e., the baseline score, before DBI begins). The teacher then plots the baseline score on the date corresponding one day before DBI begins and draws a dotted vertical line on the graph on this date to indicate the setting of the baseline performance.
4. The teacher then determines a goal (i.e., the expected year-end score).
5. The teacher plots the goal on the graph on the date corresponding to the last instructional day of the school year. The teacher then draws a straight line from the baseline score/date to the year-end goal/date. This "goal line" is the student's "moving target." It represents the score the student needs to achieve on any given date to be on target for achieving year-end goal.
6. The teacher then implements the intensified instructional program and continues collecting progress monitoring data. The teacher graphs one data point each week.
7. When four consecutive scores fall above goal line, the teacher increases the goal and redraws the goal line.
8. If eight data points have been collected since the last vertical line and four consecutive scores do not fall above or below the goal line, the teacher draws a

> line of best fit through the eight data points. If the line of best fit is steeper than the goal line, the teacher increases the goal. If the line of best fit is less steep than the goal line, the teacher revises a component of the instructional program. (Fuchs et al., 2014, p. 16-17)

The DBI process continues throughout the school year. Program development is informed by progress monitoring data that quantify student's response to the instructional changes and help the teacher understand what works for a specific student. Research on the efficacy of DBI shows that it helps teachers plan stronger, more strategic programs and accelerate the academic growth of struggling students with and without disabilities (Fuchs & Fuchs, 1998; Fuchs, et. al., 2010; Fuchs et al., 2014; and Stecker, 2005).

Students can be moved from one tier to another on a daily basis. To determine what tier a student occupies on a given day teachers should use as many formative assessment techniques as possible (Herrelko, 2013). To provide evidence for tier placement decisions, the teacher could use daily short-cycle assessment methods, prior knowledge questions, quizzes, homework evaluations, or written responses to questions at the start of the lesson. Examples of assessment for learning might include exit slips from the previous day, knowledge of students' backgrounds, student interest inventories, or conversations with the students that reveal prior knowledge of the lesson content. These formative assessment methods are just some of the ways to determine which tier a student may need in order to achieve the lesson objective (Black et al., 2003).

One of the most effective ways to inform instructional planning is through the use of formative assessment measures, and in particular, curriculum-based measurement (CBM) (Deno, 2003). Formative assessment measures can inform instructional placement and instructional programming. More than three decades of research support the use of CBM as an important

formative assessment tool that results in improved student outcomes. CBM has a strong evidence base that supports its use to benchmark and progress monitor student performance in a variety of academic areas (Deno, 2003, Foegen, Olson, & Impecoven-Lind, 2008). This evidence is in contrast with other types of measurement more routinely used as formative measures, for example mastery measurement, where performance on the specific skill being taught is assessed and retaught until students reached a specified level of performance, then the next skill is taught and assessed, but student's performance across skills is never systematically reviewed (Fuchs & Deno, 1991). Although both types of formative assessment are useful in instructional planning, CBM is considered superior to mastery measurement as a benchmarking (Johnson et al., 2013).

Gifted Students

RTI leaves out the group of students who achieve at a high level – the high achieving, gifted, accelerated students (Herrelko, 2013; McCallum et al., 2013). Because giftedness is variously defined educators charged with screening and identifying it often relies on state department of education guidelines, which, in turn, rely on the federal definition of giftedness (Callahan & Hertberg-Davis, 2013; Clark, 1997; Crepeau-Hobson & Bianco, 2011; Davis & Rimm, 2004; Johnsen, 2004; Piirto, 1999; Renzulli, 2004, 2005; Tannenbaum, 1997; Worrell, 2013). According to Stephens and Karnes (2000), most states relied on the following definition:

> The term "gifted and talented children" defines children, and whenever applicable, youth, who are identified at the preschool, elementary, or secondary level as possessing demonstrated or potential abilities that give evidence of high performance capability in areas such as intellectual, creative, specific academic or leadership ability or in the performing and visual arts and who by reason thereof require services or activities not ordinarily provided by the school. (PL 95-561, 1978, p. 102)

"The term *twice exceptional* first appeared in the work of Whitmore (1980) and Maker (Udall & Maker, 1983; Whitmore & Maker, 1985)" (as cited in McCallum et al., 2013, p. 209 emphasis in original). Kalbfleisch (2013) described the twice-exceptional status as gifted as giftedness measured by high cognitive abilities or strong distinctive abilities, existing alongside processing or other disabilities, which moderates/limits expression of the high abilities. "Moon and Reis (2004) [provided] a list of twice-exceptional student qualities that limit identification, including learned helplessness, frustration, low motivation, perfectionism, low self-esteem, and emotional and/or social/behavioral problems" (as cited in McCallum et al., 2013, p. 209). Variability in academic achievement is a hallmark of twice-exceptional students. According to the National Joint Committee on Learning Disabilities (2011), although twice-exceptional individuals may appear to be functioning adequately in the classroom, their performance may be far below what they are capable of, given their intellectual ability.

McCallum et al. (2013) described a unique model to screen for twice-exceptionality within the RTI process. Use of an RTI model has the potential to identify twice-exceptional students because of the universal screening and the progress monitoring that are required (Herrelko, 2013). However, most RTI models do not target students unless their academic performance on universal screeners is at or below some particular cut score relative to same-grade peers. Most gifted students with specific learning disabilities will not meet this criterion. Instead, rather than relying on traditional RTI data solely to screen those students with academic deficits, modification to the RTI model to also select high performing students who have a concomitant academic weakness might provide a systematic and inclusive screening mechanism for ultimately identifying twice-exceptional students.

With the diversity of students in today's classrooms, assorted instructional practices are needed to engage everyone in a classroom setting. Instruction must address the strengths and needs of learners through the use of multiple resources and evidence-based instructional practices. "As we consider the planning for RTI, we know that it is a model for effective practices for *all* learners, and supports *how* we educate all learners" (Gresham & Little, 2012, p. 23, emphasis in original). The philosophy of furnishing high-quality instruction based on individual student needs allows teachers to assess and evaluate student learning, how quickly a particular student acquires instructed material, and how to adjust teachers' practices accordingly. Differentiation needs to be done in a classroom to engage all students. Tomlinson (1990) advanced the educational definition of differentiation by noting that teachers should discover multiple student interests and use multiple learning modalities as avenues to engage students. Tomlinson's view of differentiated instruction, in which teachers proactively plan varied approaches to how students will learn content, is key to the four-tier method.

While RTI focused on early intervention and formal, institutional long-term group of students in tiers, Herrelko (2013) proposed a format that would help teachers address the needs of all learners within a classroom on a daily basis – this format would be to add a tier for accelerated students resulting in a four-tier differentiated model. This tier she named Tier 0.

> Tier 0 is for accelerated students, which grasps the lesson concept with ease. These students are able to complete the actions, plans, assignments, and activities presented to them within a few minutes of being given the tasks. Tier 0 lesson adaptations must meet the needs of students who absorb a lesson concept with such speed that they complete their requirements shortly after the work is assigned. Additional challenges – not busy

> work but intellectually challenging material – should be assigned to these students. This would address approximately 1% to 3% of the class. (p. 419)

Herrelko saw a need to educate all students, therefore she proposed the research question, "when a teacher uses the four-tier method of lesson differentiation, does student achievement increase" (p. 421)? The case study showed that when a class is taught with differentiated instruction, it benefited learners. The benefits of implementing RTI in classrooms are plentiful: providing support in the general education setting, identifying students who are not succeeding with the general education curriculum, and offering early interventions to struggling students as well as those who need a challenge (Fuchs & Deshler, 2007; Riccomini & Witzel, 2010).

RTI in Different Areas of Focus

Concern with RTI relates to the fact that the majority of RTI research focuses on students at the elementary level (Fisher & Frey, 2013; Johnson et al., 2013; Vaughn & Fletcher, 2012). RTI is typically associated with early elementary grades for three reasons.

1. Much research on screening, assessment and interventions has been conducted in kindergarten through third grade (Fletcher, Lyon, Fuchs, & Barnes, 2007)
2. Reading First provided about $1 billion in funding for screening, progress monitoring, and multitiered intervention practices in high-poverty, underperforming schools nationally, providing a jump start to the implementation of RTI-type models in kindergarten through third grade
3. the emphasis on prevention established a priority at the early grades with little consideration for what RTI might mean in the older grades. (Vaughn & Fletcher, 2012, p. 245)

Implementation of RTI at the secondary level presents challenges due to the structure and organization of secondary schools (Johnson et al., 2013). There are a number of reports and recommendations focused on what high schools could do with RTI (e.g., Ehren, Deshler, & Graner, 2010; Torgesen, 2003), but little evidence for its effectiveness or how it can be implemented (Brozo, 2009–2010). Ehren et al. (2010) provided recommendations about the systematic implementation of RTI in secondary schools, focused on content literacy and embedded strategy instruction, but did not study the implementation of this framework school wide. As Fuchs, Fuchs, and Compton (2010) noted, "many researchers avoid middle and high schools entirely because of the scheduling problems and compliance issues often encountered when working with adolescents" (p. 22). While it may be difficult to execute RTI at the secondary level, many researchers have found benefits in its implementation (Fisher & Frey, 2013; Johnson et al., 2013; Vaughn & Fletcher, 2012).

Despite the implementation challenges, there are compelling reasons for high schools to consider RTI models (Johnson et al., 2013). Fisher and Frey (2013) agreed that the RTI process in the high school level has more positive attributes than negative. They conducted a case study that was designed to determine how instruction and interventions were organized in a complex high school environment and to collect data on student achievement over the course of the two years of the study. Over a two-year period field notes were taken, interviews were done, and student achievement data were collected. The five themes that emerged during the case study were:

1. focus on quality core instruction – as a special educator noted, "Without good first teaching, supplemental intervention doesn't have a chance" (p. 104),

2. use course competencies to monitor progress – "Progress monitoring is key to the operation of an RTI framework" (p. 111),
3. schedule intervention supplement not supplant, core instruction,
4. dedicated resources to support intervention efforts – "the school hired a full-time reading specialist who was released from her regular duties so that she could coordinate all the supplemental and intensive intervention efforts. As part of her job, the intervention teacher redesigned the academic part of the after-school program. Additionally, the intervention teacher instituted several screening measures, which were administered annually to all students during the first week of school and to all new students who enrolled during the school year" (p. 107-108), and
5. adopt a schoolwide approach to RTI to maximize intervention impact – "the whole school has to be involved with the effort for it to be successful" (p. 110).

At the end of the two-year study, the high school outperformed the state-identified similar schools by 11% and increased 4% on state achievement measures. Second, attendance also improved increasing from 90.4% to 95.6%. Lastly, referrals to special education also decreased from 17% in the baseline year to 3% during the final year of the study.

As Johnson et al. (2013) discussed that despite challenges, many compelling reasons for high schools to consider RTI models. A discussion of these reasons included:

1. In recent years, states have increased the number of credits required in mathematics, and the Common Core State Standards reflect a strong emphasis on ensuring all students complete advanced mathematics successfully.

