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The Use of the Problem Solving Method in a Middle School Mathematics Response to Intervention Program

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COLLEGE OF EDUCATION

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Abstract

Response to Intervention (RTI) has primarily been used as an early intervention in the elementary grades to improve the reading of all students; however, in recent years, mathematics has been added to the program and this addition has not been systematically evaluated. Guided by Deno's problem-solving model, the purpose of this qualitative case study was to gain insight on how middle school mathematics teachers use the problem-solving process to design interventions for struggling students and to understand the strategies they used to implement the plan. The research questions addressed how the problem-solving method is used when creating and implementing interventions, as well as the impact of the intervention on student achievement. The first phase of data collection was a focus group interview with 6 middle school RTI teachers. A convenience sample of participants described how the problem-solving method was used in planning the RTI process. The focus group interview was recorded, transcribed, and coded to find common themes among the responses. Data regarding the RTI implementation, as well as associated instructional strategies, benefits, and challenges were discussed. The second phase of data collection came from mean mathematics state test data from a cohort group of middle school students in 2012, 2013, and 2014. Scores were compared to determine if there was an increase in the percentage of students who scored at levels 3-4, as well as a decrease in the level 1 and 2 scores. Inconsistent data on the state test did not support the findings of the focus group. Social change can be achieved through this RTI mathematics study by providing teachers with instructional strategies that cultivate the growth of academic confidence and achievement of all students in the general education classroom.

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Section 1: Introduction to the Study

In 1975, the Education for All Handicapped Children Act granted all students a free and appropriate education, regardless of developmental, sensory, physical, or cognitive limitations (Harry & Klingner, 2007). In particular, the label of specific learning disabilities was given to students who showed a discrepancy between intellectual or cognitive IQ and achievement (Fuchs & Fuchs, 2007; Gresham, 2009; Reston, Katz, & Lee, 2009). Generally, this discrepancy had been determined by analyzing the scores from cognitive tests and the standard scores on other standardized measures (Restori, Katz, & Lee, 2009). Since that time, a major concern in the field of special education has been determining if students truly have a disability or if there is a specific learning need (Gresham, 2009; Harry & Klingner, 2007). Some researchers believe that the issue is not a matter of intelligence but of quality instruction and research-based curriculum (Fuchs & Fuchs, 2007; Fuchs, Fuchs, & Compton, 2004; Gresham, 2009; Harry & Klingner, 2007).

After almost 30 years, the Individuals with Disabilities Education Improvement Act (IDEIA) offered Response to Intervention (RTI) as an alternative to the IQ-achievement discrepancy debate (Fuchs & Fuchs, 2008; Gresham, Restori, & Cook, 2008; Palenchar & Boyer, 2008). Through IDEIA, local education agencies were given the option to use a process of interventions to determine if students have a specific learning disability (U.S. Department of Education, 2004). RTI allows teachers to create interventions for students who do not experience success in the general education classroom before identifying a disability and creating special education services (Gresham, 2009; Harry & Klingner, 2007; Reston et al., 2009).

The RTI framework supports all students academically in the general education classroom (National Center on RTI [NCRTI], 2013). This framework ensures that students receive a quality education in the general education classroom, as well as additional educational supports when needed (Fuchs & Deshler, 2007; NCRTI, 2013). The RTI model provides tiered support for students who show academic difficulties. Fuchs and Fuchs (2008) recommended three tiers of support. The first tier is provided in the general classroom to all students. Students who may appear to have academic problem receive extra help from the general education teacher (NCRTI, 2013). If there are still signs of difficulty, the student may need to move to the second tier of support. This level offers more support and is done in a small group setting with careful progress monitoring. If the student does not make adequate progress through this level of support, the third, and most intensive, support may be needed. Tier 3 interventions are generally given to up to three students at one time for a longer period of time. After a student does not show enough progress to meet the designated goal, the student may be referred for special education testing (Fuchs & Fuchs, 2008; NCRTI, 2013).

The two most common approaches to RTI are the *standard protocol model* and the *problem-solving model* (Carney & Stiefel, 2008; Fuchs, Mock, Morgan, & Young, 2003). The standard protocol model gives the same intervention treatment to all students (Shapiro, 2009). One advantage is that it can be administered to large groups of students with similar needs at one time (Fuchs, Mock, Morgan, & Young, 2003). The standard protocol model does not meet the needs of students who need more specific and individualized instruction (Shapiro, 2009). On the other hand, the problem-solving RTI

model addresses the specific academic needs of individual students (Iris Center, 2007). While this is an advantage, the disadvantage is that because of their specific needs, only a few students can be served at a time to this model is that students are given instructional strategies based upon their needs (Shapiro, 2009).

The concept behind RTI is to provide at-risk students with scaffolded instruction that increases the frequency and intensity of instructional support as identified by monitoring students' progress (National Center for Learning Disabilities, 2011). Students are able to move from an educational system that traditionally waited for them to fail in order to receive assistance to a system that provides tiered-support before they fail (Hoover, 2010). Much of the research on RTI has been limited to reading, and a significant amount of the math research has been limited to mathematics intervention at the elementary level (Moors, Weisenburg-Snyder, & Robbins, 2010).

Statement of the Problem

The limited empirical evidence on the implementation of RTI programs in middle school mathematics prompted this case study. The guiding RTI document, "Response to Intervention: Guidance for [Redacted] State School Districts," (2010) indicated only that appropriate instruction in mathematics should include problem-solving, arithmetic skill and fluency, number sense, and reasoning ability.

The local problem was evident in the 2013 results from the [Redacted] State Mathematics exam. Over 80% of all 6th and 7th grade students tested in the study site school scored in the Level 1 and Level 2 range (State Department of Education, 2013). These scores indicated the need for more intensive intervention services in mathematics.

The problem was the limited growth and academic success in middle school mathematics.

According to the National Center of Education Statistics, 75% of 8th grade students demonstrated basic mastery of skills on the 2009 National Association of Educational Progress results (NAEP, U.S. Department of Education, 2009). In 2011, students showed a 1-point increase on the basic level (U.S. Department of Education, 2011). Test results from the 2013 NAEP Assessment showed no significant increase in the scores of those students performing in the below-average range. Basic mastery represents a student's ability to complete grade-level mathematics with some prerequisite skills, which further supports the need for mathematics intervention services in middle school.

In order to be successful, students who continue to demonstrate low test scores and minimal growth should receive quick-paced, explicit instruction with teacher modeling (Piper, Marchand-Martella, & Martella, 2010). Such additional instruction can come through an RTI intervention program- a data-based, multi tier intervention program which can be used to develop effective interventions to improve students' mathematics skills (Fuchs et al., 2012). Limited research exists on the effectiveness of RTI models for mathematics programs, especially those in the secondary setting (National Center for Education Evaluation and Regional Assistance, 2009; Witzel, 2010). In order for all students to be successful in mathematics, more research is needed on the problem-solving process and its impact on the academic success of at-risk middle school students in a RTI program. The purpose of this study was twofold: (a) to gain insight into how middle

school mathematics teachers use the problem-solving process to design an intervention plan and (b) to understand the strategies they used to implement the plan.

Nature of the Study

Creswell (2007) identified a qualitative study as one that collects and analyzes data by interpreting what is seen, heard, and understood. Qualitative research takes place in the natural setting of the problem and uses a variety of data including interviews, observations, and documents (Creswell, 2007; Hatch, 2003). This study used the qualitative case study method to gain insight on how middle school mathematics teachers use the problem-solving process to design an intervention plan and to understand the strategies they used to implement the plan. The data collected provided insight on how participating schools implement RTI mathematics intervention programs using the problem-solving model. Data for this study was collected through a focus group interview and archived state mathematics test documents.

A focus group interview was conducted to explore teachers' knowledge of RTI intervention strategies. Data from the spring administration of the 2012, 2013, and 2014 mathematics test were described in the focus group to gather more insight on strategies used when teachers implement interventions to improve the academic progress of at-risk mathematics students. Notes from the focus group served as a basis for triangulating the state mathematics test data. A document review of the data from the archived state mathematics test data of the participating school was used to triangulate the findings from the focus group.

Research Questions

The research questions were created based upon the problem statement and were anchored in the purpose statement found in the following section. The questions that guided the study were:

- How do middle school mathematics teachers describe their use of the problem-solving process when creating interventions for struggling students in mathematics?
- What strategies do middle school mathematics intervention teachers use to implement interventions for struggling students?

Purpose Statement

The purpose of this study was twofold: (a) to gain insight into how middle school mathematics teachers use the problem-solving process to design an intervention plan and (b) to understand the strategies they used to implement the plan. The findings explain the use of specific strategies and curriculum to implement the intervention. They also describe the benefits and challenges faced when implementing RTI mathematics interventions.

Conceptual Framework

One of the most important aspects of the RTI framework is its focus on problem-solving through data-based decisions (Barnes & Herlacher, 2008). The problem-solving process is critical to understanding the RTI Problem Solving Model. Here, the "problem" is the discrepancy between the student's current level of performance and the expected level of development (Deno, 2005). The problem-solving process refers to the steps that

are being taken to decrease or eliminate the given discrepancy. Gathering data at each step is imperative to planning instruction that will be effective in decreasing or eliminating the problem (Tilly, 2005). Thus, Deno's problem-solving method will frame this research study.

There are five essential steps in a data-based problem-solving model: (a) problem identification, (b) problem definition, (c) intervention design, (d) intervention implementation, and (e) problem solution (Deno, 2005). In the initial step, observations are made about the student's academic performance. It is important to find out the discrepancy between the student's current performance level and where he or she is expected to perform (Office of Public Instruction, 2013). Through the second step, the problem is qualified as important by assessing the discrepancy (Deno, 2005). Data are collected in relationship to the area of difficulty and assessments are given to determine the academic problem (Musti-Rao, Hawkins, & Tan, 2011). During this step, the discrepancy must be identified as a skill the student cannot do or will not do (Tilly, 2008). After the discrepancy has been determined, the next step includes identifying goals, planning an intervention, establishing the period of the intervention, and deciding how progress will be assessed (Bransford & Stein, 1984; Deno, 2005). After the intervention and its assessment have been determined, the plan must be implemented with clear guidelines for collecting data during the time of the implementation. It could be advantageous to create a schedule for monitoring progress to ensure that the intervention goals are being met (Musti-Rao, Hawkins, & Tan, 2011). Finally, an evaluation must be conducted to determine if the problem was solved during the

intervention (Deno, 2005). A critical look at the effects should show what steps should be taken next (Branford & Stein, 1984).

