THE IMPACT OF RESPONSE TO INTERVENTION (RTI) PROGRAM ON 6TH GRADE MATH COMMON ASSESSMENTS AND STAR MATH ASSESSMENTS

By

Brian Webster

Submitted to
The Faculty of the Educational Specialist Program
Northwest Missouri State University Missouri
Department of Educational Leadership
College of Education and Human Services
Maryville, MO 64468

Field Study Committee Member
Dr. Tim Wall

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This study investigated the impact of Response to Intervention (RtI) on math common assessment scores and STAR math assessment scores of sixth grade students in a suburban Kansas City middle school. The purpose of this study was to determine if there was a significant difference in assessment scores of students who received tier 2 RtI intervention compared to those who received tier 1 interventions. The three groups involved in this study were students who received tier 2 interventions, students who received tier 1 interventions, and students who did not receive interventions. The study also looked to determine if there is significant difference in assessment scores of students who receive tier 2 intervention compared to those students who do not need interventions. Data was collected from math common assessment scores and STAR math assessment from the fall 2013 semester. An Analysis of Variance (ANOVA) was used to analyze the test scores of the three groups. The study showed a significant difference in assessment scores; however, the results were mixed from the math common assessments and the STAR math assessment. The researcher recommends that further study be continued covering RtI interventions in mathematics in sixth grade mathematics.
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CHAPTER ONE
INTRODUCTION TO THE STUDY

Background

Schools and school districts are constantly examining ways to improve academic performance of their lower performing or at-risk students. Response to Intervention is an intervention model support system that uses early detection and prevention to reach lower performing or at-risk students (Gersten, et al., 2009). This study examines a Response to Intervention (RtI) program currently used in a Kansas City suburban middle school with sixth grade math students.

The objective of this study is to analyze the effectiveness of a Response to Intervention program. This study will focus on common math assessments and STAR math assessment scores of a Kansas City suburban middle school. The scores will be used to evaluate and determine if there is a difference in scores from students who receive RtI tier 2 intervention from those who receive tier 1 intervention and those in the student population who do not need any interventions.

Sixth grade students who receive RtI instruction at this suburban middle school attend RtI class ninety minutes per week or one hundred thirty-five minutes per week depending on an a/b schedule. The a/b schedule is an alternating schedule with an elective course. Students who are enrolled in RtI receive instruction for an entire semester. However, some students will not receive RtI instruction until the second semester due to middle school scheduling. Students who will be enrolled the second semester receive tier 1 intervention strategies during the first semester. The screening process for this suburban middle school includes a basic skills test and the initial STAR math assessment at the beginning of the school year. This information along with Missouri Assessment Program (MAP) scores was used to develop an RtI list for the school
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year. During the school year teachers, administrators, and the counselor could add students to tier 1 intervention when performance indicated a need for intervention. Scheduling dictated which students could receive tier 2 interventions during the first semester. Mathematics and communication arts teachers had alternating semester schedules. Each teacher had an RtI class that worked with students who needed tier 2 interventions. The number of students enrolled depended on teacher schedules and student a/b schedules. Only a certain number of students were enrolled in each RtI class to keep quality instruction with lower numbers. Students who were not enrolled in the RtI class received tier 1 instruction.

During RtI tier 2 instruction students received small group instruction that was specific to the current unit of study, plus teachers were re-teaching previous concepts, and students worked on calculation fluency. Math calculation fluency is a critical component to RtI instruction. Insufficiencies in calculation fluency appear to be a big component of mathematics difficulties. (Gersten, Jordan, & Flojo, 2005). Assessment analysis of common assessment data was used to determine concepts that needed to be retaught during RtI. Sixth grade teachers used STAR assessment data as a resource to aid in instruction including suggested skills that are made from the STAR Math program. Teachers incorporated suggested skills for individualized instruction within RtI.

Conceptual Underpinnings

Response to Intervention is considered a critical component to meeting the needs of students who many times are considered at-risk academically. RtI is a three-tiered prevention and intervention model that measures and addresses student needs through research-based pedagogy (Crawford & Ketterlin-Geller, 2001). RtI puts a focus on the students who are on the borderline of passing state assessments and students who are at-risk academically (Crawford & Ketterlin-
Geller, 2001). Tier 2 interventions are designed to meet the needs of students who are at risk, failing or who do not qualify for special education. Tier 2 intervention incorporates small group instruction that has a focus on high quality teaching that is provided multiple times a week (Gersten, et al., 2009). Statewide assessments have become the primary measurement tool of schools and school districts.