2. The increased academic demands come at a time when national performance in mathematics is low. Recent reports of math performance at the secondary levels are discouraging. Only 26% of twelfth graders (2009) and 33% of eighth graders (2015) scored at or above the proficient level on the most recent National Assessment of Educational Progress (NAEP) mathematics test (NAEP, 2015).
3. A responsive system of effective instruction and intervention that are the hallmarks of an effective RTI system can support high schools as they work to meet these new challenges.

At the secondary level, Tier 2 interventions for students with mathematics difficulties have shown to significantly improve math achievement when provided at least two times per week, for 30 minutes each session (Calhoon & Fuchs, 2003). Empirical research on the effect of Tier 2 has generally shown that when groups of four to six students are provided at least 30 minutes of intervention in addition to core instruction for three to five days of the week, there are significant increases in student performance in mathematics (Fuchs, Fuchs, & Hollenbeck, 2007). Tier 2 instruction provides students with increased exposure to mathematics material and additional opportunities to practice learned skills. Although there is support for broad essential components of Tier 2 mathematics interventions, limited information is available that details effective interventions that can be incorporated into secondary mathematics instruction in an RTI model (Dobbins et al., 2014).

Every teacher in every discipline has identified with a goal for all students to be able to learn in their classroom. “The goal is to ensure that *all* students learn mathematics through high-quality instruction using evidence-based instructional and intervention methods, products and practices” (Gresham & Little, 2012, p. 22 emphasis in original). RTI in mathematics focuses on

the effective use of evidence-based instructional approaches, resources, and strategies within the classroom while continuously monitoring student learning. The benefit of implementing RTI in mathematics are plentiful: providing support in the general education setting, identifying who are not succeeding within the general education curriculum, and offering early interventions to struggling students as well as to those who need a challenge (Fuchs & Deshler, 2007; Riccomini & Witzel 2010).

Currently, much of the literature and research regarding RTI has focused on the area of reading instruction. However, RTI is not limited to just reading; rather it can be applied to all academic areas (Pool et al., 2013).

> When generalizing from reading to math though, it can be deduced that without early identification, intervention, and progress monitoring to determine students' response to instruction and intervention, many young students with difficulties and deficits in math skills many not develop a level of automaticity that is necessary for becoming proficient in math. (pp. 210-211)

Students who fail to develop proficiency and automaticity in computational skills (e.g., addition, subtraction, multiplication, and division) and problem solving in the primary grades are more likely to experience difficulties in math curriculum later (Miller, Stringfellow, Kaffar, Ferreira, & Mancl, 2011).

Summary

To summarize this review, learner interventions have been used in special education for decades. This need to address academic needs of children at an earlier point in school has resulted in an alternative intervention and assessment called RTI. Research suggested that RTI may be an effective way to identify struggling students, differentiate instruction to accommodate

all learners, and reduce the amount of special education referrals. RTI is usually broken down into three tiers. The first tier representing general instruction that all students receive in the mainstream classroom. The second tier is supplemental to Tier 1 instruction and is built for students who need more guided, personalized instruction that is given usually in small groups to students. The third tier involves individual or small group instruction for students who are not making sufficient growth in Tier 2.

RTI implemented successfully, takes careful consideration and a great deal of planning. Throughout reading various pieces of literature, factors have been noted for successful implementation. The first factor to success is school-wide commitment. The second factor is professional development for all staff. Lastly, the third key and most important factor to successful implementation is the constant data collection of various assessments throughout the process.

A foundational component of RTI is the use of data as the basis for decision making about instructional changes. The ongoing collection of data, also known as progress monitoring, is an efficient tool for gauging the effectiveness of instruction on a regular basis and can assist teachers in making decisions about appropriate instruction and intervention for students. Data collection is important at all tiers, starting with a universal screening at the beginning of the year. This universal screening is then given again at least two or three times throughout the year. However, universal screenings are only the beginning. Progress monitoring should be done throughout each tier, and data should be monitored, tracked, graphed, and analyzed. This data is used as the basis for making decisions about the intensity of the instruction that students require to meet their learning needs.

One major concern that was raised in the literature was the fact that RTI left out the group of students who achieved at a high level – the high achieving, gifted, and accelerated students. These students can be spotted usually with the universal screenings, and can be accommodated from there. After data is collected from various progress monitoring assessments, instruction can be differentiated to accommodate all learners, not just learners who are struggling with the instruction.

Another major concern in the literature related to the fact that majority of RTI research focused on students at the elementary level and in reading. While implementation of RTI at the secondary level presents challenges due to the structure and organization of secondary schools there are a number of recommendations focused on what high schools could do with RTI but little evidence for its effectiveness or how it can be implemented. Additionally, RTI is not limited to just reading; rather it can be applied to all academic areas. At the secondary level, Tier 2 interventions for students with mathematics difficulties have shown to significantly improve math achievement. RTI in mathematics focuses on the effective use of evidence-based instructional approaches, resources, and strategies within the classroom while continuously monitoring student learning. The benefit of implementing RTI in mathematics are plentiful.

Chapter 3

Methodology

The purpose of this thesis is to examine the impact of response to intervention (RTI) in a high school mathematics setting. A major concern in the literature related to the fact that majority of RTI research focused on students at the elementary level and in reading. Therefore, I am interested in observing and implementing RTI in a high school mathematics classroom and analyzing effects. This general purpose leads to the following research questions:

1. How are Tier 2 interventions implemented in a high school mathematics setting?
2. What are the students' perceptions of the instruction strategies that are employed as Tier 2 interventions in a mathematics classroom?

The study is focused on a sample of ninth and tenth grade students from two classes and taught by one teacher in the same high school, as such action research is the most appropriate methodology to explore implementation of RTI at this site.

In this chapter the researcher will first describe why action research is the appropriate methodology for this research thesis. Following this description, the researcher will outline the participants who are partaking in this action research study. Next, the researcher will describe the quantitative and qualitative collection methods used to answer the two research questions proposed. Immediately after this description, the researcher will discuss the methods used analyze the quantitative and qualitative data. Afterward the researcher will describe three methods to prove the reliability and validity of the data collection methods. Finally, the researcher will outline their subjectivity and then summarize this chapter.

Research Design

As Glanz (2014) simply stated, the process of action research is as follows, "the problem is identified by the practitioner, some questions are framed, data are collected from some sources, conclusions are drawn, and some action is then taken" (p. xxiv). Further, Craig (2009) indicated, "one of the key characteristics of action research is that it involves a limited number of subjects of one particular group within one specific environment and may involve multiple research cites or classrooms" (p. 9). In addition, action research is being used more in schools as an attempt to further professional growth in teachers (Craig, 2009; Glanz, 2014; Sullivan & Glanz 2013). This professional growth causes teachers to reflect on their practice and in return can be an empowering experience.

Craig (2009) also described three main purposes for selecting action research.

1. Action research is selected for those who want to solve problems, address issues, and improve situations and conditions because the process promotes professional growth, improvement, and change. The process enables teachers and practitioners to become "experts in the field" because findings are based on true inquiry and therefore inform practice.
2. The method is ideal for addressing specific targeted goals and objectives that are within the realm of possibility for the practitioner to achieve. By actually conducting an action research study, teachers are able to experience success firsthand.
3. Action research promotes collaboration and encourages "community" among all parties involved in a specific learning situation, leading to results that have the

> potential to improve conditions and situations for all members of the learning community. (pp. 6-7)

Action research was chosen for this study because I have the ability to directly control outcomes in the setting. Additionally, these three purposes mentioned by Craig fit the research questions I have identified. Currently, a problem at Shoreline High School[1] is that the struggling students are left behind with not enough additional support. A solution needs to be found to remedy this situation. With all challenges that exist, goals, objectives and questions need to be made to guide research.

Participants

This action research was conducted in a suburban town in Connecticut within the high school setting of Shoreline High School. This school contains roughly 1,350 students. At this time, 311 students (i.e., 23.04%) took one of the three different levels of Geometry are offered: 200 Geometry (i.e., remedial level), 300 Geometry, and Accelerated Geometry (i.e., honors level). There were 17 students (i.e., 1.26% of the total school population) in the 200 Geometry course, 194 students (i.e., 14.37% of the total school population) in the 300 Geometry course, and 100 students (i.e., 7.41% of the total school population) in the Accelerated Geometry course. Geometry was taken primarily by freshmen and sophomores, and the 300 Geometry course was taught by five teachers in the 2015-16 school year.

In this particular action research, the researcher worked closely with students in the 300 Geometry course in two different settings. The first setting was a regular classroom setting with 19 students, and the second a lab type setting with three students. The lab type setting included four students who had a C or below in the first semester, and were considered prime students for

[1] A pseudonym for the name of this school was used.

Tier 2 interventions. These lab students are also in a regular classroom setting in addition to the lab.

Data Collection Methods

The purpose of this thesis was to examine the impact of response to intervention in a high school mathematics setting. The research questions stated were analyzed by multiple forms of data collection that included student-completed online surveys and classroom observations from a sample of ninth and tenth grade students from two classes and one teacher. In this case study quantitative and qualitative research methods were used to conduct a study to answer the research questions set forth in Table 1 below.

Table 1.

Research Questions and Methods

Research Question	Methods
1. How are Tier 2 interventions implemented in a high school mathematics setting?	• Documents/Artifacts • Observations
2. What are the students' perceptions of the instruction strategies that are employed as Tier 2 interventions in a mathematics classroom?	• Interviews • Surveys

The two research questions described in the table above were answered through the use of both qualitative and quantitative methods. In the next section, each of the methods is described in detail.

Qualitative Methods

Three qualitative methods were used in this study to acquire necessary data in obtaining answers to the research questions proposed. These three methods were documents/artifacts, observations, and interviews.

Documents/Artifacts. Creswell (2012) stated that the researcher should be able to identify the types of documents that will aid in answering the qualitative research questions. To address the first research question, the researcher collected various artifacts of the teacher's lesson plans, student work, and intervention logs that document the implementation of RTI in a high school mathematics setting. Devers and Frankel (2000) stated, "when the study is more exploratory or attempting to discover and/or explore theories and concepts, a very open-ended protocol is appropriate to consider" (p. 336). The purpose of this research study was to examine the impact of response to intervention in a high school mathematics setting, which according to Devers and Frankel, would suggest that documents and artifacts could be collected as needed throughout the study. There is no specific protocol as to exactly which documents would prove useful when interpreting the impact of response to intervention, however, it was still imperative that student work samples be collected and analyzed to form a greater understanding of each learner within the action research.

The types of documents that proved to be useful were the teacher's lesson plans that articulated lesson objectives, the dates the lessons were implemented, and comments about how interventions were used in each particular lesson. Tracing comments through lesson plans help to provide a means of tracking change and development (Bowen, 2009). In addition to this, various pieces of student work were collected that outlined interventions taking place. The advantage of using visual documents within this action research was that the images provided real-life

documentation of a student's learning versus simply relying on observational notes (Creswell, 2012).

Observations. Observations were most appropriate for collecting data on naturally occurring behaviors in their usual contexts, therefore, were most appropriate for this study as they allowed for the opportunity of in the field data to be collected (Denzin & Lincoln, 2000). For this particular action research, non-participant observation was used. This data collection approach results in an opportunity to collect data on a wide range of behaviors, to capture a great variety of interactions, and to openly explore the evaluation topic (Stevens & Sharp, 1993). The researcher was able to see current practices in place of implementation of RTI. As Creswell (2012) noted, collecting observations enables opportunities to document information as it occurs.