Throughout the RTI process, continual planning and problem-solving is linked to instructional needs and resources. The RTI problem-solving team diligently works to ensure academic success is met and continued. The team is responsible for using the problem-solving process to identify clear intervention goals, in addition to the collection of on-going data. This is paramount to the success of the RTI model (Telzrow, McNamara, & Hollinger, 2000).

Definition of Terms

The following terms were essential to understanding this research study.

Curriculum-based measures: Curriculum-based measures are simple and effective procedures used to evaluate students' progress and instruction given on specific concepts taught (Deno, 1985).

Fidelity of implementation: This is a term used to describe the system that ensures intervention plans are implemented as designed (Keller-Margulis, 2012).

Primary level of intervention or primary prevention: High-quality instruction is provided to all students in the general education classroom, while certain students may receive additional assistance from teachers (National Center on Response to Intervention, 2013; Stecker, Fuchs, & Fuchs, 2008).

Problem solving protocol: This RTI model that ensures the intervention is matched to the students' instructional need (Fuchs & Fuchs, 2008; Shapiro, 2011).

Progress monitoring: Teachers use this process to measure students' progress within each tier and how instruction will be varied to meet the instructional needs of each student (Fuchs & Fuchs, 2006).

Secondary level of intervention or secondary prevention: The secondary level of intervention includes "evidence-based intervention(s) of moderate intensity that addresses the learning of most at-risk students" (National Center on Response to Intervention, 2013, p.4).

Standard treatment protocol: This Response to Intervention model focuses on a small group of students who have similar academic needs, usually lasts 10-15 weeks (Fuchs & Fuchs, 2008).

Tertiary level of intervention: The highest level of "Individualized intervention(s) of increased intensity for students who show minimal response to secondary prevention" (National Center on Response to Intervention, 2010, p. 4).

Universal screening: A series of short assessments that are given to all students to determine students who may need additional instructional support (Hughes & Baxter, 2013).

Assumptions

This reearch was based on four assumptions. (a) All participating teachers and administrators have been trained in implementing the RTI problem-solving process. (b) All schools implement the model in accordance with [redacted] state guidelines. (c) The cohort group of students was the same from Grades 6-8. (d) Finally, All participants

would provide truthful and thoughtful responses when participating in the focus group interview.

Limitations of the Study

This study was subject to three weaknesses. (a) There is no standard curriculum or curriculum-based measure that is required for the problem-solving model. This could impact the collected data because of the lack of consistency among schools. Another limitation of the study was the sample size from which the responses are gathered. (b) The sample size from which responses were gathered was small; teacher impressions and student outcomes were derived from a specific location and a limited population. (c) Because the state focuses on the use of standardized assessments as the measure of growth, progress on school-based curriculum-based measures may not be recognized as a measure of success.

Significance of the Study

The focus of this study was to gain insight on how middle school mathematics teachers use the problem-solving process to design an intervention plan and to understand the strategies they used to implement the plan. The findings were expected to contribute to the limited body of research found on mathematics in a RTI model. Participants shared successes and challenges that could directly impact the success or failure of the intervention. Results from this study could help RTI coordinators and teachers in planning relevant and effective mathematics intervention programs.

Implication for Social Change

Positive social change is defined as "a deliberate process of creating and applying ideas, strategies, and actions to promote the worth, dignity, and development of individuals, organizations, institutions, cultures, and societies" (Walden University, n.d.). When the results of a study are implemented effectively, social and human conditions improve. When team members use data to plan and implement interventions for struggling students, they increase opportunities for success with at-risk middle school mathematics students.

This study might impact social change on the local level by giving teachers and RTI teams viable options to use when planning mathematics intervention programs for at-risk middle school students. As a result, more students should experience success when learning more complex grade-level mathematics standards, as well as while preparing for high-stakes testing. On a larger scale, the results of this study could impact education as more schools prepare to meet the needs of at-risk middle students who struggle in mathematics. The ideas presented by teachers in the study could improve the development of intervention programs on the district and state level. Any improvement in intervention programs will improve the impact education of at-risk middle school students.

Summary

Through this research, more information regarding the problem-solving method in RTI and the academic progress of at-risk students in mathematics was to be revealed. The research may also reveal a variety of factors t to the success hat lead or detriment of the

RTI mathematics intervention program. Section 2 of this study provides a history of the development of Response to Intervention (RTI). A review of literature will be presented about the RTI model and the incorporation the problem-solving model in planning. Section 3 explains the research method, delineates the data collection procedures, and describes the method in which data was interpreted.

Section 2: Review of Literature

Introduction

This section will provide a brief background on RTI beginning with a summary of *A Nation at Risk.* Goals 2000 set specific goals for all students during the 1990's, followed by legislation from No Child Left Behind in 2000. No Child Left Behind also influenced the reauthorization of the Individuals with Disabilities Education Act in 2004, which required that even students with disabilities were required to meet state standards. The reauthorization also introduced RTI, a method of providing support to struggling students before they fail.

This section covers the following topics:

- A definition and a framework for RTI.
- The essential elements of RTI including universal screening, tiered interventions, progress monitoring, and data-based decision-making.
- Because parental involvment and fidelity of implementation are both critical, they are also described in this section.
- Two protocols, problem-solving and standard, are used when planning intervention in the RTI program.
- RTI in the middle school setting is a current subject, so research regarding implementation is quite limited.
- There are specific standards that should be addressed in the middle school.

- This section concludes with research-based recommendations from the What Works Clearinghouse for mathematics intervention in the middle school setting.

Current research was predominantly found in peer-reviewed journals through searches on the following databases: Walden Thoreau Library and Google Scholar. The following search terms include "RTI in middle school," "RTI and mathematics," "RTI and middle school and mathematics," "RTI and elementary school and reading," RTI and problem solving," and "Problem solving method and mathematics". Additional supporting research was found on RTI implementation websites such as www.rtinetwork.org, www.rti4success.org, and www.iris.peabody.vanderbilt.edu. Information was also found through links "RTI and mathematics" searches conducted on www.google.com and www.yahoo.com. These sources proved especially helpful in generating research since RTI is still in developmental and reviewing stages. Searches were also conducted of books related to RTI in mathematics. Books were not included in this review primarily because they did not contain research on the use of the problem-solving method in planning instruction.

Background of RTI

The last 3 decades have brought a multitude of significant reforms in the field of education. In 1983, the National Commission on Excellence in Education presented *A Nation at Risk,* a highly criticized report which delineated current failures to meet the educational needs of students (U.S. Department of Education, 2008). The data from the report was categorized into four major areas of need: (a) content, (b) expectations, (c)

time, and (d) teaching (U.S. Department of Education, 1983). Specifically disturbing in the area of content is a study that indicated that 37 states required only one year of mathematics (National Commission on Excellence in Education, 1983). The National Commission on Excellence in Education also found that achieving minimum standards became the expectation in 37 states with minimum competency exams. For this reason, the commission recommended specific benchmarks in the areas of reading and mathematics for high school graduates.

With a new decade came reform. The Goals 2000: Educate America Act was signed into law in 1994 to promote higher achievement by implementing higher expectations for all students (Paris, 1994). For instance, academically, the law mandated that by the year 2000, gains would be made in mathematics and science therefore making the United States the leader in mathematics and science achievement. Results from the 2000 mathematics assessment administered by the National Assessment of Educational Progress (NAEP) indicated a lack of significant progress in mathematics of fourth-, eighth-, and twelfth-graders across the nation (U.S. Department of Education, 2000). The assessment indicated that only 26% of fourth-graders, 27% of eighth-graders, and 17% of twelfth-graders scored at the proficiency level, the level at which the NAEP believes all students should perform (U.S. Department of Education, 2000). These alarming statistics influenced legislation that led to the No Child Left Behind Act (NCLB, 2001). Under NCLB legislation, all students from third to eighth grades must be tested each school year in reading and mathematics. Specifically in mathematics, NCLB encouraged school districts to use scientifically-based instructional and assessment practices to assist all

students, especially those considered at-risk of failure (U.S. Department of Education, n.d.). Annual Yearly Progress (AYP) was instituted to ensure that all students, including those with disabilities, were academically prepared (Learning Disabilities Association of America, 2003).

IDEA was reauthorized in 2004 to include many changes relevant to No Child Left Behind. Specifically, students with disabilities were required to meet the same standards as their non-disabled peers (US Department of Education, 2007). IDEA 2004 also included the option to identify a student's disability through his or her RTI. This system, RTI, helps students avoid years of failure before diagnosing the need for special education services (Stecker, Fuchs, & Fuchs, 2008). RTI is grounded in the belief that schools should not wait until a student has experienced years of failure to intervene; rather, students should be screened early to determine those who need additional support to be successful (Jenkins & Johnson, 2011).

What is RTI?

RTI (RTI) is an instructional approach used to identify and support students who have academic needs (Fuchs & Fuchs, 2007; RTI Network, 2011). This approach impacts the entire school and incorporates instruction, intervention, and assessment (Johnson & Smith, 2008). Several principles guide the RTI framework:

1. All children can learn with effective instruction.
2. Early intervention is critical.
3. Multi-tier instruction is necessary for student success.

4. The problem solving method should be used to make decisions in the multi-tier model.
5. Instruction and intervention should be research-based.
6. Student progress should guide instruction.
7. All decisions should be based on data.
8. Assessments should be used for screening, diagnostics, and monitoring progress. (NASDSE, 2006)

According to the National Center on RTI (NCRTI, 2010), the goals of RTI are to utilize all instructional resources to reduce the long-term impact of poor learning and to improve the process used to appropriately identify students with a disability. An effective RTI model must have the following components: (a) universal screening, (b) tiered interventions, (c) progress monitoring, and (d) data-based decision making (NCRTI, 2010). Fidelity of implementation and parental involvement are also essential components to an RTI program (International Reading Association, 2010; NCRTI, 2013).

Universal Screening

Universal screening is the process used to test all students in a school to identify students who may be at-risk for academic difficulty (NCRTI, 2013). This process may be completed three times throughout the year, generally at the beginning, middle, and end (Gerzel-Short & Wilkins, 2009; Hughes & Dexter, 2011; NCRTI, 2013). Although it is recommended that the first round of universal screening be completed at the beginning of the year, data team members must be cognizant of the potential danger of using only this data to place students in an intervention (Fuchs & Fuchs, 2007). It is recommended that

data from universal screening be analyzed in conjunction with data collected in the general education classroom to reduce the number of students identified for tier 1 support (Fuchs & Fuchs, 2007). Additionally, schools may choose to look at the data from the previous year's high-stakes test and compare results based upon the selected criterion to determine students for intervention (Fuchs & Fuchs, 2006; NCRTI, 2013).