This study will look at other assessments other than the MAP test. The MAP assessment has been used as the major assessment tool to measure whether programs and teaching are effective. The MAP assessment is given each year toward the end of the school year to sixth grade students covering communication arts and mathematics. The assessment contains multiple choice, constructed response, and performance events (DESE, 2014). The MAP assessment that is only given once a year has become a major influence in determining whether education, programs, instruction, and schools are working acceptably.

Statement of the Problem

Response to intervention is a program that is difficult to put into place at the secondary level. Researchers have avoided the middle and high school levels due to issues with scheduling and compliance of adolescents (Fuchs, Fuchs, & Compton, 2010). Research in the area of RtI in mathematics is at infancy. The majority of research studies in RtI focus on the elementary level and/or primarily with reading. Raising two important questions: does RtI at the middle school and secondary level work and how do we as educators know if the intervention is truly benefitting students?

This study will analyze test scores of students who receive tier 2 and tier 1 interventions to determine if students who receive tier 2 interventions are truly making educational gains over those who are receiving tier 1 interventions. The study will also analyze the test scores of tier 2
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and tier 1 students compared to those who do not need intervention and see if there are
significance differences between the groups.

Purpose of the Study

The purpose of this study is to determine the impact of RtI instruction for students who
are enrolled in RtI math classes and receiving tier 2 interventions. The Missouri Assessment
Program developed by D.E.S.E. has been the statistical data used to evaluate students’ overall
progress. However; should this be the only measure used to evaluate whether students are
learning or improving? This study will look at common assessment scores and Star math
assessment scores to give another perspective for educators within this suburban school. In this
current RtI framework are the students’ scores improving and is the program working?

Research Questions

RQ1: Is there a significant difference between math common assessments scores of 6th
grade RtI students (tier 2) who are enrolled in RtI compared to the 6th grade students (tier 1) who
might be enrolled in RtI the following semester at a suburban Kansas City middle school?

RQ2: Is there a significant difference between math common assessments scores of 6th
grade students (tier 2) who are enrolled in RtI compared to the rest of the 6th grade population at
a suburban Kansas City middle school?

RQ3: Is there a significant difference between student scale scores of the STAR Math
Assessments scores of 6th grade students (tier 2) who are enrolled in RtI compared to the 6th grade
RtI students (tier 1) who might be enrolled the following semester in RtI at a suburban Kansas
City middle school?

RQ4: Is there a significant difference between student scale scores of the STAR Math
Assessments scores of 6th grade students (tier 2) who are enrolled in RtI compared to the rest of the
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6th grade population at a suburban Kansas City middle school?

Null Hypotheses

H₀₁: There is no significant difference between math common assessments scores of 6th grade RtI students (tier 2) who are enrolled in RtI compared to the 6th grade students (tier 1) who might be enrolled in RtI the following semester at a suburban Kansas City middle school.

H₀₂: There is no significant difference between math common assessments scores of 6th grade students (tier 2) who are enrolled in RtI compared to the rest of the 6th grade population at a suburban Kansas City middle school.

H₀₃: There is no significant difference between student scale scores of the STAR Math Assessments scores of 6th grade students (tier 2) who are enrolled in RtI compared to the 6th grade RtI students (tier 1) who might be enrolled in RtI the following semester at a suburban Kansas City middle school.

Anticipated Benefits of Study

The benefit of this study will be the evidence of whether the current RtI program that is currently used by the Kansas City suburban middle school is working. The data should provide statistical evidence that shows whether the program is functioning as it should or if it needs to be reevaluated. Research from this study, will give some clarification if RtI works at this level. Information gained from the study will be presented to the administration to validate the success or lack of success of the current RtI model. This study should help building administrators and educators get a better understanding of RtI in the middle school.
Limitations and Delimitations

The limitation of this study is that students who receive RtI instruction only receive tier 2 instruction for a semester. The limited sample size may not give enough evidence for conclusions; however, the study might shed some light if gains are made with students. The study would also benefit from a full year of study using students who are enrolled during the second semester.