Data obtained through these observations allowed for the researcher to answer the first research question. These observations were made bi-weekly and had anecdotal notes on each of the students as well as the interventions the teacher was providing. When using non-participant observations, using a recording device was appropriate. Throughout the action research there were various days where the teacher was video recorded, followed by the researcher watching the video and taking observational notes and recording them into an intervention log. The field notes were created on a journal-based log so that it was flexible to note teacher interventions being used, student behavior, participation and activity as well as dates of intervention. Over time, the researcher was able to use these observations to begin making generalizations on the type of interventions taking place as well as the impact that the interventions has had on these students. Observations also added further explanations to the documents/artifacts to answer the first research question.

Interviews. Lipton and Wellman (2012) indicated that interviews were a source of qualitative, perceptual data, and the intention was to record as fully and fairly as possible each respondent's particular perspective. Interviews were used to answer the second research question. Creswell (2012) noted that in qualitative survey interviews, an interviewer asks open-ended, questions without response options and listens to and records the comments of the interviewee. Finally, Eder and Fingerson (2002) noted that an important reason for interviewing adolescents was to allow them to give voice to their own interpretations and thoughts rather than rely solely on adult interpretation of their lives.

In this action research study the researcher set up a one-on-one interview data collection opportunity where the students participated in a qualitative survey interview (see Appendix A for a copy of the protocol). Interviewing adolescents, the interview style the researcher will use is informal conversational (Lipton and Wellman, 2012). This is the most informal interview and it is conversational and responsive, with the questions emerging from the interactions. This interview style relies on spontaneously generating questions in the natural flow of the interaction. This allowed the researcher to explore beliefs, attitudes, values, and perceptions of the interviewees.

Quantitative Methods

One quantitative method was used in this study to acquire necessary data in obtaining answers to the research questions proposed (i.e., surveys).

Surveys. Surveys were chosen as the most appropriate method of use as they offered the results at which I was looking to collect. Surveys are simple questionnaires that would be accessible for this population and appropriate in gaining information on their perceptions as well as current practices (Creswell, 2012). There were many advantages to surveys. These advantages

included: they permit anonymity, they permit a person a considerable amount of time to think about answers before responding, they can be given to many people simultaneously, and they provide greater uniformity across measurement than interviews because each person responds to exactly the same questions. The disadvantages to surveys include the fact that surveys do not provide the flexibility of interviews and people are generally better able to express their views orally than in writing (Henerson, Morris, & Fitz-Gibbon, 1987).

Two different types of surveys were used to answer the second research question. They were web-based surveys and various in-classroom exit slips. First, web-based surveys were given, to meet twenty-first century skills as well as promote participation and accessibility (see Appendix B for a copy of this survey). The web-based surveys were also more time efficient for research as the data collection process is generated through the software used, in this case *Survey Monkey* was utilized to collect data (Wright, 2006). These surveys were given at the beginning and end of the data collection process. The same survey was used at spaced intervals of time to measure student progress with interventions in place as well any change in behavior seen in students' work (Stevens & Sharp, 1993).

Second, exit slips were collected throughout the action research to document students' growth and perceptions of interventions being used in the mathematics classroom. Open-response questionnaires usually included one or two open-ended items and had many advantages. These included that they produced responses which drew the evaluator's attention to a situation or outcome that was unanticipated when constructing the questionnaire, they did not limit the range of possible answers as do closed-response questions, and they permitted the evaluator to explore comments people had that were beyond the responses to the closed-ended questions (Creswell, 2012; Henerson, Morris, & Fitz-Gibbon, 1987). These exit slips were given

at the end of the class period at least twice a week. The students were asked two to four questions that determined if they had a general understanding of the content at that time as well as the students' perception of the topic and whether or not they felt they had a better understanding of the topic due to the interventions in place.

Data Analysis Methods

After all data was collected from the various data collection methods, analysis of that data was necessary to determine the answers to the research questions proposed. Analysis of both qualitative and quantitative data occurred to establish answers to each of the research questions.

Qualitative Methods

In order to generate themes from the qualitative data collected, the constant comparative method was the process used to examine the data over time and constantly compare the data to determine what it was indicating as to the effect of interventions in place. Creswell (2012) stated that this method "eliminates redundancy and develops evidence for categories" (p. 434). Creswell also stated that the constant comparative method allows the researcher to develop categories of information from specific to broad which will allow the researcher to generate themes and draw conclusions. Similarly, Ruona (2005) described that analyzing qualitative data requires patterns to be discovered through immersion in your data. The constant comparative method allowed the researcher to begin looking through the data from the first piece collected to begin identifying emerging trends, as Ruona suggested.

When looking at the documents/artifacts, observations, and interview documentation that was collected, the researcher aimed to gather data, sort this data into different categories, and found patterns in the types of interventions in place as well as students' perceptions of these interventions. Ruona (2005) described a four-stage process for developing charts and tables on

Microsoft Word. She also described different features that are available to conduct more systematic representation of qualitative data and analysis. Stage one, data preparation, requires the transcribing all interviews and observation notes collected. In this action research, documents/artifacts were collected, observations were made on bi-weekly intervention logs and had anecdotal notes on each of the students as well as the interventions the teacher was providing. The researcher constantly looked through the observations and documents asking what the data was revealing about interventions in place. Additionally, interviews took place to gauge students' perceptions of these interventions. The observations and interviews were transcribed and double checked for validity and confirmed by participants. Once transcriptions are approved, a table was created where data was formatted into columns. Stage two, familiarization, data was analyzed deeper to capture meaningful segments of data and insights. In order for this to be possible, the researcher reviewed all the data and tried to decipher the main themes in the data that emerged. In stage three, coding, it was time to code the data presented into categorized themes. The coding method is a procedure in which text from transcripts was organized and patterns were clearly discovered. Patterns lead to discovery of the major concepts and insights on the data (Auerbach & Silverstein, 2003). A coding table was created to insure consistency and reliability to analysis. After all data was coded and sorted, stage four began. During stage four merging and working with all data to generate meaning, all data was merged into one document in order to conduct a group-level analysis.

Quantitative Methods

Quantitative data in this study was analyzed using descriptive statistics. Descriptive statistics is a data analysis technique that allows the researcher to describe data with significant numerical indices or in graphic form (Fraenkel, Wallen, & Hyun, 1993). The survey data was

first scored in order for the analysis to occur. The descriptive statistics helped summarize the overall trends or tendencies in the data, provided an understanding of how varied the scores were, and provided insight into where one score stands in comparison with others (Creswell, 2012).

Data from each survey was saved into *Microsoft Excel*. This survey was designed to ask questions so that students could provide enough information to answer the second research question proposed. The 27 questions within the questionnaire could be answered on a 5-point Likert scale (i.e., strongly disagree to strongly agree). The survey was distributed to a geometry class and a geometry lab (which was geared towards Tier 2 intervention) taught by the same teacher. The questions were turned into an online survey, using *Survey Monkey*, and were sent to the students digitally. Students were asked to complete as honestly and to the best of their knowledge. After all students had taken the survey, a summary of responses was generated to provide an overview of how the group responded to questions. Data was represented in a chart and graph form and the descriptive statistics described the data found.

Validity and Reliability

To ensure the reliability and validity of the data collection methods, several steps were taken to make sure the data collected and results produced are of high quality and are dependable. Validating the results of this study included member checking, pilot testing and triangulation. Creswell (2012) described the process of validating research findings as a way to determine the accuracy and credibility of results by using various strategies.

To look at the results achieved through qualitative data collection of observations, interviews and documents/artifacts, the researcher implemented a member check. Member checking is a process where participants are asked after the survey, interviews, and observations

if the data concluded adequately presented their ideas, thoughts, and perceptions (Simon, 2011). A member check helps the reliability and validity of a study because the participants check the researcher's findings for accuracy in describing what actually took place (Creswell, 2012). Member checking increases reliability and validity as it asks feedback on the results directly from the participants themselves.

To look at the results achieved through quantitative data collection of surveys and qualitative interview questions the researcher implemented a pilot test. A pilot test of an instrument is a process where a researcher makes changes to an instrument based on feedback from a small number of individuals who complete and evaluate the instrument (Creswell, 2002). Pilot testing helped to identify errors both in the survey, and in the interview question's form and presentation, and allowed for the opportunity to correct errors before the instruments were used (Litwin, 1995). This researcher conducted a pilot survey that included four Geometry 300 students. Two of these students identified as regular education, one student identified as special education, and one student identified with a 504 plan (i.e., a plan that is developed to ensure that a student who has a disability identified under the law receives accommodations that will ensure their academic success and access to the learning environment). Additionally, of these students three are females, and one is a male student. The four students, two freshmen and two sophomores, participated in this pilot survey to test questions and protocol. Yin (2013) noted that in preparation of data collection, he highlights the importance of the pilot survey, and its help in refining your data collection plans with respect to both the content of the data and the procedures to be followed. Creswell (2012) identified pilot testing of a survey as, a procedure in which a researcher makes changes in an instrument based on feedback from a small number of individuals who complete and evaluate the instrument. Additionally, two of these four students

were used in pilot testing the interview questions. Where an interview is used as the research instrument, a pilot study helps to highlight uncertain, difficult, and unnecessary questions and so that the questions can be discarded or modified, record the time taken to complete the interview to determine whether the interview can be completed in a reasonable time, determine whether each question elicits an adequate response, determine whether the researcher has incorporated all the questions necessary to measure all concepts, and allows the researcher to practice and perfect interviewing techniques (Berg, 2001; Dikko, 2016). This researcher conducted a pilot interview that included two Geometry 300 students. One of these students identified as regular education, one student identified as special education. Additionally, of these students one was female and one is a male student. The two students, one freshman and one sophomore, participated in this pilot interview to test questions and protocol.

Finally, triangulation of data is essential. Methods triangulation was the most appropriate type of triangulation to promote validity. Throughout the data analysis process, themes were generated through coding and triangulating the data, which allowed the researcher to find evidence that supported each theme and result constructed (Creswell, 2012). Patton (2002) encouraged the use of triangulation by stating "triangulation strengthens a study by combining methods. This can mean using several kinds of methods or data, including using both quantitative and qualitative approaches" (p. 247). Both Patton (2002) and Creswell (2012) described triangulation as a way to improve the accuracy of a study because the information is drawn from multiple sources. This action research demonstrated how Tier 2 interventions were implemented in a high school mathematics setting, and students' perceptions of these interventions through data collected through both qualitative and quantitative methods such as observations, interviews, documents/artifacts, and surveys.

Subjectivity Statement

My bachelor of science in mathematics, masters of arts in teaching with a concentration in secondary mathematics, masters of science in teacher leadership with a concentration in mathematics, along with my own experiences as a secondary mathematics teacher and researcher of effective teacher instructional strategies, has provided me with a framework on how I see RTI in a high school mathematics setting. A learner's RTI has been used in special education for decades (Fuchs, Deno, & Mirkin, 1985). The need to address the academic needs of children at an earlier point in school has resulted in an alternative intervention and assessment method called RTI (Dunn & Browning, 2012). The hope was that RTI would ensure that all students receive high-quality instruction and intervention before being referred to special education services. Research evidence suggested that RTI may be an effective way of identify students, in terms of both allocating additional instruction and qualifying for special education services (Barnett, Daly, Jones, & Lentz, 2004; Dorn & Shubert, 2008; O'Connor, 2000). The result, it was theorized, might be fewer referrals to special education, fewer students identified as disabled, and a way to address the overrepresentation of students of color in special education.