Effective screening measures should be sensitive, specific, practical, and have an overall positive effect (Jenkins, 2003). Sensitivity refers to the ability of the assessment in accurately identifying students who are truly at risk of failing in the future. It is advantageous to have more students whose scores reflect a false positive, or needing intervention, than those who do not in order to avoid missed opportunities to help students (Mellard, Johnson, & Fuchs, 2008). Jenkins, Hudson, and Johnson (2007) agree that screening measures must avoid multiple false negatives, students that do not indicate a need for intervention, but advise that measures that yield too many false positives can be a waste of resources and time. If an assessment is specific, it will point out students who will successfully perform at the designated benchmark. Universal screening measures are also practical. They have a quick and simple method of administering and scoring tests (Jenkins & Johnson, 2012). Also, assessments are administered without any special equipment by any school member and in any location. Finally, universal screening measures have an overall positive effect (Jenkins, 2003). Students who are selected based on screening results receive intervention services, which are designed based on their needs, in a timely manner (Jenkins & Johnson, 2011).

It is critical to be as accurate as possible when identifying students for intervention services (Mellard, Johnson, & Fuchs, 2008). Cut scores, the range of scores that determines those students who need intervention and those who do not, can be used to accurately identify students (Jenkins & Johnson, 2011). Additionally, accuracy of administering and scoring the tests increases when all teachers are trained and monitored (Mellard, Johnson, & Fuchs, 2008).

Tiered Instruction

This process begins with high-quality core instruction in the general education classroom; therefore, Tier 1, or primary instruction, is provided to all students including those with special needs and English Language Learners (Fuchs & Fuchs, 2007; Gerzel-Short & Wilkins, 2009). The goal of this Tier of intervention is to provide each student with the opportunity to receive a quality core-based instruction (Johnson & Smith, 2008). This is a requirement when considering students for placement in special education services. IDEA states that students cannot be considered if they have a lack of quality education (United States Department of Education, 2007).

Vaughn (2003) found that 80%-85% of students in the general education classroom, also known as Tier 1 support, should experience success with no additional support. During the universal screening, students are identified for targeted assistance and short-term progress monitoring (Fuchs & Fuchs, 2007; Jenkins & Johnson, 2011). Students who fail to meet expected benchmarks in the general education setting are then targeted for potential academic assistance. These students often receive additional support from the classroom teachers (National Center for RTI, 2013).

Fisher and Frey (2010) suggested that the most powerful method to ensuring student success at the primary intervention level is to use the release of responsibility model. The model works to provide quality instruction by strengthening student confidence and allowing for independence. First, teachers must ensure students understand the purpose and function of the content taught. If teachers carefully establish purpose and design instructional activities that follow that purpose, they can then assess if students have responded to the instruction. In addition to setting clear purpose, teachers must effectively model the task presented. Teachers must provide an example of what they are thinking when reading, writing, or completing the task. Once teachers have set a clear purpose and provided a model, they must now provide guided instruction. Guided instruction is the use of cues, prompts, and questions to encourage student engagement.

After guided instruction has taken place, Fisher and Frey (2010) suggested that students participate in productive group work. Participation in group work allows students to practice the concepts taught with their peers. Students are now able to consolidate their learning by discussion, asking, and answering questions (Frey, Fisher, & Everlove, 2009).

Finally, students are given the opportunity to practice the learned concept independently. At this phase, students should feel confident to complete the practice (Fisher & Frey, 2010). If teachers have clearly set the purpose, modeled the task, and allowed for collaborative practice, students should complete the practice with confidence and competence.

Students who do not demonstrate success in the general classroom are referred to further academic supports through Tier 2 intervention (Johnson & Smith, 2008; RTI Network, 2011). Tier 2 interventions are sessions that are conducted in addition to instruction given in the general classroom (RTI Network, 2011). The interventions must be aligned with core instruction, designed to fill the gap of Tier 1 instruction based on the results from the screening measure (Fisher & Frey, 2010). This level of support allows teachers to provide more intense scaffolded instruction, specific feedback, and more collaborative practice (Fisher & Frey, 2010; Searle, 2010). Students who require more intensive intervention will receive the additional instruction from the expert in the content area, the classroom teacher. The classroom teacher may also receive additional support for modifying instruction from the intervention specialists and the special education teachers.

Tier 2 instruction requires teachers to plan more explicit, intensive, supportive, and monitored instruction (VanDerHeyden & Burns, 2010). Lessons are closely tailored to concepts taught in the general setting (Christo, 2005); however, more time will be dedicated to explain the concepts in smaller chunks (West Virginia Department of Education, 2005). Additionally, struggling learners at this level require more positive feedback and scaffolded instruction (Fisher & Frey, 2010). Finally, data will be constantly gathered to assess progress (Johnson, 2011).

Many researchers agree that Tier 2 interventions should take place 3-5 days per week for 10-40 minutes (Fuchs & Fuchs, 2010; Gerzel-Short & Wilkins, 2009; NCRTI, 2010. Dissent exists about the duration of the length of the cycle. Some researchers

suggest that Tier 2 intervention sessions may be on a cycle of 6 to 15 weeks (Fuchs & Fuchs, 2008; Johnson & Smith, 2008; NCRTI, 2010; Searle, 2010; Tilly, 2008) while other research suggests that a minimum of 20 weeks is imperative for success (Fisher & Frey, 2010).

In many RTI frameworks, Tier 3, is the most intensive level of intervention (Fuchs & Fuchs, 2007; Gerzel-Short & Watkins, 2009; NCRTI, 2010; Searle, 2010). Tier 3 intervention is characterized by more complex, personalized instruction (Fisher & Frey, 2010; Fuchs & Fuchs, 2007; Gerzel-Short & Watkins, 2009; NCRTI, 2010; RTI Action Network, 2011). To gain insight on the effectiveness of the intervention, students are assessed more frequently and instruction will change based on the outcomes of the assessment (Fisher & Frey, 2010; Gerzel-Short & Wilkins, 2009; Johnson & Smith, 2011; NCRTI, 2010; Searle, 2010). Teacher modeling, direct instruction, paired practice, and independent practice characterize this level of intensive services (Searle, 2010).

Because of the specified intervention, no more than three students can participate in Tier 3 groups (Brozo, 2009; Searle, 2010). The small group size allows the teachers to provide quality focused practice accompanied by specific feedback. The instruction given should be designed to help students close the skill gaps that cause them not to be successful in the general education classroom (Fisher & Frey, 2010; Johnson & Smith, 2011; Searle, 2010).

Is is important to note that, in many models, Tier 3 intervention does not automatically equal special education (Fuchs & Fuchs, 2007; Gerzel-Short & Wilkins, 2009; NCRTI, 2010; Tilly, 2010). However, if students continue to show a lack of

progress through Tier 3 interventions, they may be referred to testing to consider if they are eligible for special education services (NCRTI, 2010; Searle, 2010; Tilly, 2010). At this time, the intervention team will evaluate the students' academic progress, including the data collected during Tier 1 and Tier 2 intervention sessions (Brown-Chidsey, 2007).

Progress Monitoring

In the RTI model, assessment and high quality instruction are critical to higher student achievement (Johnson & Smith, 2008; NCRTI, 2013). In order to gauge progress, students are assessed frequently to gather data on the effectiveness of the intervention (Gerzel-Short & Wilkins, 2009). Progress monitoring is conducted in order to (a) assess students' response to the given intervention, (b) determine rates of improvement, (c) assess quality of instruction to ensure its impact in meeting the individual needs of students, and (d) determining if teachers require additional coaching to strengthen instruction (NCRTI, 2010; Stecker et al., 2008).

Because all tiers are critical to the success of the RTI program, each tier should use progress monitoring to plan instruction (Stecker, et al., 2008). Progress monitoring measures are given frequently, at least once per month, to assess progress on intervention goals. Progress monitoring assessments may be formal or informal (Fisher & Frey, 2010). Frequent checks ensure that teachers are constantly assessing students' growth, checking to ensure the current intervention is working, and adjusting the intervention to effectively increase the students' learning (Fuchs et al., 2008). When progress monitoring is implemented, students receive instruction tailored to meet their needs based upon careful

decisions driven by data collected by teachers (Dexter & Hughes, 2011). Additionally, teachers' expectations increase and special education referrals decrease.

Table 1

RTI Progress Monitoring

Content Area	Process/ Monitoring Instrument	Qualifying Criteria
Mathematics	Individual student goals are established based on universal screening measures and other district summative data The goal is broken down into manageable parts for instruction and is aligned with grade-level curriculum The student is informally assessed daily to check progress on given goal	Nonresponsiveness is determined when required scores are not met on progress monitoring measures and other criteria is not met

(Prewett, Mellard, Deshler, Allen, Alexander, & Stern, 2012)

Data-based Decision Making

The success of an RTI program is dependent upon the strength and accuracy of its assessments (Margolis, 2012). Students require frequent checks in their work to ensure educational progress and to monitor if they need modifications in their teaching (Lembke & Stecker, 2007). One research-based formative assessment used to make decisions in an RTI program is curriculum-based measurement (Anderson, Lai, Alonzo, & Tindal, 2011; NCRLD, 2006). Although originally designed to assist special educators with monitoring the progress of their students, curriculum-based measurement (CBM) has evolved over the years to represent a method for teachers to use reliable data to record and improve the academic growth of students (Deno, 2003; Stecker, Fuchs, & Fuchs, 2006). CBMs can give teachers an idea of the impact of the interventions on student progress and how instruction should be modified to improve progress (Clarke, 2009). CBMs can be used at

any level of RTI including screening, monitoring progress, and determining eligibility for special education services (Clarke, 2009).

CBMs have three distinctive characteristics. First, CBMs measure students' progress on long-term objectives (Stecker et al., 2005). In an RTI program, long-term objectives are based on grade-level standards or school district requirements (Clarke, 2009; Lembke & Stecker, 2007). Each CBM given would address all of the required standards for that particular grade level; however, the specific question or order of the skills should change for each test (Deno, 2003; NRCLD, 2006; Lembke & Stecker, 2007). Additionally, CBM assessments are given frequently, often once or twice per week. Lembke and Stecker (2007) suggested that the assessments should be no longer than 8 minutes; however, Deno (2003) strongly recommended a 1-3 minute timeframe. Because of the frequent use, assessments should be easy for teachers to administer, score, and record (Lembke & Stecker, 2007). Finally, CBMs must be research-based and proven for use to measuring student progress (Lembke & Stecker, 2007; Stecker et al., 2005).

Students will continue to suffer academically if the assessments used to monitor students' progress are not effective (Margolis, 2012). Therefore, teachers must take great care to ensure that all CBMs are reliable, valid, easy to administer, and easy to analyze (Deno, 2003; Margolis, 2012). Additionally, time should be dedicated to properly train all staff members in the CBM process to ensure accuracy and fidelity (Clarke, 2009; Deno, 2003). The data from the assessments will be imperative to determine the success or failure of the intervention, as well as if the level of services must be changed in order for the student to make academic growth (NASDE, 2006).

Fidelity of Implementation

Fidelity of implementation is a critical component of any RTI program. Reschly and Gresham (2006) defined fidelity as the level to which something is "implemented as designed, intended, or planned" (p.6). In any RTI model, it is imperative that the intervention has been implemented as designed for student success (Prewett et al., 2012). Additionally, no determination of a disability can be made if students have not received specialized instruction in the general education program (Johnson, Mellard, Fuchs, & McKnight, 2006).

Fidelity of implementation also includes a system that ensures universal screening and progress monitoring measures are completed as scheduled and in relation to the problem-solving team's decision making process (Johnson et al., 2006). The fundamental goal of fidelity of implementation is to analyze the effectiveness of classroom instruction as well as RTI implementation on the academic success of students (Johnson et al., 2006). If the intervention has been implemented as designed, school leaders can rule out specific aspects of the intervention that need to be redesigned or improved.

Fidelity of implementation can be improved by accurately explaining methods and techniques for instruction, clearly delineating roles for implementation, providing insightful feedback to staff members that provide the instruction, and outlining consequences of not complying with the intervention as designed (Reschly & Gresham, 2006). Equally important is the need for an opportunity for all interventionists to receive feedback on their implementation (Keller-Margulis, 2012). This allows the intervention

team to be observed adhering to deadlines and implementing the intervention correctly, and then discuss areas of improvement and growth.

Table 2

Methods to Ensure Fidelity of Implementation

Category	Fidelity Check Options
Tools	Classroom observations
	Progress monitoring results
	Observation checklists
	Teacher interviews
	Student work samples
	Peer observations
Staff	Principal
	School psychologist
	RTI coordinator
	Teachers
Frequency	Scheduled observations
	Unannounced observations

(Prewett et al., 2012)

Parental Involvement

Parents should be involved at every level of the RTI process. School staff should always assume that parents want to be a part of the process, and they want to be educated on strategies that will promote the success of their students (Byrd, 2011). Byrd (2011) cited specific reasons why parental involvement is valuable in the RTI process. One reason for involvement is to educate parents about the language and process of RTI. The education-specific language and criteria could be overwhelming to parents which could result in a lack of participation (Pena, 2000). For example, even though teachers are speaking the language of tiered-interventions, parents could possibly think special education (Byrd, 2011). Secondly, parents could present confusion between the tiered system of intervention and a one-time opportunity for academic improvement (Byrd,

2011). The system should be thoroughly explained so that parents understand that there are multiple opportunities in place to guide students toward meeting their specific academic goals.

Another key reason to involve parents in RTI is to help them understand that the RTI process could lead to a special education referral (Byrd, 2011). Ideally, the goal is to increase support so that all students can be successful. However, students who continue to experience slow growth and improvement may need a special education placement to receive a more intensive level of support (Byrd, 2011; NCRTI, 2013). Parents are legally required to be a part of the special education process; thus, including them in the step-by-step process could increase their understanding and participation in the process.

Finally, increased parental involvement may result in positive results for both students and parents (Byrd, 2011). Although increased student achievement is not guaranteed, research has shown a positive relationship between parental involvement and student achievement (Fan & Chen, 2001). It is important to note that involvement cannot be forced upon parents, and no judgments should be made on any parents who may only have a limited role of involvement (Byrd, 2011; Pena, 2000). Nevertheless, all attempts should be made to keep parents involved and build positive relationships in the RTI process.

RTI Models: Standard Protocol vs. Problem-Solving Protocol

Two models of intervention are most commonly used in the RTI framework: standard protocol and problem solving protocol. The first, standard protocol is characterized by the use of a single standard treatment for all students with similar needs

(Hoover et al, 2008). This option has been beneficial to schools to maximize use of staff and minimize the number of intervention groups (Shapiro, 2009). An advantage of the standard protocol model is its ability to be replicated because of the standardization of procedures (VanDerHeyden, 2011). Similarly, this model is effective when measuring fidelity of the intervention (The Iris Center, 2011). In contrast, a major disadvantage to the standard protocol model is its focus on one predetermined intervention (Searle, 2010). This "one-size-fits-all" approach may not meet the specific academic needs of students who require the intervention.

The problem-solving protocol focuses on meeting the specific instructional needs of each student (Fuchs & Fuchs, 2008; VanDerHeyden, 2011). The model includes a school-based team that meets to assess the students' performance and create interventions to meet the specific academic need (Shores, 2008; VanDerHeyden, 2011). The school-based team also meets to evaluate the intervention and its impact on the students' success. One advantage of the problem-solving model is its design to provide individualized instruction to students who have not met specific goals (Fuchs & Fuchs, 2008). Moreover, the instruction can be modified to meet the needs based on data from progress monitoring (Searle, 2010). Adversely, a disadvantage to implementing the problem-solving protocol is the possibility for fidelity to be compromised because of its subjectivity and flexibility (VanDerHeyden, 2011). Also, it can be time-consuming with the additional planning time required to plan for individualized instruction (Searle, 2010). A final point to consider is the model assumes that anyone working with an intervention

group has had training in conducting assessments and can determine an appropriate intervention based on the results (Fuch & Fuchs, 2008).

According to research conducted by the Iris Center (2011), the problem-solving approach and the standard protocol approach are very similar in practice. Particularly, the greatest difference lies in conducting the Tier 2 interventions. Similarly, both models begin with a specific assessment for universal screening. Moreover, frequent progress monitoring is used in Tier 1 to gauge progress and specific gains in academic performance. In contrast, Tier 2 intervention varies by way of delivery method. In the standard protocol method, the teacher that is delivering the intervention makes decisions regarding instructional materials. Along with that, students with similar needs are grouped together and receive the same instruction. On the other hand, in a Tier 2 problem-solving method, a problem-solving team makes decisions regarding instructional materials and delivery. Equally important, the intervention is specifically designed for each student as determined by assessment data.

RTI in the Middle Schools

Transitioning to middle school represents a major milestone in a student's academic career. Middle school students have to adapt to changing classes, meeting the demands of multiple teachers, and remaining in school for a longer period of time (Johnson & Smith, 2008). These expectations coupled with the academic needs of some students can present a major challenge at this level. RTI can provide a model of instruction, assessment, and intervention to provide academic success for all middle school students (Johnson & Smith, 2008). This is critical for this level because at this

point academic deficits have become more pronounced and can become more severe as students matriculate through school (Fuchs, Fuchs, & Compton, 2010; Ehren, 2011). RTI can also provide evidence of a disability after years of lacking the discrepancy needed to qualify for special services through the traditional route (Ehren, 2011).

Research for implementing RTI in the middle school setting is limited (Johnson & Smith, 2011); however, the research indicates that middle school RTI does have special factors that should be considered (Ehren, 2011). According to a survey conducted by the National Center on RTI (2011), major goals of a middle school RTI program can include closing the achievement gap and meeting academic goals within all subgroups of students. Scheduling should also be taken into account when creating an intervention program in middle school. Schools must be creative when designating times for intervention groups to meet (National Center on RTI, 2010). Many groups are scheduled during a "flex" period or an elective class, or even during a core class if more specialized instruction is needed (National Center on RTI, 2010; Ehren, 2011).

Although research is limited for RTI mathematics programs, research has been conducted regarding the use of RTI reading programs in the middle school. Faggella-Luby and Wardwell (2011) conducted a study in a large, inner city urban school to ascertain the impact of three different treatments on reading comprehension of struggling middle school students receiving tier 2 intervention. The three treatments, Story Structure, Typical Practice, and Silent Sustained Reading, were randomly assigned to individual students. Students were selected for participation based on their results on the school's screening measure. Several key ideas were discovered through their study

(Faggella-Luby & Wardell, 2011). First, data proved that there is a need for intervention in the middle school. Additionally, explicit instruction for struggling readers should include strategies on how good readers comprehend. Researchers also found that careful attention should be given to instructional time and ensuring that teachers understand how to best use the time to meet the needs of the students.

Another research study was conducted to assess the impact of researcher-based instruction on the reading of Tier 2 students (Vaughn et al., 2010). This group of researchers designed the year-long study to close the gap between those struggling students and students performing at grade level by addressing word recognition, fluency, vocabulary, and comprehension. All sixth grade students from the research sites identified as having reading difficulties based on state assessment scores, as well as a random control group, participated in the study. One significant detail from this study is that all content area teachers received specific professional development targeted at improving instructional practices in vocabulary and comprehension.

Students who received Tier 2 intervention score made more gains on the screening measure than those in the control group; however, the gains made were small (Vaughn et al., 2010). After reviewing the data, the researchers noted that it might be unrealistic to expect that students would close the learning gap in one year after only being exposed to a 50-minute daily intervention class. They also concluded that it may be more beneficial financially and logistically to spend resources in strengthening Tier 1 methods and implementing more Tier 3 interventions.

Pyle and Vaughn (2012) also conducted a study to discuss the effects of a 4-tiered intervention program on secondary students, as well as discuss more strategies for implementing RTI at the secondary level. Participants for the study included students who did not meet state requirements on the reading portion of the state assessment in 7 rural, urban, and suburban schools in 2 large cities in the Southwest. Teachers at each of the research sites participated in a professional development that targeted vocabulary development and comprehension strategies. They were also able to request in-class coaching if needed.

Results of this study showed that intervention for struggling readers allowed students to continue making progress in their reading (Pyle & Vaughn, 2012). Even students who demonstrated severe reading difficulty made minimal progress and did not regress as those struggling students who did not participate in any intervention. Data also showed that intervention for secondary students who have reading difficulty should be addressed with different levels of intervention with varying intensity and should include instruction all components of reading.

Advantages and Challenges of RTI Implementation

There are many advantages to implementing RTI programs in the middle school. A major advantage is the expectation that all students will be successful through a system of instruction and tiered support when needed (Johnson & Smith, 2008). Students are exposed to quality, research-based instruction in Tier one and are presented multiple opportunities to demonstrate understanding or the need for additional support through universal screening and progress monitoring measures. Furthermore, RTI can be viewed

as a preventive program, providing students with an opportunity to receive help before failing (Mellard, Frey, & Woods, 2012). This system is accomplished through a set of scheduled screenings and frequent progress monitoring. Additionally, all teachers receive intensive professional development for increasing skills in the general education classroom (Prewett et al., 2012).