In the upcoming school year, my current school of employment, Shoreline High School, will be getting rid of leveling causing a great need for RTI. In this current school year Shoreline High School is trying out different models for a Tier 2 intervention. These include a co-taught class by two content certified teachers and a lab model where students who are identified as struggling are put into an additional lab based class where they are pre and post taught material. I currently am piloting one of the lab models. I am also currently piloting tier 2 interventions in my regular classroom setting. All of these initiatives have influenced my current thinking

regarding RTI for secondary mathematics students and could serve to bias my own opinions as I conduct this research study.

Summary

In this chapter, the research design, participants, data collection methods, data analysis methods along with validity and reliability were described. An action research study was most appropriate methodology to explore implementation of RTI. Participants for the study were from a geometry lab setting and a geometry regular classroom setting at Shoreline High School in a suburban town of Connecticut. To collect data on Tier 2 interventions implemented in a high school mathematics setting and the student perceptions of these interventions the study used documents/artifacts, observations, surveys and interviews. The data was analyzed using both descriptive statistics and the constant comparative method. Validating the results of this study included member checking, pilot testing and triangulation.

Chapter 4

Results and Discussion

The purpose of this study was to explore the impact of response to intervention (RTI) in a high school mathematics setting. The hope was that RTI would ensure that all students receive high-quality instruction and intervention before being referred to special education services. Research has suggested RTI may be an effective way to identify students who are struggling before they are referred to special education services (Barnett, Daly, Jones, & Lentz, 2004; Dorn & Shubert, 2008; O'Connor, 2000). Klotz (2007) argued that there are three essential aims of a RTI approach which could be summarized as: providing interventions, monitoring student progress in response to those interventions, and then using this data to shape instruction.

Concern with RTI relates to the fact that the majority of RTI research focuses on students at the elementary level and in reading (Fisher & Frey, 2013; Johnson, Gallow & Allenger, 2013; Vaughn & Fletcher, 2012). However, RTI is not limited to just reading, rather it can be applied to all academic areas (Pool, Carter, Johnson & Carter, 2013). As Fuchs, Fuchs, and Compton (2010) noted, "many researchers avoid middle and high schools entirely because of the scheduling problems and compliance issues often encountered when working with adolescents" (p. 22). While implementing RTI at the high school level may be difficult, researchers have also found many benefits of its implementation (Fisher & Frey, 2013; Johnson et al., 2013; Vaughn & Fletcher, 2012).

There are numerous benefits of implementing RTI in a mathematics classroom including: providing support in the general education setting, identifying who are not succeeding within the general education curriculum, and offering early interventions to struggling students as well as to those who need a challenge (Fuchs & Deshler, 2007; Riccomini & Witzel 2010). While

implementing RTI in mathematics, it is important and effective to used evidence-based research practices as well as frequently monitor student progress.

Since there was little research on the implementation of RTI in a secondary math setting, in this study the researcher implemented RTI in a high school mathematics classroom and analyzed the effects and results. The results were based on a sample of nineteen ninth and tenth grade students from a geometry classroom and four students from a geometry lab taught by one teacher in the same high school. The demographics for these participants are provided in Table 2 below.

Table 2.

Demographics of participants

Class	**Geometry Class**	**Lab Class**
Number of Students	19	4
Number of Male Students	11	3
Number of Female Students	8	1
Number of 9th Grade Students	10	0
Number of 10th Grade Students	9	4
Number of Regular Education Students	16	4
Number of Special Education Students	3	0
Number of Regular Education Students with 504 Plans	2	0

Each of the students were told that they were participating in this action research study.

Implementation of RTI at the secondary level presents challenges due to the structure and organization of secondary schools (Johnson et al., 2013). There were a number of reports and recommendations focused on what high schools could do with RTI (e.g., Ehren, Deshler, & Graner, 2010; Torgesen, 2003), but little evidence for its effectiveness or how it could be

implemented (Brozo, 2009–2010). Below is an analysis of how Tier 2 interventions were implemented RTI in a high school mathematics setting, the students' perceptions of the Tier 2 interventions implemented, as well as data from this research organized by each of the research questions probed. For each question themes were reported with evidence from the data collected through the four forms of data collection (i.e., observations, documents/artifacts, surveys, and interviews). The data was also supported with current research from the literature review.

Research Question 1: How Are Tier 2 Interventions Implemented In A High School Mathematics Setting?

Tier 2 interventions were put into place for students who were failing to make adequate progress with Tier 1 classroom lessons and strategies. This Tier 2 intervention was supplemental to Tier 1 instruction, with the goal of alleviating difficulties with the general education curriculum (Pool et al., 2013). Fisher and Frey (2013) reported, "the key to success is scheduling of intervention efforts to supplement, but not supplant, core instruction" (p. 112). The goal of Tier 2 interventions is to target students who are currently struggling, and make a plan to help these students with individualized intervention and support (National Center on Response to Intervention [NCRTI], 2010). NCRTI (2010) named three key essential aims for Tier 2 interventions including: screening data for placement, implementing interventions, and frequently monitoring students' progress.

Tier 2 instruction was built for students who need more guided, personalized instruction that was given in the Tier 1. This more individualized instruction was given to students in small groups. Regardless of how Tier 2 interventions are implemented, it is essential that there are a variety of instructional strategies offered, staff must be trained to implement these interventions as well as how to measure student performance, and parents must be contacted about these new

procedures. In this study, Tier 2 interventions were implemented in a high school mathematics setting. Qualitative data was collected in the forms of observations and documents/artifacts. While analyzing this data two themes have emerged: Tier 2 interventions made inside a classroom, and Tier 2 interventions made outside a classroom.

Tier 2 Interventions Inside A Regular Education Classroom Setting

The first theme came from making Tier 2 interventions in the researcher's geometry class through the use of frequently progress monitoring my students. The class had nineteen students in it, and at the end of each lesson, students would complete an exit slip that was guided by what the students had learned that day. A foundational component of RTI is the use of data as the basis for making decisions about the intensity of instruction that students are required to meet their learning needs (Pool, Carter, Johnson, & Carter, 2013). Data collected continuously at each tier and are used to make instructional decisions to determine if students are responding to instruction or interventions (Gresham & Little, 2012). This data may be in the form of quizzes, tests, formative assessments etc. It is important that this data is collected frequently and on an ongoing basis. The ongoing collection of data is also known as progress monitoring. For this study, this progress monitoring would be used in the form of exit slips.

The exit slips consisted of four to six questions and were graded by each question being correct of incorrect. Then the students were grouped according to their grades. In the beginning of doing Tier 2 interventions, the researcher grouped the students who scored the same. For example, if the exit slip had four questions, students who got questions 2 and 3 correct would be grouped together to try and work together and figure out how to do questions 1 and 4, while the researcher walked around the classroom and help students individually. However, after interviewing students throughout this process to gain their perception of the interventions in

place, the researcher learned that they also enjoyed learning from their peers. It is important to note that some researchers did not suggest student-to-student peer tutoring in Tier 2 (Dunn & Browning, 2012), whereas others recommended using peer-assisted learning strategies in the Tier 2 level (Kroeger & Kouche, 2006). Therefore, as time went on, the researcher also grouped students who score differently. For example, if the exit slip had four questions, the researcher grouped students who got questions 2 and 3 correct with students who got questions 1 and 4 correct so that they could teach each other how to do problems while the researcher walked around and monitored progress. Below are some screen shots of various days where the researcher video-recorded the Tier 2 interventions in place.

Figure 1. Students in groups working through exit slip that was given the prior day.

Note, in this example, the researcher is seen working with group that has least amount of answers correct.

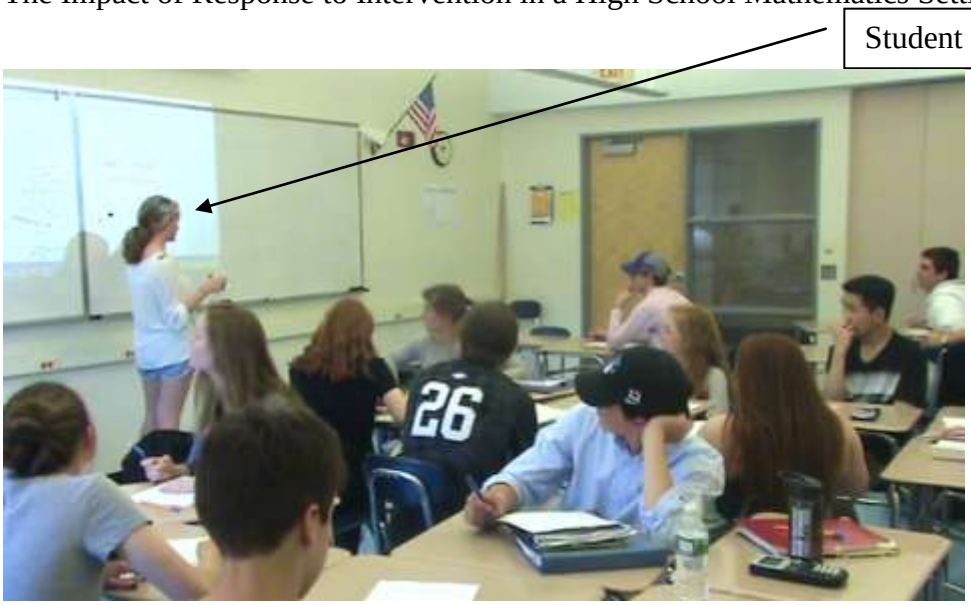

Figure 2. A student teaching class how to do a problem on the exit slip.

After doing one-on-one interviews, some students responded that they enjoy learning from peers. Note in Figure 2 and Figure 3, two students who got two separate problems correct are teaching the class how to do each of the problems that the class struggled with.

Figure 3. Another student teaching class how to do a problem on the exit slip.

Figure 4. Students in groups working through exit slip that was given the previous day.

Note, in Figure 4 and Figure 5 the researcher is seen working with groups that had difficulties on the exit slip.

Figure 5. Students in groups working through exit slip that was given the previous day.

Figure 6. Students in groups working through exit slip that was given the prior day. The researcher and a student (who had all answers correct) are seen working with groups that need some extra help.

Note in Figure 6 and Figure 7, the researcher (who is not shown in Figure 7) and a student that had all the answers correct are both seen working with different groups that needed extra help.