Unfortunately, there are also obstacles that challenge successful RTI implementation in the middle school setting. One challenge to the implementation of RTI programs in the middle school is scheduling (Borzo, 2009; Fuchs, Fuchs, & Compton, 2010; Prewett et al., 2012). It is often difficult to create time in a middle school schedule and find available space in a middle school for pull-out intervention. Another challenge is the lack of professional development regarding the expectations of implementation (Sanger, Friedli, Brunken, Snow, & Ritzman, 2012). According to research conducted by Sanger et al. (2012), teachers felt that their training was unclear, overwhelming, and did not give specific details about components of the RTI model. Universal screening measures also present a challenge for implementation at the middle school level (Vaughn & Fletcher, 2010). Since students are exposed to various measures of criterion- and norm-referenced tests, there should be sufficient data to determine if students need additional support. A final disadvantage to implementation is the lack of standard protocol measures for secondary students (Johnson & Smith, 2008). Because much of the research for RTI is conducted in the elementary school, guidance for implementation focuses on the early grades.

RTI and Mathematics Intervention

Research has shown opportunities for at-risk students to receive additional instruction in mathematics can be beneficial in assisting students catch up with their peers (Piper, Marchand-Martella, & Martella, 2010). In 2009, a panel of college professors, special educators, and mathematics coaches were chosen to create a practice guide for implementing a RTI mathematics program to provide this necessary instruction through a study sponsored by the U.S. Department of Education (Gersten et al., 2009). The panel analyzed several experimental RTI studies, as well as those for assessment and progress monitoring. Out of this research came eight recommendations to help schools implement their RTI mathematics program.

The first two recommendations are closely linked through the area of assessment. The panel suggested that schools test all students to identify those who may need additional instructional support (Gersten et al., 2009). This is most evident in the universal screening component of the RTI model. Each year students are screened at the beginning of the school year to identify those who may be at risk for learning difficulties (Hughes & Dexter, 2011). The panel also proposed that students who are receiving intervention should receive grade-level assessments to gauge progress (NCRTI, 2011). This is further supported by the recommendation from the National Center on RTI to include progress monitoring as a part of any RTI program (NCRTI, 2013). Similarly, the National Mathematics Advisory Panel (2008) proposes that ongoing formative assessments are beneficial to planning quality, individualized instruction.

The third recommendation states that there are specific skills that grade levels should be able to master (Gersten et al., 2009). The Council advised that middle school students should concentrate primarily on mastering concepts using rational numbers (Gersten et al., 2009). This recommendation is aligned with the National Council for Teachers of Mathematics (2000) specific middle school standards which state that middle school students should be able to demonstrate proficiency with rational numbers and computation, as well as algebraic and geometric concepts. Similarly, the National Mathematics Advisory Panel (2008) recommended that all kindergarten – eighth grade students should have a deep understanding of fractions, geometry, measurement, and whole numbers in order to be successful in algebra.

Students who require mathematics intervention should receive direct, explicit instruction rather than hands-on discovery learning (Fuchs, 2011). Along those lines, the panel also suggested an explicit and systematic method for teaching any mathematics intervention (Gersten et al., 2009). They suggested that explicit teaching includes models for solving problems and thinking aloud while teaching, followed by opportunities for guided practice, feedback, and review of previously learned skills.

Intervention teachers must be very deliberate when selecting materials for Tier 2 and Tier 3 instruction. Therefore, the panel offers advised that materials used for intervention have visual representations to match instruction (Gersten et al., 2009). Visual representations are drawings, pictures, sketches, or other graphic representations used to teach or explain specific mathematics concepts or processes (Jayanthi, Gersten, & Baker, 2008). The teacher should begin instruction by creating a model given skill to provide the

most effective instruction, rather than allowing students to create models on their own (Xin, Jitendra, & Deatline-Buchman, 2005). Once the teacher has provided instruction using the models, students must have an opportunity to practice the skill with the teacher using the models (Manalo, Bunnell, & Stillman, 2000).

Because solving word problems is a critical skill for mathematics success, the panel's sixth recommendation includes providing specific instruction on how to connect similarly structured problems (Gersten et al., 2009). Instruction for the intervention by teaching students the specific skills they will need throughout the course (Fuchs, 2011). Following this, teachers should design instruction that teaches students how to think through and plan solutions for a variety of skill sets that can be applied to problems they will encounter in the general education curriculum (Fuchs, 2011). Other research conducted by Xin et al. (2005) found that schema-based instruction is more beneficial than traditional problem solving methods. Schema-based instruction teaches students how to use a schema model to represent the problems. Students then create a mathematics sentence based on the information placed on the model before solving the problem.

Research conducted by the National Mathematics Research Panel (2008) noted daily practice of basic mathematics facts is essential to mathematics success. For this reason, the panel proposed that about 10 minutes of each intervention session be dedicated to review basic facts. According to data from a survey conducted by the National Mathematics Panel, a common concern among middle school teachers is the lack of basic mathematics skills when entering Algebra classes (2008). Students continue to fall behind in higher-level classes without these fundamental skills (Fuchs, 2011).

More specifically, intervention in higher grades should focus on reviewing and applying mathematics properties including commutative, associative, and distributive to increase automaticity of basic facts (National Association of Elementary School Principals, 2011).

One final recommendation from the panel is to incorporate different strategies to motivate the students for success (Gersten et al., 2009). Students have continued to experience failure in mathematics, and as a result, they may not be willing to try (Fuchs et al., 2008). When students are given extra assistance in building mathematics skills and concepts, they will take a more active role in their classes and feel more confident about asking for assistance (Piper, Marchand-Martella, & Martella, 2010). One method to build this confidence is to implement strategies for self-regulated learning. Self-regulated learning takes place when students take a more active role in the development of their learning and self-improvement (Paris & Paris, 2001). This process is often seen when students receive instruction from supportive teachers (Kronenberg & Strahan, 2010). Positive school experiences could lead to greater student momentum, the relationship between the students' academic engagement and their willingness to complete their tasks (Kronenberg & Strahan, 2010). Based upon his research, Strahan (2008) established a system of gaining momentum with unenthusiastic students. First, teachers must create an environment that focuses on building trusting relationships and collective teamwork. After a sense of community has been established, students may feel confident in taking chances within the classroom. Students begin to trust each other and the teacher to give positive feedback and direction. The next stage in this process is setting goals and reflecting on how they will accomplish those goals. Once students have set their goals,

they begin to experiment with their own learning by using a variety of self-selected strategies based on their thoughts and feelings. Through this process, students have gained confidence to trust their own learning ability which in turn increases their momentum and achievement.

Another key point in mathematics intervention is the use of peer-to-peer learning in the small group setting (Owens & Fuchs, 2002). Students who work together can do so while the teacher is assisting other students, or if they feel more confident, they can ask another student. They are able to collectively solve problems by recalling previously learned strategies and share other valuable background knowledge necessary to solving the problem.

Methodology

Quantitative research in education seeks to answer the question why, seeking out factors to explain the cause of the issue, event, or behavior (Mason, Bray, & Adamson, 2007). Researchers also use quantitative studies to verify a hypothesis, refine the theory to a hypothesis, test the hypothesis, and analyze the statistical data (Mason, Bray, & Adamson, 2007). Qualitative research focuses on the interpretation of human activities (Lodico, Spaulding, & Voegtle, 2010; Stake, 2010). The purpose of qualitative research is to gain insight into a specific issue or event through the participants' perspectives (Mason et al., 2007). Conversely, quantitative research allows researchers to collect data that can be verified though numerical means, while qualitative research gathers data through interviews or holistic observations of participants in their natural environment (Lodico, Spaulding, & Voegtle, 2010; Stake, 2010). Moreover, correlational quantitative

research seeks to use this numerical data to describe the relationship between the given variables (Mason, Bray, & Adamson, 2007). Data can be collected through predetermined tools such as experiments, test scores, surveys, or questionnaires (Creswell, 2003; Mason, Bray, & Adamson, 2007). Mixed method studies seek to triangulate data using both qualitative and quantitative methods (Creswell, 2003).

Conclusion

RTI is a model of scaffolded academic intervention available to all students. Unfortunately, to this date, there is a dearth of research on implementation of RTI programs in middle school mathematics. This review of literature has found suggestions for implementation as well as RTI best practices but no specific model of implementation for Tier 2 and Tier 3 programs.

In section 3, the research process will investigate middle school RTI mathematics programs to find common practices and materials for implementation using the problem-solving model. Middle school RTI teachers will be invited to participate in a focus group to investigate practices in implementing RTI mathematics intervention and gain insight on how the problem-solving method is used to assist struggling learners. Percentages from archived mathematics state test data will also be described to triangulate the data from the focus group.

Section 3: Methodology

The RTI model in mathematics has been researched at all levels (Bryant, Bryant, Gersten, Scammacca, & Chavez, 2008). Although early intervention has been primarily researched in the elementary setting, RTI is equally important in the middle school. Teachers may face the challenge of educating low-achieving students who failed to meet traditional IQ-achievment discrepancy requirements through their elementary years (Ehren, 2012). Participating in a RTI model could encourage students to build academic confidence and focus on basic instructional strategies to help them be successful. Therefore, the purpose of this study is to gain insight into how middle school mathematics teachers use the problem-solving process to design an intervention plan and to understand the strategies they used to implement the plan. This section is a description of specific aspects of the research design that will be used to answer the following research questions:

1. How do middle school mathematics teachers describe their use of the problem solving process when creating interventions for struggling students in mathematics?
2. What strategies do middle school mathematics intervention teachers use to implement interventions for struggling students?

The chapter begins with a description of the research design, participants, and setting used in the study and will conclude with an explanation of the methods used to analyze the data.

Research Design

This study used a qualitative case study design. Archived state test data were used to verify instructional practices presented in all levels of tiered instruction. I began the study by conducting a focus group session. I entered the focus group session with no preconceived ideas about particular schools based on their state test scores. I showed impartiality while recording notes and did not focus my attention on the successes of the implementation.

The first phase of data collection used the focus group interview to collect data on the use of the problem-solving method in implementing mathematics RTI. Researchers use interviews to gain insight on how participants make sense of experiences that occur within the research setting (Hatch, 2002). This study used the focus group with participating teachers to gather information about teachers' perceptions of the implementation of Tier 2 and Tier 3 mathematics RTI groups, as well as differentiation in Tier 1, in the middle school setting. I gathered data to assess the methods used during intervention sessions, as well as to assess the fidelity of the implementation of RTI. The second phase of data collection was a review of archived mathematics state test data. All schools in the local school district must administer the state mathematics assessments, so this should provide standardization of data across the schools. Test data was gathered from the State Report Card website.

Before deciding upon the use of these data collection methods, many options were considered. A qualitative survey would give me the opportunity to ask participants to rate their experience with RTI and mathematics; however, that would not yield the data

needed to answer the research questions. A more detailed closed-ended survey was also considered. This was eliminated because survey responses could have led to a more evaluative measure of the program instead of just giving specific feedback about their use of the problem solving method and the strategies they use during the planning and instructional process. Finally, one-on-one interviews were also considered. This collection method was eliminated because I believed that I could gather additional data as participants responded to each other through questions or further points of discussion.

Setting and Participants

Qualitative research seeks to find and explore relationships between specific phenomena and its impact on participants (Janesick, 2004). Participants were asked to share their perspective toward the phenomena, or be observed within the natural setting of research, so that the researcher can gather data. Participants in the study were chosen through a convenience sample. This method of sampling was preferred because of the accessibility of the participants. There may an overrepresentation of a certain group of students' test scores because of the school system's location in an urban setting. The goal was to have a total of five teachers participate in the focus group sessions; six teachers actually participated in the focus group. Middle school mathematics and intervention teachers who worked with Tier 2 or Tier 3 groups were asked to participate. General education teachers were invited to participate because their instruction and differentiation is critical in Tier 1. Intervention teachers were invited because of their specialization and experience in working with struggling students. This sampling of teachers could give

more insight into how intervention programs vary at the different schools and provide suggestions based on their current programs.

My former school served as the research site for this study. The school is a public urban charter school located in a northeastern school system. The school is separated into two single-gender schools that offer 5th-8th grades; however, only 6th – 8th grade teachers were invited to participate. Approximately 86% of the students of the school receive free or reduced lunch, and 94% are minority students. There are 418 students at the school, of which approximately150 students participate in the RTI program. This number may vary between rounds because of students who may enter or exit the intervention program.

I met with the middle school principal and explained that the mathematics RTI program was be the focus of the research study, as well as to request their school's participation in the study. A copy of the IRB application, along with specific details regarding the study, was given to the principal. I emailed all participants a copy of the consent form (Appendix A) or provided a hard copy when requested. Participants were asked to share their insight in implementing the problem-solving method when planning RTI in mathematics.

Ethical Considerations

In order to carry out an ethically sound research study, several considerations must be made including securing consent, informing participants of any potential risks, and preserving confidentiality (Drew, Hardman, & Hosp, 2008). Participants were given details of the study, including objectives and their rights as participants, in writing before

any data was collected. They were also provided with any potential physical or emotional risks associated with participation in the study. After hearing details and any associated risks, participants responded in writing signifying their consent to take part in the study. Finally, participants had access to findings from the study.

All physical data collected were saved in a locked file cabinet. To protect the input and data from participants, a professional shredding company will shred physical data and its subsequent findings at the conclusion of the required 5 years. All computer files will be deleted to further protect the anonymity of participants. Before beginning any research, approval was sought the Institutional Review Board (IRB) of Walden University (Approval No.05-08-15-0119363) to further ensure ethical safeguards were met.

Role of the Researcher

At the time of the initiation of this study, I served as an intervention teacher and student support team coordinator at the research site and did not serve in any supervisory capacity. I have served as a math and reading intervention teacher for 6th, 7th, and 8th grades. As an intervention teacher, I was responsible for planning weekly instruction for my students based on initial screening results and curriculum-based assessments given throughout the intervention. Data was also collected through assessment checks that students complete after learning a specific skill. Although I am involved, several measures were taken to uphold ethical research standards as described in the preceding section. I ensured participants from my school that their responses are confidential, as no names were given from the focus group. I was hopeful that their desire to improve RTI

mathematics instruction would positively affect their willingness to participate and the honesty in their responses.

One limitation of using a case study is that the researcher could integrate subjective feelings into the research. Participants were asked open-ended questions to maintain the integrity of the research and reduce subjectivity. Because of my background as a RTI mathematics teacher, I had to bracket any biases that I may bring to this study. I understand the need to separate myself from the data, so I kept notes of my personal feelings about the data in a separate reflection notebook. At this point in my study, I believe that RTI is an essential component to the academic success of at-risk students; however, it must be implemented and maintained with fidelity in order to be most effective. In my experience, the problem solving method has been present at all stages of RTI planning and implementation. Students achieved more success when RTI groups met consistently and materials were prepared according to results on progress monitoring measures. All of these feelings must be documented in order to present my data clearly.

Data Collection

This study used qualitative data to gain insight on how middle school mathematics teachers use the problem-solving process to design an intervention plan and to understand the strategies they used to implement the plan. Data sources for this study included:

- Responses from focus group interviews and
- Document review of archived mathematics state test data.

The following sections delineate the data collection methods that will be used in the study.

Focus Group Interviews

Participating RTI teachers were interviewed by the researcher to obtain information about the implementation of the mathematics RTI program in their middle school. Prior to conducting the interviews, the questions were Beta tested and given to two colleagues for feedback. They were asked to analyze the questions for clarity and subjectivity. Colleagues were also asked to suggest any questions that they believe would be useful in this research study.

In preparation for the focus group, I ensured that I had 5-6 participants that represent a variety of grade levels. The participants were a combination of Tier 1, Tier 2, and Tier 3 teachers. Additionally, I created a matrix that listed the participants and the research questions. This was helpful as I listened and recorded notes from each participant related to body language and facial expressions, as well as any incomplete statements. It also prevented me from adding any biases during the questioning process. During the focus group, participants were asked to describe their use of the problem-solving process when planning mathematics RTI intervention for struggling students. I further elaborated on this question by asking the participants to describe challenges and successes of their mathematics RTI program. Participants were asked to describe the strategies used, including any curriculum-based measures, in their problem-solving process. Finally, I asked the participants if they have any final thoughts that I did not

address through my questioning. The interview was recorded so that I may transcribe after.

Document Review of Archived Mathematics State Test Data

Archived scores from the state mathematics assessment were used to explore student success in mathematics and to help triangulate data. Scores were retrieved from http://data.nysed.gov. Test scores reflected how the RTI implementation impacted the students as a school. If teachers implemented interventions at Tiers 1, 2, and 3, test scores should reflect growth in the mathematics scores. Using state test scores standardizes the results, as different schools may use different universal screening measures. Test data from spring administrations of the mathematics state test were collected and reviewed from consecutive years from 2012, 2013, and 2014. The 2012 cohort of 6th grade students were used for data collection because they would have matriculated through the three years of comparison. Data was presented as a mean score of all mathematics subtests. The document categorized students by the percentage of students who scored at Levels 1, 2, 3, and 4.

Data Analysis

According to Merriam (2002), data collection and data analysis are a simultaneous occurrence that allows the researcher to make adjustments during the evolving process. In this study, data was analyzed after it is collected so that I can stay informed of any progression in the research process. It is important to track progress because new questions may arise. As new questions arise, I included them in my reflection journal notes.

Focus Group Interview

Before beginning the analysis of the focus group, I created a Google Docs spreadsheet for each research question. I then transcribed each focus group session, ensuring that I note all contributions from each participant. I used a word processing format to transcribe the interview. After transcribing, I cut and paste relevant information under the appropriate research question. Once I added all of the notes, I color coded responses based upon similarities of the responses. This particular document had three pages, one for each research question, and I used the data to construct a summary for each research question.

Creswell (2007) suggested looking for patterns within the data and finding relationships between categories presented through the data. After the responses have been color coded, I had an additional page that contained possible themes for the responses. Each column represented a research question, and I copied similar groups of responses into the appropriate column to search for broad categories. After reviewing the categories, I searched for themes within the categories. Themes are ideas that are found consistently through all of the data (Hatch, 2002). I identified possible themes by writing broad statements that summarize the data presented.

Document Review of Archived Mathematics State Test Data

I decided to use the qualitative method of a document review by reading data of records. Data was presented by percentages of students who scored in the specific levels on the New York State Report Card found on the New York State Education Data website. Since I sought to find the impact of the RTI intervention on the academic

success, I reviewed the mean mathematics test scores from 2012, 2013, and 2014 to determine if there was a difference in the percentage of students who scored at each level on their mathematics state test scores. The use of this type of data to triangulate the data from the focus group interviews builds assurance in the findings (Hatch, 2003). I reviewed the percentages of students who scored at Level 1, Level 2, and Level 3-4 data for the selected years.

Conclusion

Data from focus group interviews, as well as archived mathematics state test data, was used in order to support or refute the impact of the problem-solving process on RTI mathematics. Teacher may share strategies for implementation of RTI, as well as materials that they use to implement the intervention through the interview process. It would also be beneficial to note any successes and challenges that teachers experience in the planning and implementation phase of the RTI mathematics process.

In Section 4 of this study, I cover the following: (a) the findings of my research study as they relate to my research questions, (b) tables and figures of the data collected, and (c) a summary of the outcomes of my focus group and the analysis of the archived mathematics state test data. Any patterns and themes that I discover will be revealed and discussed.

Section 4: Results

Introduction

This qualitative case study was designed to explore the problem-solving process and its success in supporting struggling middle school math students. Existing research indicated there to be a lack of RTI studies conducted in the middle school, specifically in mathematics. The research questions formulated for this study were created to gain insight into how middle school mathematics teachers describe their use of the problem-solving process when creating interventions for struggling students in mathematics, as well as to delineate strategies that middle school intervention teachers use when implementing interventions for students.

After conducting the focus group interview with RTI middle school intervention teachers, the session was transcribed. Audible sounds to signal any agreement, or disagreement, among the participants were added. Following the transcription, all participants member-checked the transcript for accuracy and all approved. I then reread the transcript and created a document with the focus group questions aligned with the reearch questions. After reviewing all related responses, themes that aligned with the research questions were identified. Those themes are presented below.

The results from this single case study constituted a triangulation of (a) a summary of responses from a focus group session with middle school intervention teachers and (b) archived state test data. In the first phase of the qualitative data collection, the focus group participants outlined the RTI process at their school, along with their roles as teachers in the process. Instructional strategies in the classroom were

compared, intervention strategies were shared, and benefits and challenges were revealed. Likewise, the second phase of the data collection used a document review compared data from 3 consecutive years of mathematics state test data to show growth in all levels of tiered instruction.

Focus Group Interview Responses

After coding the responses from the focus group interview, several themes were found about the RTI process in middle school mathematics:

1. Use of the problem solving process
2. Participation in the RTI implementation process
3. Collaboration/communication
4. Administrative support
5. Challenges of implementation
6. Successes from implementation.