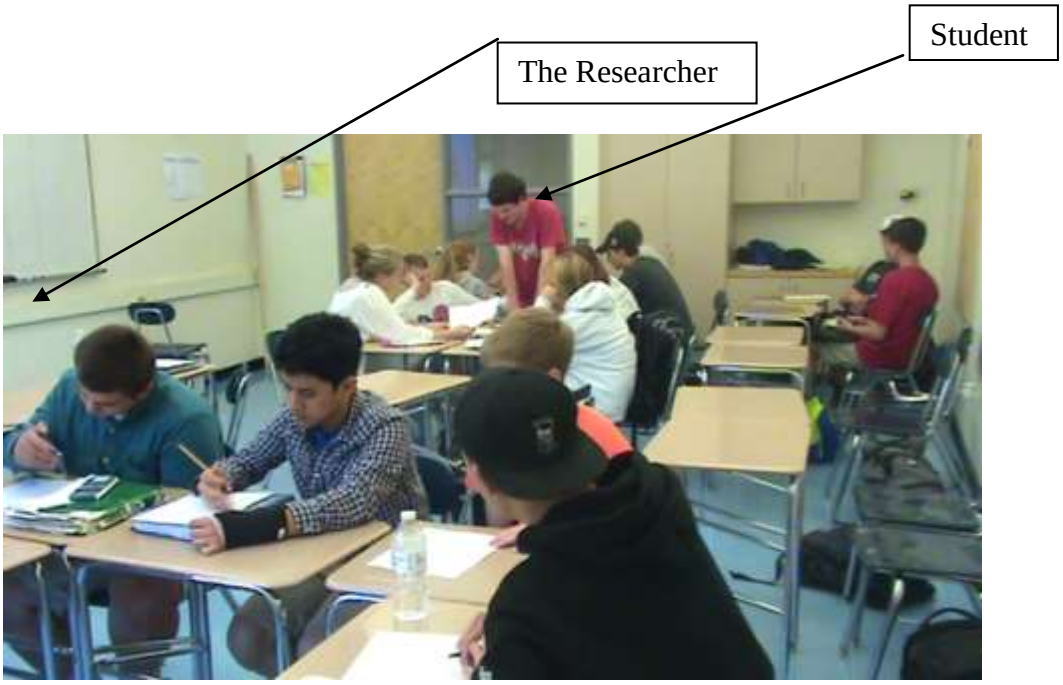

Figure 7. Students in groups working through exit slip that was given the previous day.

The Tier 2 interventions that were seen were monitored daily for data. This data was organized to see how students were grouped on a daily basis to see if any improvements were made.

The main purpose of progress monitoring is to determine whether the intervention(s) provided were effective and successful (Johnson, Mellard, Fuchs, & McKnight, 2006). Progress monitoring is a formative process to assess student academic performance and evaluate the effectiveness of instruction, involves repeated samples of student performance data over time (e.g., weekly quiz grades or twice-weekly lab assignments). For example, in this study, exit slips were given to students on an almost daily basis (with the exception of test review, quiz review, quiz and test days). The exit slips gave the researcher a quick idea of how many students understood the day's lesson. Formative assessments are usually used so that they can quickly provide feedback for teachers on student learning (Vannest, Soares, Smith, & Williams, 2012), which can be useful to make decisions on future interventions.

After each exit slip was given, they were graded that day. Data was then tracked and measured, groups were made from the data retrieved, and interventions were provided based off of the data collected. On one occurrence, after collecting responses from an exit slip the researcher found the majority of students still had a difficulty with the content that was delivered, therefore lesson plans were modified for the next day to include material the students were confused on. If after the exit slip only one or two students were still confused, the researcher made an effort to spend more one-on-one time with students going over material. This extra one-on-one time was usually planned after contact was made with a parent about the students' confusion on the material. Time was scheduled either during a free period that the student and researcher shared, or before school for the student and researcher to meet to go over material more in depth.

Tier 2 Interventions Outside Of A Regular Education Classroom Setting

The second theme came from making Tier 2 interventions in my lab class through more individualized one-on-one and small group instruction. The class consisted of four students who took a geometry class in addition to this lab class. The students were placed in this class after a multi-step process. First, the students were screened based off of their semester 1 grade. Students who scored a C or below in the first semester were selected. Following the screening process of selecting students with appropriate grades, each of these students' schedules were monitored to see who had a free period when the lab was offered. Based on these first two steps, three students fit the criteria to attend this lab. In the third and final step, the students' parents were contacted and were given an explanation of the lab, and parents were able to discuss with their student whether the student wanted to partake in the lab. Fortunately, all three students committed, wanting to attain a better understanding of the geometry material. Through word of mouth, a fourth student heard about the lab and also wanted to join. These four students met with the researcher for a 48-minute class period that convened three days out of an eight-day rotation. Fuchs et al. (2007) argued that:

> empirical research on the effect of Tier 2 has generally shown that when groups of four to six students are provided at least 30 minutes of intervention in addition to core instruction for 3-5 days of the week, there are significant increases in student performance. (as cited in Dobins et al., 2014, p. 19)

The researcher found that over time, significant increases in student achievement as well as participation and confidence. The lab was implemented in the fourth quarter of the school year. Table 3 shows the grades of the four students in the lab. You can see all four students' grades improve while attending the lab.

Table 3.

Chart showing students grades over all four quarters.

Student	Quarter 1	Quarter 2	Quarter 3	Quarter 4 (With Lab)
T	70.27	64.74	67.94	71.00
U	66.59	67.18	76.99	78.81
V	69.70	76.78	78.13	84.39
W	82.57	82.59	80.23	80.39

These students were seen as struggling and were put into this lab because they were in need of more targeted intervention, also known as Tier 2 supports (Dobbins et al., 2014; Dunn & Browning, 2012; Fuchs et al., 2011; Fuchs et al., 2014; Pool et al., 2013; Robins, 2013). During this lab, the researcher would implement Tier 2 instruction that would supplant the Tier 1 instruction these students were given during their regular geometry class. Tier 2 instruction was supplemental instruction provided to those students who are struggling, at risk, or otherwise not meeting grade-level benchmarks in Tier 1.

As mentioned earlier, Klotz (2007) argued that there were three essential aims of a RTI approach that could be summarized as: providing interventions, monitoring student progress in response to those interventions, and then using this data to shape instruction. Following these three essential aims successfully takes a lot of planning and preparation. "As we consider the planning for RTI, we know that it is a model for effective practices for *all* learners, and supports *how* we educate all learners" (Gresham & Little, 2012, p. 23 emphasis in original). In order to make the lab in this study successful, much planning and preparation was necessary. The researcher needed to attain data on these four students prior to the lab, as well as plan with the sole geometry teacher of those four students. The researcher approached him at the beginning of

each week to see what his schedule would look like so that they could pre-teach and post-teach material. This was all documented in a lesson plan with notes taken on the progress of each individual student, which can be seen in Appendix C.

Research Question 2: What Are The Students' Perceptions Of The Instruction Strategies That Are Employed As Tier 2 Interventions In A Mathematics Classroom?

To answer this particular question quantitative and qualitative data was analyzed. In terms of quantitative data, web-based surveys were given. These surveys were given at the beginning and end of the data collection process. The same survey was used at spaced intervals of time to measure student progress with interventions in place as well any change in behavior seen in students' work (Stevens & Sharp, 1993). The 27 questions within the questionnaire could be answered on a 5-point Likert scale (i.e., strongly disagree to strongly agree). It is important to note, that the three first questions had the most significant growth in change of perception. These can be seen in the following charts:[2]

[2] For each chart, the first bar in orange is the first survey given, and the second bar in blue, is the second survey given.

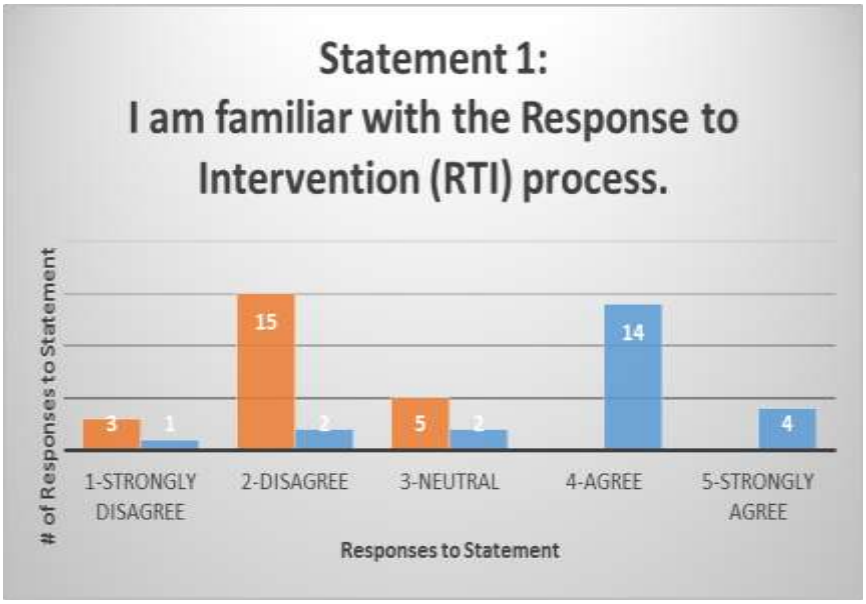

Figure 8. Statement One: I am familiar with the Response to Intervention (RTI) process.

After the first survey, statement one had an average of 3.086957. After the second survey, statement one had an average of 3.782609. The difference between the two surveys was 0.695652.

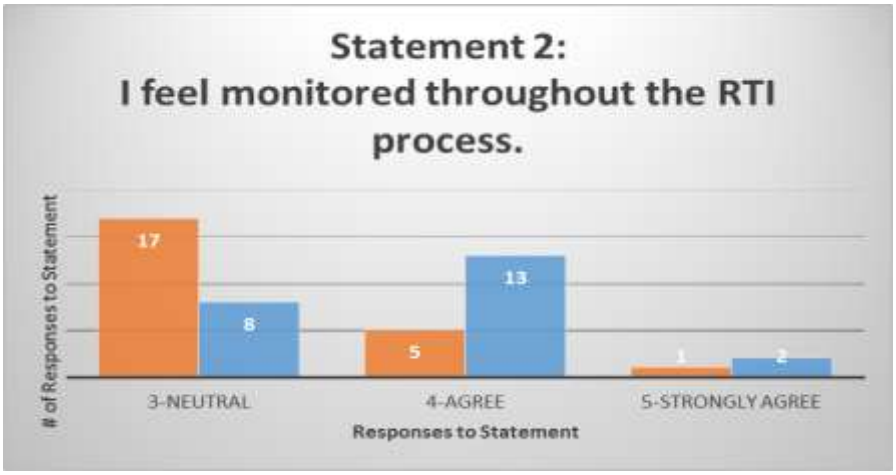

Figure 9. Statement Two: I Feel monitored throughout the RTI process.[3]

[3] "Strongly Disagree" and "Disagree" were an option for a response, but no students chose to respond with those answers.

After the first survey, statement two had an average of 3.173913. After the second survey, statement two had an average of 3.73913. The difference between the two surveys was 0.565217.