The themes were found throughout the responses to the interview questions, which showed consistency and collaboration among this team of teachers.

Focus Group: RTI and the Problem Solving Process

Research question 1 asked teachers to describe their use of the problem solving process when creating RTI interventions for students in mathematics. Before describing the use of the problem solving process, teachers were first asked to describe the RTI process at their school. Teachers explained that the process began at the beginning of the year with the diagnostic screening measure Star Math. All students were required to take the curriculum-based measure so that all scores could be compared. The RTI team met to

determine the students whose scores fell in the strategic and intensive ranges based on Star Math and state test data. One teacher added that the scores shared by the RTI team were helpful to determine where to begin the Tier 1 instruction in the classroom. Along those lines, the RTI team selected students with the most needs to be in the strategic (Tier 2) and intensive groups (Tier 3) for the first round of intervention. Tier 2 groups met 2 days a week for 40 minutes each session and were kept to no more than 10 students. On the other hand, Tier 3 groups met 4 days per week for 45 minutes each session, and the groups had no more than 3 students. Teachers stated that the low numbers were imperative to the success of the groups because the small number allowed them to really address what each student needed.

Assessments were a major component of the school's RTI process. Students in RTI were given daily assessments such as do-nows and exit tickets, along with weekly assessments based on the standards taught. In conjunction with the frequent standards-based assessments, Star Math was given every 10 weeks to measure growth and to determine if students were able to move into a new tier. Additionally, Tier 3 students were assessed using the AIMS Web measure. At the end of the quarter, students were also given interim assessments, and the scores became another data piece for how students moved throughout the tiers. One participant commented, "The fluidity of the program is the key component because kids are able to move up or down depending on where they stand." If the students were successful with their intervention by demonstrating specific targets on their assessments, they were able to move down to Tier 2 from Tier 3 and from Tier 2 to Tier 1. Adversely, if students needed more assistance,

they could also move into a higher tier or move into the RTI process from Tier 1. The participants agreed that sharing the data with the students was beneficial to their success. When students received immediate feedback, they knew what mistakes were made and how to prepare for additional instruction. The students also enjoyed seeing their progress on Star Math and celebrating their growth.

This research question also led teachers to describe their role in this process. General education teachers agreed that their first role in the process is to ensure that all students are receiving strong instruction in the classroom and that struggling students are supported in the classroom. Daily lessons are designed not just to reach the higher students, but each lesson gives an opportunity to scaffold instruction for those who need it. Teachers are also frequently gathering data from the class work and from assessments to add to the RTI data process. One teacher commented that one of his roles included the responsibility for taking any misconceptions that were uncovered in small group instruction back to the whole class to assist all students. The instructional support teachers met primarily with Tier 3 students and planned their instruction according to skills on Star Math and AIMS Web data. They were also responsible for attending weekly meetings with general education teachers to check in on the RTI intervention. This group of teachers was responsible for assisting teachers in planning for intervention and providing support for general education teachers when needed.

Focus Group: Strategies, Benefits, and Challenges

When asked about specific strategies, participants shared some of the ideas they had implemented in their different levels of tiered instruction. Four of the participants

noted some use of peer instruction or peer interaction in their instructional planning. One teacher believed that even though she was delivering the instruction, the students benefitted from having a fellow classmate break it down in a way they understood. As he agreed, another participant stated, "…the struggling learner gets it from a different perspective and the person giving [instruction] is actually reinforcing it for themselves." One more participant added sharing that her students have even come from the Tier 2 group sessions and communicated how they learned from the mistake they made and can show others how to communicate the correct procedure. Along those lines, a participant included that she incorporated project-based learning where students had to break into groups to find the underlying theorem or concept being taught.

Another strategy presented was the use of interactive notebooks in the Tier 1 classroom. This gave students a guide to manage their learning and a reference for future study as they reviewed previously learned standards. The interactive notebook included graphic organizers, word problem with key details highlighted, and visual references for students to solve problems. Technology was also used to engage reluctant learners. It was stated that the students who would show resistance to learning missed concepts were presented the same concepts on the computer, they would really become engaged and want to participate. Together with the previously mentioned strategies, teachers used large vocabulary cards and anchor charts. These provided the students with an outline and daily reference to skills taught. It is important to note that the anchor charts were used as a part of the scaffolded instruction and did not remain posted in the classroom but was presented as needed. Additionally, one participant noted that explicitly explaining to

students what they were going to learn, what strategies would be used, and what the expectation was for the lesson (e.g. turn and talk or small group) prepared and engaged them for instruction.

Collaboration/communication was presented as a strategy and a benefit. For example, when preparing to teach students about word problems, the math teachers relied on support from the English Language Arts teacher to "break down" the language in a word problem. This also was true for teaching the students how to write in math. Participants stated that there was much more writing in math this year as common core standards have been implemented, so they incorporated the use of math journaling to practice the "math writing." Participants felt comforted that they collaborated with all team members and communicated daily regarding the students and strategies. Also, the One participant felt that "having the team meetings helped them deliver instruction since they weren't in the classrooms," and other participants readily agreed. Moreover, administrative support was a key component to the RTI program. Participants agreed that accountability for meeting with the RTI team and grade-level team contributed to the strong communication between the teachers. A participant stated, "The organizational structure drives the good process." Because administration expected and required all members to meet to discuss instructional strategies and the data, it became a "more cohesive" system.

Several other benefits were uncovered during the focus group session. One key benefit of the RTI structure (i.e. having clear levels: Tier 1, Tier 2, Tier 3, level up) allowed the teachers to reach almost every student in some way because they worked

with all levels. One major benefit all teachers celebrated was seeing the students who were typically "momentum stoppers" in the classroom build confidence by working in the small group. Once they have experienced the success, they show that they are ready and able to take control of their own learning. One teacher shared that one of her students became so confident that he continually refused her help and show her the mistakes made. Additionally, having the small group instruction allowed teachers to incorporate the same kind of language that would be presented on tests and build their momentum in using the language to make sense of the math. They were also able to incorporate skills that students missed on assessments with into their Tier 2 instruction.

Participants also shared the Level Up program, created as an extension of the RTI program. Since there were specific numbers for RTI Tier 2 and Tier 3 groups, Level Up allowed teachers an opportunity during the week to meet with students who were not a part of the RTI groups but needed the additional instruction. Finally, participants shared that this RTI problem solving and planning process made them better classroom teachers, those who were able to use data to drive their instruction.

Although participants shared many great successes, they also revealed some challenges to implementation. Space was a big issue in this particular site. One participant mentioned having to "travel around" searching for space, but instruction was still carried out even if they gathered at a nook in the school and gathered around a whiteboard. Another participant explained that having one student in the Tier 2 group who had no basic knowledge of the concept being taught could slow down the momentum of the group. A solution presented to this obstacle was exposing all students

to the strategy during the mini-lesson period, and after students demonstrated some understanding, the teacher would allow the majority of the students to work independently. This allowed her the opportunity to work one-on-one with the struggling student. Finally, student motivation was a challenge expressed by all participants. Because the students felt that they were reviewing remedial skills and that group time was something extra, teachers had to be creative in making meaningful lessons so the students would be interested and engaged in the process.

Document Review of Archived State Test Data

In order to support and triangulate data from the focus group, test data from 2012, 2013, and 2014 were compared. The archived state test data was in the format of documents that were downloaded and reviewed from the New York State Report Card. If RTI mathematics intervention works at Tiers 1, 2, and 3, the percentage of students who score at a level 1 or level 2 should decrease while the percentage of students who score at a level 3 or level 4 should increase. The baseline data for the school year of 2011-2012 included 11.5% of students scoring at Level 1, 34.5% of students scoring at Level 2, and 54% of students scoring at Levels 3 and 4. In 2013, Level 1 and Level 2 scores increased by 36.5% and 7% respectively. Adversely, scores for Levels 3 and 4 decreased by 44.5%. Data from 2014 results showed some growth as Levels 3 and 4 increased by 7.5% from 9.5% to 17%. While Level 1 decreased by 16%, from 48% to 32%, Level 2 scores increased by 9% to 51.5%.

Table 3

New York State Mathematics Test Results

School Year	Level 1	Level 2	Levels 3 and 4
2011 – 2012	11.5	34.5	54
2012 – 2013	48	42.5	9.5
2013 – 2014	32	51.5	17

(New York State Department of Education, 2015)

Conclusion

This single case study explained how teachers in a charter school incorporate the problem solving process in their RTI model to assist students who are struggling in mathematics. Continually collecting and interpreting data, then using that data to drive instruction has created a strong system of interventions that allows the teachers to meet the needs of more students. Additionally, they strongly believe that collaboration and communication and administrative support lead to a successful program. Also, several successes and benefits were shared, the most important being the opportunity to see academic growth in their students, as well as the growth in their confidence. There were some challenges to implementation shared; however, participants also shared strategies to overcome them. While state test data was inconsistent over the three years, the final year of data presented seemed support the ideas shared by the teachers.

Section 5 will conclude the study by presenting the implications of the research and the limitations on the use of a single case study. After reviewing the data from the focus group and comparing the data from the mathematics state test results, additional

questions and challenges have been formulated. Recommendations for action and further research are presented.

Section 5: Discussion

Introduction

The purpose of this study was to gain insight on how middle school mathematics teachers use the problem-solving process to design an intervention plan and to understand the strategies they used to implement it. Through RTI, students who are struggling in mathematics can receive quick-paced and explicit instruction in a small group setting (Piper, Marchand-Martella, & Martella, 2010). The guiding questions for this qualitative study included:

1. How do middle school mathematics teachers describe their use of the problem solving process when creating interventions for struggling students in mathematics?
2. What strategies do middle school mathematics intervention teachers use to implement interventions for struggling students?

In order to answer the research questions, two qualitative data collection methods were used: focus group interview and review of archived data. The focus group was selected so that I could hear about experiences in implementing RTI and the use of the problem-solving method directly from the teachers. I sought to describe examples of key benefits, successes, and challenges that could assist other middle schools implementing RTI in mathematics. After conducting the interview, I sensed that the sampled group fully supported and believed in their RTI process. The participants expressed respect for the RTI implementation structure and the collaboration it fostered as a result of the process.

Additionally, archived mathematics state test data were downloaded from the years 2012, 2013, and 2014- the matriculation years of the 2011-2012 cohort of 6th graders. Archived data were were reviewed to triangulate the data from the focus group interview and thus substantiate that the strategies and problem-solving method used in implementing RTI were successful. However, the data were inconsistent in supporting the relationship between the success of students on the standardized assessment and the mathematics RTI program.

Interpretation of Findings

RQ! was designed to elicit responses of middle school teachers' description of the way they incorporated of the problem solving process when creating interventions for students struggling in mathematics. To answer RQ1, I gathered data from the focus group interview. When analyzing the findings from the focus grou, I refered back to Deno's (1985) decision-making model, as it constituted thr framework of the research. As a part of identifying the problem, participants spoke of the use of Star Math as their universal screening method. The data collected from the results helped them determine which students could benefit from the intervention. In their second phase of problem-solving, they used the Star Math analysis of skills to decide which skills to teach in the group. The participants noted that the skills analysis also helped them in their Tier 1 planning. The intervention was designed by using the universal screening guidelines set forth in the RTI guiding document. Students who fell into the strategic range received Tier 2 intervention while those who fell into the intensive range received Tier 3 intervention. Teachers implemented the intervention by planning skills according to the skills on the Star Math

assessment. Tier 2 teachers selected skills, which were missed by all of the students in the group, whereas the Tier 3 teachers tailored instruction for the needs of each of the students. The time period for each group was also determined by the RTI guiding document, Tier 2 received 40 minutes twice per week and Tier 3 received 45 minutes for 4 days. Teachers also kept records for attendance and weekly assessments. In order to assess the intervention, the Star Math assessment was given at the end of each round to all intervention students, in addition to the AIMS web assessment for Tier 3 students. At the end of each round, the teachers and RTI team met to determine if the students need to continue in the intervention or may be moved out of the current tier of intervention.

Data from the focus group was also used to answer RQ2, which addressed the strategies that middle school mathematics intervention teachers use to implement interventions for struggling students. Strategies can be implemented in the intervention implementation phase of Deno's decision-making model. Participants discussed many strategies that would enhance any level of tiered intervention. Some of these included interactive notebooks, peer instruction and tutoring, group problem solving, and establishing clear expectations within the group. One of the most agreed upon and supported strategies was the use of collaboration in all phases in the RTI problem solving process. They shared that being able to communicate and collaborate with teachers and the RTI team allowed them to be successful in their intervention.

When reflecting on Deno's steps of intervention implementation and problem solution, the success of the intervention must be tested. Data from the archived test results show that students were unsuccessful in meeting the required benchmark. It also

failed to support that the intervention would decrease the percentage of students in levels 1 and 2 while percentage of students who scored in the level 3 and level 4 ranges. After reviewing the data, it would be necessary to review and change the intervention to meet the deficiencies of the students.

It is important to note that at the beginning of the 2012-2013 school year, the state education department of New York decided to fully implement the Common Core State Standards at all grade levels, choosing not to give teachers time to properly prepare for the new instruction (Murphy & Torff, 2014). Additionally, students were assessed on these new standards at the end of the school year. In other words, the middle school students who were assessed were at a disadvantage before they began to prepare for the test. Since the students did not begin instruction in Common Core standards in the lower grades, there was a gap in what they learned through previous standards and what they were expected to know based on the new standards. In 2014, New York granted school systems until 2022 to be assessed on the implementation and success of the instruction of the standards (New York State Education Department, 2014). This will give teachers more time to adequately prepare for meeting the needs of the struggling learners and help increase their skills to that required by the Common Core State Standards. I can conclude that as Common Core standards are more accessible to students, the number of students who need intervention based on these results will decrease as teachers truly understand the instruction required to be successful on the assessments.

Implications for Social Change

As social change describes the improvements of individuals, communities, and societies, it is only fitting that a program such as RTI be recognized as a factor of social change. As stated in section 1 and supported with findings from the focus group, teachers who work collaboratively to implement interventions and reflect upon data will ultimately experience success with middle school students. Data from this study showed that participation in a RTI mathematics program cultivates the growth of academic confidence and gives teachers the opportunity to present basic instructional strategies to help them be successful in the general classroom. The impact of the students' success on curriculum-based measures did not translate into the positive results that I anticipated, as the state test results are the data used to measure the success of an organization. However, the teachers from this organization have shown a passion to change the lives of their students and build strategies for lifelong success in math.

Recommendations for Action

Because the study was conducted to add to the limited research regarding mathematics intervention in the middle school, the results would benefit middle school teachers and RTI facilitators. The results could benefit math and ELA teachers, as the participants strongly supported the collaboration this team. RTI facilitators could benefit from the suggestion of frequent RTI meetings and the inclusion of the RTI teacher in grade level meetings. General classroom and RTI teachers both expressed the value of having input from both sides in order to implement curriculum to help the students. As this RTI study is published, it will be available to teachers and other intervention team

members. I will also share the results with the participants that they may share the information with other middle school math teachers.

Equally important to the study would be the recommendation to increase professional development and training on improving Tier 1 instruction. There was no significant increase in scores in levels 3 and 4 with the instruction given during the timeframe of this cohort of students. Also, I would recommend further training for intervention teachers to help decrease the percentage of students who scored in the level 2 range.

Recommendations for Further Study

As I continue to review the data compiled from the focus group and the current test scores, other questions have surfaced whose answers could add more depth to the study. The teachers suggested many instructional strategies that were used; however, no standard curriculum was mentioned. It would be beneficial to find if there are any schools using a standardized, or published, curriculum, how the success impacts not only their in-school curriculum based measures, and if that success translates to data on standardized testing. Additionally, since the 2012-2013 scores represent the first year of use of the Common Core State Standards (CCSS) assessment, it presented a setback in progress for the 2012 cohort. Further research could be conducted on a later cohort that was taught using the CCSS in their lower grades. Also, it may be helpful to compare strategies of teachers in lower performing classes with those of higher performing classes.

Although the focus group did yield recommendations for instruction and collaboration, a survey of more middle school mathematics teachers could be conducted

to gain more insight on strategies used when implementing intervention. Open-ended questions could be asked regarding instructional planning and implementation, while close-ended questions could be asked to assess teacher preparedness and training. Teachers would be asked to share their thoughts on what they need to successfully implement interventions across all the tiers of instruction. I would also propose that school administrators and instructional coaches be included in the research to gain a different perspective on the implementation process. School administrators are afforded the opportunity to receive specific training on introducing and implementing new programs such as RTI.

Reflection

This RTI study has truly been a learning experience for me. In writing my review of literature, I learned the value of thorough research and the importance of corroborating research to support my beliefs. The most challenging part of the process was the completion of my methodology. At first, I wanted to conduct a closed-ended survey a part of my study; however, in reviewing my research questions with my advisory team, I could not truly defend how it would support my study. I also had difficulty explaining my process of using and analyzing the quantitative data. I believe that this process has made me more reflective in my writing and research, even in my daily professional life. As I prepare for instruction, I research different strategies to accomplish my tasks and reflect daily on the method and results of my instruction. I am currently implementing Tier 1 and Tier 2 instruction and intervention in my current position, and I use many of the suggestions from the research I conducted.

I strongly support the use of RTI in middle school mathematics, and it was very challenging to keep my personal biases out of the research. It was important to present opposing research to show that there could be some negative aspects to the implementation of intervention. I had personally experienced success with intervention groups and seen the growth on test scores and motivation, so I had to be careful to keep those thoughts in the back of my mind as I listened to the responses from the focus group. In this case, the responses from the group were quite favorable, but I had to be prepared to hear the worst. Conducting this research study has been a journey, and I will be cognizant to use and apply all of the lessons I have learned as I continue in my educational career.

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Appendix A

CONSENT FORM

You are invited to take part in a research study of the problem-solving method as it is used in mathematics RTI (RTI). The researcher is inviting middle school RTI mathematics teachers of RTI to be in the study. This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to take part.

This study is being conducted by a researcher named Robbi Cook Brown, who is a doctoral student at Walden University. You may already know the researcher as a Learning Specialist, but this study is separate from that role.

Background Information:
The purpose of this study is to explore the relationship between the problem-solving method and the academic success of at-risk middle school students in a RTI program.

Procedures:
If you agree to be in this study, you will be asked to:

- ____ Participate in a focus group interview which should last approximately one hour.

Here are some sample questions that will be presented during the focus group:
____ How does your school use the problem-solving process to implement RTI in mathematics?
____ What are some successes and challenges you have experienced in implementing the mathematics intervention program?
____ What are some strategies your school uses to implement the mathematics RTI program?

Voluntary Nature of the Study:
This study is voluntary. Everyone will respect your decision of whether or not you choose to be in the study. No one at XYZ Middle School will treat you differently if you decide not to be in the study. If you decide to join the study now, you can still change your mind later. You may stop at any time.

Risks and Benefits of Being in the Study:
Being in this type of study involves some risk of the minor discomforts that can be encountered in daily life, such as additional time outside of your scheduled work hours to complete the survey. Being in this study would not pose risk to your safety or wellbeing.

By participating in the study, you will add to the growing body of research regarding mathematics RTI programs in the middle school. My hope is that your input will provide teachers with strategies they can use to improve mathematics intervention programs. In turn, this will positively impact and improve the academic achievement of all students.

Payment:
There is no payment for participation in this study.
Privacy:

Any information you provide will be kept confidential. Also, the researcher will not include your name or anything else that could identify you in the study reports. Electronic data will be kept secure by being saved on a password protected website. Hard data will be kept in a locked file cabinet at the home of the researcher. Data will be kept for a period of at least 5 years, as required by the university.

Contacts and Questions:
You may ask any questions you have now. Or if you have questions later, you may contact the researcher via email at robbi.cook@waldenu.edu. If you want to talk privately about your rights as a participant, you can call Dr. Leilani Endicott. She is the Walden University representative who can discuss this with you. Her phone number is 612-312-1210 . Walden University's approval number for this study is **IRB will enter approval number here** and it expires on **IRB will enter expiration date.**

Please print or save this consent form for your records.

Statement of Consent:

I have read the above information and I feel I understand the study well enough to make a decision about my involvement. By returning a completed survey, or by replying to this email with the words, "I consent", I understand that I am agreeing to the terms described above.

Printed Name of Participant _____

Date of consent _____

Participant's Signature _____

Researcher's Signature _____

Appendix B

Focus Group Questions

Informed Consent

1. What is your current title at your school?
2. Describe the RTI process in your school.
    a. Describe your role in the RTI process.
3. Describe how the RTI team uses the problem-solving process to plan for mathematics intervention.
    a. Describe any challenges that you have experienced in implementing RTI in your school.
        i. How were those challenges overcome?
    b. Describe any successes that you have experienced since using the RTI program in mathematics in your school.
4. What strategies does your school use to implement the mathematics intervention program?
    a. How does your school use curriculum-based assessments and data in the problem-solving process?