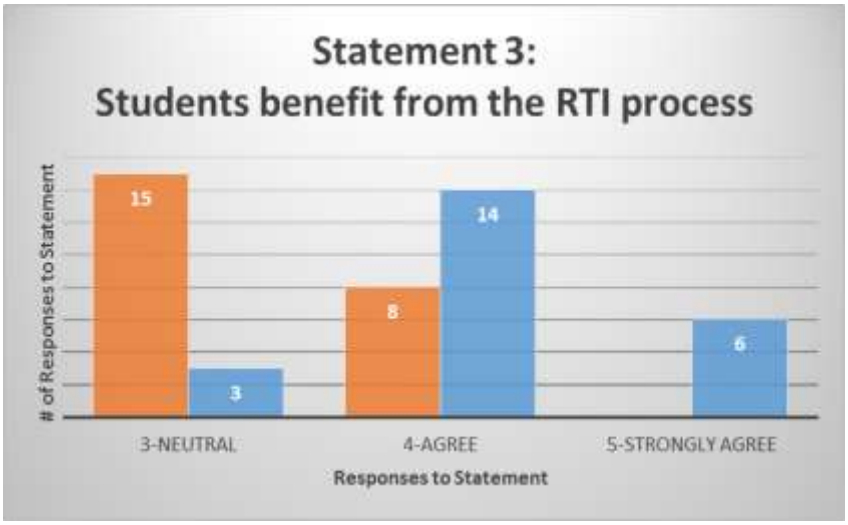

Figure 10. Statement Three: Students benefit from the RTI process.[4]

After the first survey, statement three had an average of 3.347826. After the second survey, statement three had an average of 3.130435. The difference between the two surveys was 0.782609.

In terms of qualitative data, interviews were most appropriate. The researcher set up a one-on-one interview with those who stated they were willing from the first survey given (see Appendix A for a copy of the protocol). While analyzing this data, the researcher found that overall students had a positive perception of the Tier 2 interventions that were made. These positive perceptions were found through interviews as well as the surveys given. The first indication of the positive perception was from the responses given to statement three from the survey, which can be seen in Figure 10. In addition, the following interview questions also showed positive perceptions:

[4] "Strongly Disagree" and "Disagree" were an option for a response, but no students chose to respond with those answers.

Table 4.

Interview Question Three: How does the new RTI process setting compare with traditional math classes you have taken?

- Student E: Um, I like this new way better.
- Student H: I actually prefer having the exit slips.
- Student L: I like it a lot better I think.
- Student O: I think the exit slips we have been doing have been helping a lot.
- Student P: I like the exit slips we have been doing.
- Student Q: I think it's really beneficial.
- Student V: I really like the lab. It feels like a tutoring session. It is more one-on-one.
- Student W: Well I like that in the lab I get things here in advance, so it helps me in the long run.

Table 4 shows that all eight students who were interviewed though that the Tier 2 interventions in place were beneficial for their learning.

Table 5.

Interview Question Four: How has your mood/attitude changed in our geometry class since starting the RTI process?

- Student E: Not sure, but probably towards the better.
- Student H: No.
- Student L: No.
- Student O: No.
- Student P: Um, I like it more.

- Student Q: I definitely enjoy class more.
- Student V: Yes, because my grades have gotten better.
- Student W: I think so because I just feel more positive about it, and I feel more confident with my work.

Table 5 shows that five of the eight students interviewed thought that their mood or attitude towards math had changed positively after the Tier 2 interventions were put into place.

Table 6.

Interview Question Five: How effective, in your experience, is the RTI setting as opposed to the traditional classroom setting?

- Student E: I think it is pretty effective. For some students it can be super helpful. Most of them don't want to have to take the time to go outside of class to get help, so this is also just another way to easily do that.
- Student H: Again, I think its just the level of comfort you get from just you know, having check-ins, its' just very helpful. It just keeps you from getting really stressed out.
- Student L: I don't know. I have done well with both, like while we're doing intervention, and when we were weren't. But I think it works both ways.
- Student O: I think it helps because it is sort of like a review after what you've done, so it kind of refreshes up your mind for the homework.
- Student P: Well, I like that it's a change. I like that it's a different way to learn that we haven't done before.
- Student Q: I think it's really helpful.
- Student V: Yea, I think it works really well.

- Student W: Yes! Because you get that extra time with the material.

Table 6 shows that seven of eight students found a math classroom with Tier 2 interventions were more effective than the traditional math classroom.

Table 7.

Interview Question Six: Do you feel that the RTI helped to improve your understanding of mathematics? Why or why not?

- Student E: Yes.
- Student H: Yes.
- Student L: I don't think it helped or hurt me.
- Student O: Yes.
- Student P: Yes.
- Student Q: Yes.
- Student V: Yes.
- Student W: Yes.

Table 7 shows that seven of eight students thought that the RTI process helped improve their understanding of mathematics.

Table 8.

Interview Question Eight (was only given to the two students in the lab): What would you leave the same about the lab?

- Student V: I think keeping the lab a small class for more one-on-one time and having a different teacher because sometimes it is easier to learn from different teachers.
- Student W: I think the smaller class size, different teacher, and seeing the material twice

really helps because the material really syncs in.

In each of these questions there were clear similarities between students' responses. The responses from the students portrayed that the students thought the intervention process was effective and enjoyed being given the exit slips because it helped their understanding of the mathematics content. The researcher believed that these positive perceptions had been formed by two themes that had emerged the data: repetition and comfort and confidence.

Repetition

The first theme that was found from analyzing the interviews and surveys given was that students enjoyed seeing material repeatedly throughout a content unit. Tier 2 instruction must provide a connection back to the core instructional curriculum in Tier 1. Additionally, it should increase the frequency and intensity of instruction in Tier 1, which is accomplished with providing students with increased exposure to material and additional opportunities to practice learned skills (Dobbins et al., 2014). Furthermore, Tier 2 instruction includes explicit and systematic instruction, guided and independent practice, and cumulative review of previously learned material (Fuchs, 2011). This repetition was seen in the lab from pre-teaching and post-teaching material. Students in the lab were exposed to content multiple times, therefore felt they had a better understanding of material taught. In the geometry class, the repetition came from students completing exit slips, as well as going over the exit slips the following day. By incorporating these components into Tier 2 interventions students will have opportunities to increase conceptual knowledge of the subject area, which may further their ability to maintain and transfer learned concepts and skills (Witzel, Riccomini, & Schneider, 2008). This theme was predominantly found in the following interview questions.

Table 9.

Interview Question Two: What was your overall perception of the class setting?

- Student W: I think it's really helpful to learn things in advance. That way I can use the notes I get here when I'm in my actual class. It helps me understand it better and follow them so I'm not lost.

Table 9 shows that one particular student found that the lab was particularly helpful. They were able to use their notes that they had taken in lab and use them in their regular geometry classroom to aid their learning.

Table 10.

Interview Question Three: How does the new RTI process setting compare with traditional math classes you have taken?

- Student H: I actually prefer having the exit slips. It is kind of nice, it covers and goes over what we learned making sure we get it. Then the next day when we review it, it is helpful to see what we got wrong, fix the problems that we got wrong, because if we didn't have it, we might have thought we learned things successfully and we would know what to do, and that wouldn't go well if you had like a quiz and you go about it the wrong way.
- Student L: I like it a lot better I think. I'm the type of person that needs to like hear things a few times, or learn in like a smaller setting sometimes so its really nice having that one on one sort of being able to ask questions when I need to.
- Student P: I like the exit slips because sometimes I will like leave the class not knowing what the whole thing is about, and then we go right past it, and we never talk about it again. But I like how the exit slips forces us to talk about it the next day. Like if you're

struggling it gives you a chance to re-visit and talk about it.

- Student Q: I think it's really beneficial. I really like reviewing and going over the material at the end of class. The next day is also really helpful when you're with other students who also don't understand it so you can all get it together.

In table 10, four students who were interviewed highlight that one of the main differences between the traditional math classroom and a math classroom with Tier 2 interventions is that they were able to review the material more.

Table 11.

Interview Question Six: Do you feel that the RTI helped to improve your understanding of mathematics? Why or why not?

- Student E: Um, in some ways yes, because if there is a problem that I don't get how to do, it's nice to have like the teacher or a friend walk you through it so you really can understand it.
- Student H: Sure, it's the ability to just review things and just go over things, it just adds a level of comfort also, because there's kind of like whenever there is a test or quiz you kind of get like stressed out, and it's helpful to know if you like have these exit slips that you know what the information is. Kind of just, you know, puts my mind at ease.
- Student O: When we are talking with our other peers and going over the mistakes you made, it is just like a good refresher.
- Student P: Yea, I think so I think it's like a good review like right after we learn everything. It makes sure that we know everything and gives us possible questions that could come up on a test.

- Student Q: Yes. When you're doing the exit slips, you have to think about what you learned, and it helps you process what you learned that day, and it helps you like memorize it, especially formulas.

Questions two, three and six all had clear similarities between students' responses. The responses from the students portrayed that the students thought the intervention process was effective because they were able to see the material multiple times. Through repetition the students were able to get questions they had answered as well as work with peers through any difficulties they had. The researcher believes that this was cause for the next theme; comfort and confidence.

Comfort and Confidence

The second theme that was found from analyzing the interviews and surveys given was that students had gained a sense of comfort and self-confidence after receiving Tier 2 interventions. RTI provided students with an opportunity to be successful and build confidence, which may not happen in a regular education program (Sanger, Friedli, Brunken, Snow, & Ritzman 2012). Some researchers suggested that as students became more capable and feel better about their math abilities, their confidence increased and they were more motivated to persevere, which increased their chances of success (Fisher & Frey, 2011; Kroeger & Kouche, 2006; Pool et al., 2013). Sanger et al. (2012) also wrote, "though most were initially skeptical and nervous about implementation of Tier 2 interventions in secondary settings, the exciting advances and the opportunity to improve achievement, student motivation, and self-confidence, along with evidence-based practices represented participants' support for the model" (p. 104). Students' feelings of comfort and self-confidence was found in interview responses as follows.

Table 12.

Interview Question Four: How has your mood/attitude changed in our geometry class since starting the RTI process?

• Student W: I think so because I just feel more positive about it, and I feel more confident with my work.

This student in Table 12 highlights that since starting the RTI process, her mood has changed and that she has felt more confident in her work.

Table 13.

Interview Question Five: How effective, in your experience, is the RTI setting as opposed to the traditional classroom setting?

• Student H: Again, I think it's just the level of comfort you get from just you know, having check-ins, its' just very helpful. It just keeps you from getting really stressed out. • Student W: Yes! Because you get that extra time with the material which them makes me more comfortable in my geometry class.

Table 13 shows two students who though that the more "check-ins" or "extra time" with the material helped build their comfort level.

Table 14.

Interview Question Six: Do you feel that the RTI helped to improve your understanding of mathematics? Why or why not?

• Student H: Yes, because it's the ability to just review things and just go over things, it just adds a level of comfort also, because there's kind of like whenever there is a test or quiz you kind of get like stressed out, and it's helpful to know if you like have these exit

slips that you know what the information is. Kind of just, you know, puts my mind at ease.

When finding themes in the survey answers, each statement was counted on how many responses had changed from the first to the second survey. Besides the first three statements that were listed earlier in Tables 3-5, these next four statements had the highest change in answers between the first survey given and the final survey given.

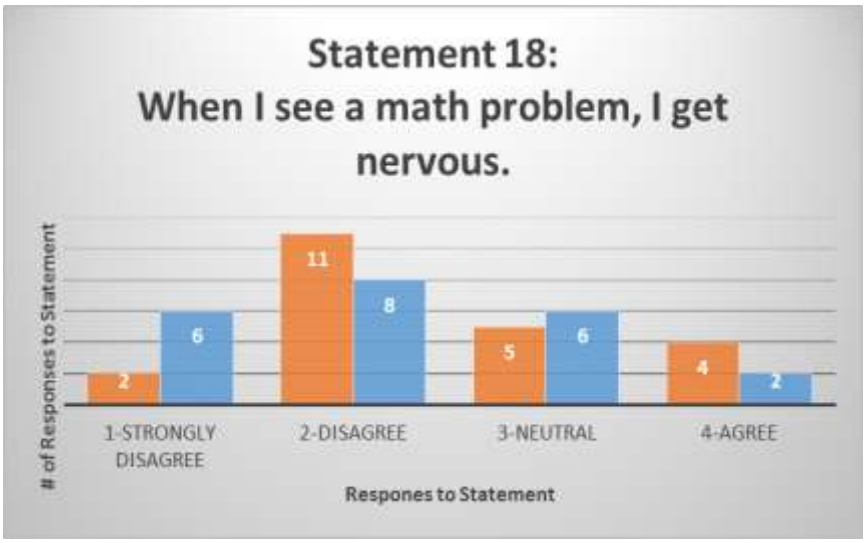

Figure 11. Statement 18: When I see a math problem, I get nervous.[5]

This statement had 11 changes of responses from the first to the final survey. After the first survey, statement 18 had an average of 2.434783. After the second survey, statement 18 had an average of 2.130435. The difference between the two surveys was -0.30435.

[5] "Strongly Agree" was an option for a response, but no students chose to respond with this answer.

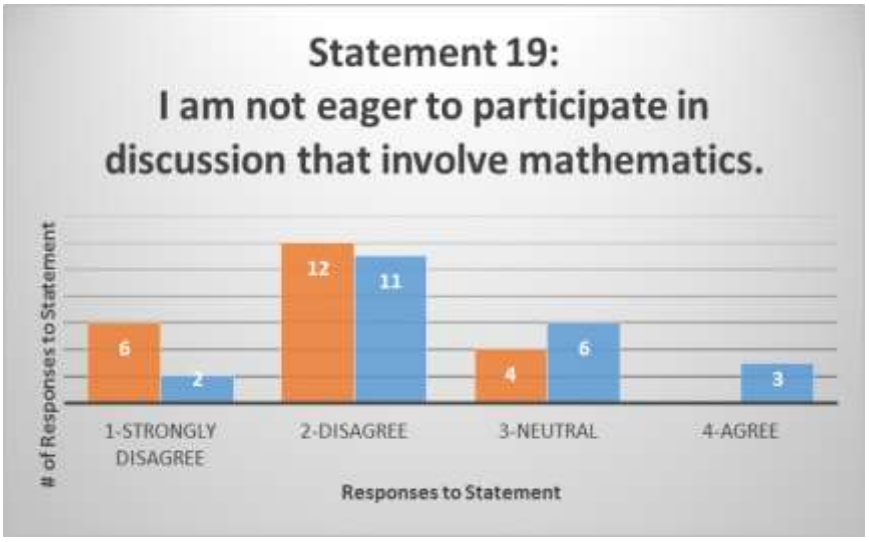

Figure 12. I am not eager to participate in discussions that involve mathematics.[6]

This statement had 14 changes of responses from the first to the final survey. After the first survey, statement 19 had an average of 2.826027. After the second survey, statement 19 had an average of 2.434783. The difference between the two surveys was -0.3913.

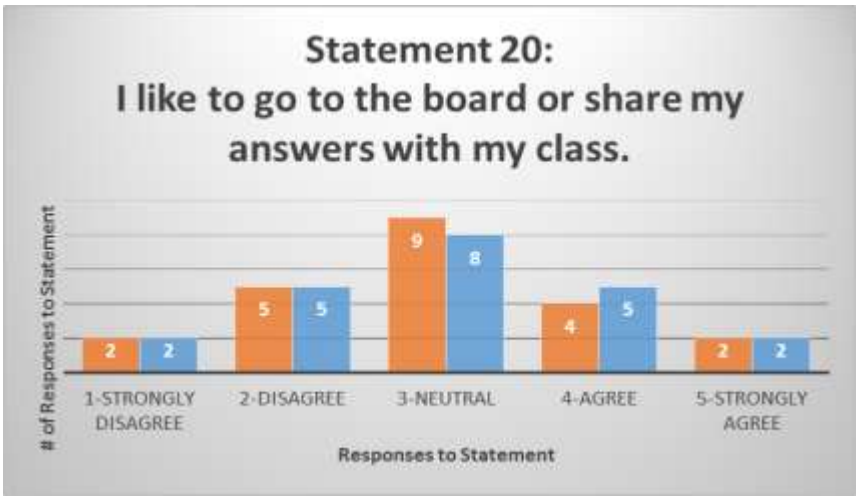

Figure 13. I like to go to the board or share my answers with my class.

[6] "Strongly Agree" was an option for a response, but no students chose to respond with this answer.

This statement had 14 changes of responses from the first to the final survey. After the first survey, statement 20 had an average of 3.0. After the second survey, statement 20 had an average of 3.043478. The difference between the two surveys was 0.043478.

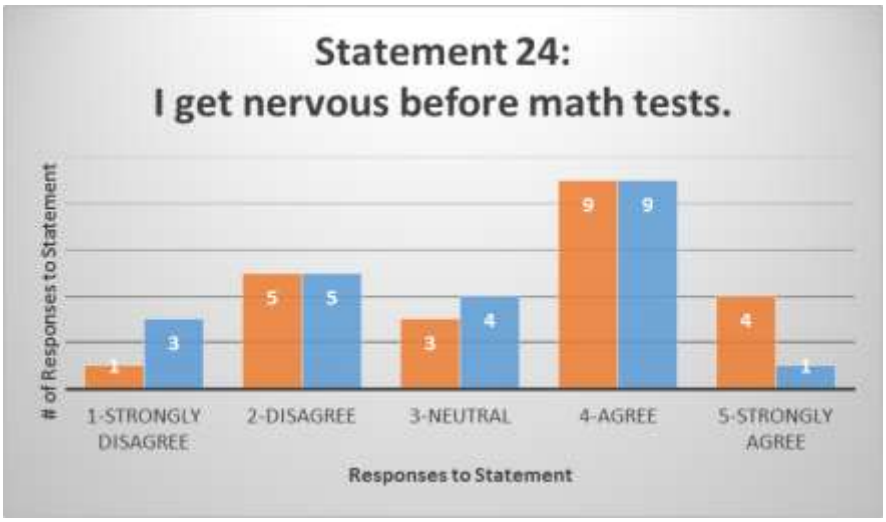

Figure 14. I get nervous before math tests.

This statement had 12 changes of responses from the first to the final survey. After the first survey, statement 24 had an average of 3.391304. After the second survey, statement 24 had an average of 3.0. The difference between the two surveys was -0.391304.

All four of the above statements had clear similarity in what the statement was referring to – comfort. All four statements showed that students' nervousness had decreased and comfort had increased as time went on due to the intervention process. This raised comfort level added confidence that the researcher saw with students more enthusiastically helping their peers as well as participating more actively in class.

Summary

In this chapter, the results for the research collected were presented in themes while discussion was provided. For question one, how Tier 2 interventions are implemented in a high school mathematics setting, themes noted that Tier 2 interventions could be made inside a

regular education classroom setting or outside of a regular education classroom. These themes were noted from data collected through observations and documents/artifacts. The Tier 2 interventions looked differently based on which setting they were being implemented in.

Research question two, which focused on students' perceptions of Tier 2 interventions in a mathematics classroom, it was found that generally students had a positive perception of interventions in place. The themes that were found included students enjoying the repetition of seeing material. With the interventions in place students saw material more than once, which caused them to be more familiar with it when it came to taking quizzes and tests. The other theme that emerged was the raised level of comfort and confidence with the mathematics material. Each of the themes discovered from the second research question were extracted from the methods of data collected from interviews and surveys.

Chapter 5

Conclusions

The purpose of this thesis was to examine the impact of RTI in a high school mathematics setting. A major concern in the literature related to the fact that majority of RTI research focused on students at the elementary level and in reading. Therefore, RTI was implemented in a high school mathematics classroom and effects were analyzed. This general purpose led to the following research questions:

1. How are Tier 2 interventions implemented in a high school mathematics setting?
2. What are the students' perceptions of the instruction strategies that are employed as Tier 2 interventions in a mathematics classroom?

The study focused on a sample of ninth and tenth grade students from two classes taught by one teacher in the same high school, as such action research was the most appropriate methodology to explore implementation of RTI at this site. RTI implemented successfully, takes careful consideration and a great deal of planning. A foundational component of RTI is the use of data as the basis for decision making about instructional changes. The ongoing collection of data, also known as progress monitoring, is an efficient tool for gauging the effectiveness of instruction on a regular basis and can assist teachers in making decisions about appropriate instruction and intervention for students. This data is used as the basis for making decisions about the intensity of the instruction that students require to meet their learning needs. To collect data on Tier 2 interventions implemented in a high school mathematics setting and the student perceptions of these interventions the study used documents/artifacts, observations, surveys and interviews. The data was analyzed using both descriptive statistics and the constant comparative method. Validating the results of this study included member checking, pilot testing and triangulation.

Implementation of RTI at the secondary level presents challenges due to the structure and organization of secondary schools (Johnson, Galow, & Allenger, 2013). For each question themes are reported with evidence from the data collected through the four forms of data collection. For the first question, how are Tier 2 interventions implemented in a high school mathematics setting, two themes were identified: Tier 2 interventions inside a regular education classroom setting, and Tier 2 interventions outside a regular education classroom setting. For each theme, Tier 2 instruction was built for students who need more guided, personalized instruction that was given in the Tier 1. Inside of a regular education classroom this took the form of exit slips, where the teacher/researcher spent more time with students who were having a difficult time with the current material. Outside of a regular education classroom, this took the form of more one-on-one personalized instructions for a smaller group of students. For the second question, what students' perceptions of Tier 2 interventions in a high school mathematics setting, two themes were also noted, repetition as well as comfort and confidence. Through interviews as well as surveys, student responses were similar in the fact they enjoyed seeing material multiple times. It helped their understanding of material since they were able to ask more questions and see material more than once. Additionally, this repetition of material in turn made students feel more comfortable in the classroom to participate more actively as well as more confident when sharing answers and taking tests.

Limitations

Throughout this study three limitations were noted. The first limitation for this study is sample size. Sample size is the number of the units of analysis used in a particular study (Price & Murnan, 2004). This action research was conducted in the suburban town of Connecticut within the high school setting of Shoreline High School. Shoreline High School contains roughly 1,350

students. This action research was done with a total of 23 students, which represents 1.7% of the high school population. With more students in the study, the answer to the second research question, students' perceptions of Tier 2 interventions in a high school mathematics setting would be more accurate.

The second limitation for this study is the measures used to collect data. Data are usually collected through qualitative and quantitative methods including: surveys, interviews, focus groups, documents/artifacts, observations, and tests. For this particular action research documents/artifacts, observations, interviews and surveys were used. With data collection, all instruments should be pilot tested to identify any problems that may exist with the instrument being used. The pilot test usually is administered to a small group of people that are similar to the participants in the proposed study to test reliability, validity, and the usability of the instrument. In this particular study, the survey and interview protocol were pilot tested on four Geometry 300 students. Two of these students identified as regular education, one student identified as special education, and one student identified with a 504 plan. Additionally, of these students three are females, and one is a male student. The four students, two freshmen and two sophomores, participated in this pilot survey to test questions and protocol. The limitation refers to the survey in that the survey was tested on such a small scale. While some errors were found, for example, it was found that the students were only able to check off the 'Strongly Agree' box once, 'Agree' once, 'Neutral' once, etc.. This meant the survey restricted the students to answer only five of 26 questions. However, when analyzing results, what didn't occur was the wording of a particular question, and how if maybe piloted with more students this would have been noticed and altered.

The last limitation was access that is a limitation of the researcher. Access refers to the study depending on having access to people, organizations, documents, etc. (Price & Murnan, 2004). This particular action research depended on having access to students during a regular school day. However, since the study started in May, time was constricted due to the school year ending in June. The data collected for this action research could have benefited from more time.

Implications for Practice

Based on what was learned from this study, I would recommend three implications to practice. My first recommendation should be that the students who in the Tier 2 interventions outside of a regular education classroom, the lab in this action researcher, should consist of students who had another teacher during their regular education class. Both students in the researcher's lab setting stated during their interviews that they enjoyed having a different teacher during the lab from their regular classroom. They explained sometimes topics were taught in various ways by different teachers, which helped make the material easier to understand.

My second recommendation should be that the Tier 2 interventions that happen outside of the classroom should happen with a small group of students. Tier 2 instruction was built for students who needed more guided, personalized instruction that was given in the Tier 1. This more individualized instruction was given to students in small groups (Fuchs et al., 2014, Dobbins et al., 2014; Dunn & Browning, 2012; Robins, 2013). Both students in the researcher's lab setting stated during their interviews that they enjoyed having a small group setting. They thought they were able to get more individualized one-on-one attention. Therefore, the class size should be capped at around eight or ten students to keep the small atmosphere afloat.

My last recommendation would be to increase the frequency of Tier 2 interventions throughout the school year. These Tier 2 interventions should be implemented throughout the

entire school year. This would help the students get into a daily routine. Tier 2 instruction must provide a connection back to the core instructional curriculum in Tier 1. Additionally, it should increase the frequency and intensity of instruction in Tier 1, which is accomplished with providing students with increased exposure to material and additional opportunities to practice learned skills (Dobbins et al., 2014). It had been found that the more data that were collected, the more meaningful the intervention was that could take place, which could then help make instructional decisions to determine if students were responding to instruction and the interventions (Fisher & Frey, 2013; Gresham & Little, 2012). The data that is collected and analyzed is known as progress monitoring. More than 30 years of research showed progress monitoring to be a reliable and valid predictor of future performance on outcome measures (Deno, 2003; Fuchs, Deno, & Mirkin, 1985; Good & Jefferson, 1998). Additionally, it would be helpful to use a screening test in the regular education classroom. Screening tools were essential and mentioned throughout various pieces of literature (Dunn & Browning, 2012; Fuchs et al., 2011; McCallum et al., 2013; Pool et al., 2013; Vaughn & Fletcher, 2012). These screening tools were conducted periodically – usually three times throughout the school year (Dobbins et al., 2014; Dunn & Browning, 2012; Fisher & Frey, 2013; Fuchs et al., 2011; McCallum et al., 2013; Pool et al., 2013; Vaughn & Fletcher, 2012). These assessments were referred to as universal screening as every regular education student completes them. Student achievement was assessed through these universal screenings (Dobbins et al., 2014; Dunn & Browning, 2012). It would be useful to give these universal screenings at the beginning, middle, and end of the year to track students' progress.

Suggestions for Future Research

Throughout the implementation of this study the researcher found two suggestions for further research. The first would be to turn this study into a case study instead of action research. While it was interesting to observe the researcher's own students, it was difficult to be the teacher and researcher at the same time. The researcher felt there were some things that could have been observed from a second party in the regular education classroom and in the lab setting that the teacher may have missed. Additionally, the researcher found it difficult to track data, set up cameras to record observations and interviews, all while trying to do teacher duties including lesson planning and grading.

The second suggestion the researcher has would be to research more on how to implement interventions with gifted students. RTI leaves out the group of students who achieve at a high level – the high achieving, gifted, and accelerated students (Herrelko, 2013; McCallum et al., 2013). With the diversity of students in today's classrooms, assorted instructional practices are needed to engage everyone in a classroom setting. Instruction must address the strengths and needs of learners through the use of multiple resources and evidence-based instructional practices. During an interview, a student brought up that when he was finished going over the exit slips with his peers, he would just sit and chat. Instead, it would be beneficial to have something planned for those students who have a better understanding of the material and will further their knowledge of the material being taught.

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Appendices

Appendix A

Interview Protocol

Good morning/afternoon/evening. The goal of this study is to examine some of your observations related to the unit you have just completed. The data collected from the study will be used in a research project that is designed to benefit both students and myself with respect to the use of using Tier 2 interventions in the future. With your permission, I would like to audiotape this interview.

Before we begin, I would like to notify you of the following: Your participation is entirely voluntary. You may stop the interview at any time and/or decide not to answer specific questions. Your responses will remain anonymous and confidential. At no time will your identity be revealed either by the procedures of the study or during reporting of the results. If you choose not to participate, no negative consequences will result.

Please feel free to tell me what you really think and feel; this will be the most helpful in trying to find out how to improve things for students and faculty members in the future. Thank you for your participation in this research.

[Start recording.]

1. What is your grade level?
2. What is your gender?
3. What was your overall perception of the lab setting?

(probe for: 1. Advantages and disadvantages 2. Different interventions made)

4. How does the lab setting compare with traditional math classes you have taken?

(probe for: 1. activity types 2. Interaction 3. Motivation)

5. How has your mood/attitude changed in your regular geometry classroom since starting the lab?

(probe for: 1. Interactions 2. Motivation 3. Mood)

6. How effective, in your experience, is the lab setting as opposed to the traditional classroom setting?

(probe for: 1. quality of intervention 2. quality of discussions 3. quality of interaction)

7. Do you feel that the lab helped to improve your understanding of mathematics? Why or why not?

(probe for as needed)

8. What improvements would you recommend to improve the lab model?

(probe as needed)

9. What would you leave the same about the lab model?

(probe as needed)

10. Would the lab model be useful for other subjects? Why or why not?

11. That is all I have. Is there anything else you would like to add about the being in the lab setting? Thank you for participating.

Appendix B

Survey

What is your gender? A. Male B. Female

What grade are you in? A. 9th B. 10th

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am familiar with the Response to Intervention (RTI) process.					
I feel monitored throughout the RTI process.					
Students benefit from the RTI process.					
If students are unsuccessful the first time, the teacher makes new types interventions.					
My teacher provides interventions to me in class.					
I do my math homework almost every night.					
I work on my math assignments to the best of my ability.					
I ask my teacher questions when I don't understand a topic in math class.					
I was able to work in math class because it is a quiet, non-distracting environment.					
I only go to math class because it is required of me.					
I have a place at home where I can do my homework.					

I feel that I am able to do the work my teachers ask me to do.					
I think that mathematics is important in my life.					
I like math.					
I feel confident in my abilities to solve mathematics problems.					
In the past, I have not enjoyed math class.					
I receive good grades on math tests and quizzes.					
When I see a math problem, I get nervous.					
I am not eager to participate in discussion that involve mathematics.					
I like to go to the board or share my answers with my class.					
Mathematics interests me.					
I sometimes feel nervous talking out-loud in front of my classmates.					
Math class is hard for me.					
I get nervous before math tests.					
I feel lost when I am in math class.					
I feel confident with my work in math class.					

Appendix C

Lab Lesson Log

Date (Day of Rotation) and Lab sequential Day	Names of students present	Lesson Objectives	Units covered before next lesson	Comments
4/6/16 (C) Lab Day 1	T U V W	• (Section 9.5)Use the properties of tangents to solve problems • (Section 9.6)Find the measures of angles formed by intersecting secants and tangents in relation to intercepted arcs	Section 9.6	Overall students very eager to learn and excited that this lab class started.
4/7/16 (D) Lab Day 2	T U V W	• (Section 9.7)Use properties of chords, secants, and tangents to solve problems	Section 9.8, two practice days, a review day	Still students eager to learn. All four students participated more today.

		• (Section 9.8) use the arc length and area of a sector formula to find the length of an arc, area of a sector, a radius of a circle or the degree measure of an arc		
4/21/16 (A) Lab Day 3	T U V W	• Review of Chapter 9	Test	Three of students (U, V, and W) found review very helpful, eager to take test. The fourth (T) seemed more disinterested than normal. Curious to see how all three do on their test.
4/25/16 (C) Lab Day 4	T U V W	• (Section 10.1) Polygons • (Section 10.2) Area of various polygons	Section 10.2	Students V and W were so excited that they did very well on previous tests and I am seeing improvements

				with them in lab as well. Student U said he did OK on the test, but wants to do better. Lesson went well today. Student T was very quiet and seemed a bit out of it, however his grade also improved on test.
4/26/16 (D) Lab Day 5	T U V W	• (Section 10.3) Area of Triangles • (Section 10.4) Applications for Area of Triangles	Section 10.3, Section 10.4, Quiz Review	Didn't get through lesson. All four students were really engaged today!
5/3/16 (A) Lab Day 6	T U V W	• (Section 10.5) Area of Regular Polygons, and second day on Area of Regular Polygons with Trigonometry	Section 10.5 (2 days)	Students seemed to work well today. All four participating and engaged.
5/5/16 (C)	T	• (Section 10.6)	Section 10.6	Today's lesson was

Lab Day 7	U V W	Probability		challenging and it was easy to see that the students were having a harder time with today's lesson. The lesson asks for students to think outside of the box, something they are not comfortable with.
5/6/16 (D) Lab Day 8	U V W	• Chapter 10 Review	Review, Test, 11.1	One student absent. Other students very engaged and eager to do review so that they do well on test!
5/13/16 (A) Lab Day 9	U V W	• (Section 11.1) Surface Area of Prisms and Cylinders • (Section 11.2) Volume of Prisms and Cylinders	11.2, 11.3	Same student absent again – hope all is ok! Other students doing well. Seeing significant improvements in student V.
5/17/16 (C)	T	• (Section 11.3)	Review	Starting to see

Lab Day 10	U V W	Surface Area and Volume of Spheres • Chapter 11 Quiz Review		significant improvements in students U, W, and T as well. Overall students are participating more.
5/18/16 (D) Lab Day 11	T U V W	• (Section 11.4) Surface Area of Pyramids and Cones • (Section 11.5) Volume of Pyramids and Cones	Quiz, 11.4, 11.5	Students say they seem to like this unit. They said they feel more comfortable with the material since they are given the formulas.
5/25/16 (A)	T U V W	• Test 11 Review	Chapter 11 Test, Project	Students seem to know material very well! They all did well on quiz, and think they will do well on test as well. Starting to make comments on how they hope they can be in the lab next year as well!

				☺
5/27/16 (C)	T U V W	• Final Exam Review	Project	Today we started working on final exam prep. Student T seemed disinterested again. He says all is ok, and he just didn't sleep well the prior night.
5/31/16 (D)	T U V W	• Final Exam Review	Project	All students participating actively for final exam review!