This study does not include Missouri Assessment Program (MAP) scores of students. Scores from the MAP would benefit the study and give another piece of data to make well-informed data based decisions. A yearlong study that incorporates mathematics common assessments and the STAR math assessment along with the MAP assessment would significantly strengthen the research.

Definition of Terms

Response to Intervention: (RtI) is an early detection, prevention, and support system that identifies struggling students and assists them before they fall behind.

Progress monitoring: The regular use of formative assessments to ensure students are progressing.

Tier 1: The implementation of the core classroom curriculum, which involves progress monitoring within the classroom. Teachers monitor student assessments, and students receive general core instruction.

Tier 2: Small group instruction, which focuses on differentiated instruction and reinforcement of classroom instruction. Students are retaught core lessons in a small group setting using research-based instructional strategies.
Missouri Assessment Program: The definition of MAP according to D.E.S.E stands for "Missouri Assessment Program." It is a series of assessments for English Language Arts, Mathematics and Science at grades 3-8; and English Language Arts, Mathematics, Science and Social Studies in high school. These assessments are designed to see if students in Missouri are meeting the grade-level expectations. The grade-level assessments are made up of multiple-choice, machine-scored items, as well as "constructed response" items. These items require students to supply (rather than select) an appropriate response. In addition, the grade-level assessments include some items from TerraNova, a nationally-normed test developed by CTB/McGraw-Hill, so that Missouri student achievement can be compared to groups of students who take the same test in other states (DESE, 2014).

Scaled score (SS): is useful for comparing student performance over time and across grades. A scaled score is calculated based on the difficulty of questions and the number of correct responses. Because the same range is used for all students, scaled scores can be used to compare student performance across grade levels. STAR Math scaled scores range from 0 to 1400. All norm-referenced scores are derived from the scaled score (Renaissance Learning, 2012).

STAR Mathematics Assessment: a computer-adaptive test where students are given three minutes to answer each question. Each assessment has about thirty questions covering numbers, operations, geometry, measurement, algebra, data analysis, statistics and probability. The test adapts in difficulty based on the correct or incorrect response (Renaissance Learning, 2012).

Summary

The study of this RtI program will reveal if there is a significant difference between at-risk students receiving tier 2 interventions and students who are only receiving tier 1
interventions. The study will compare common assessment scores along with STAR math assessment scores of students. The study will look at scores from the first semester of this suburban Kansas City middle school during the 2013-2014 school year. Results from this study will be used as support for administrative evaluations and the decision-making process in implementation of RtI at the middle school level. The study may give insight to administrators, policymakers and teachers if RtI instruction should stay in the current format, or if it should be modified, or changed all together.
CHAPTER 2
REVIEW OF LITERATURE

Overview and History

Response to Intervention (RtI) is a proactive educational strategy according to Greenwood and Kim (2012) that is an “early intervention approach to prevent learning and behavioral problems from becoming serious disabilities later” (p. 80). Since the No Child Left Behind Act of 2001 and the Individuals With Disabilities Education Improvement Act of 2004, schools have leaned on the RtI initiative to close the gap with struggling learners and prevent future disabilities. RtI has been a focus at the elementary level with a concentration on reading. RtI models have been used for decades in recognizing and supporting students who struggle in reading with positive outcomes (Lembke, Hampton, & Beyers, 2012).

Many studies in RtI have focused on reading and elementary RtI frameworks. “A substantial body of current research exists that explains how educators can implement an RtI approach with students in the early elementary grades” (Pyle & Vaughn, 2012, p. 273). The studies of these models have found positive outcomes in student learning and positive outcomes in educational practices and have laid the groundwork for the RtI frameworks.

The frameworks of RtI are based on multidimensional approaches that “include screening, an increasingly intensive multilevel school-wide system for preventing school failure, progress monitoring, and data-based decision making to allow for movement within the tiered model” (Pyle & Vaughn, 2012, p. 273). Most studies in RtI cover elementary models and reading and have shown positive results (Lembke, Hampton, & Beyers, 2012). The positive results from these studies have brought us to the point where “middle schools began adopting RtI frameworks largely based on elementary school level practices” (Prewett, Mellard, Deshler, Allen,
Many middle school RtI frameworks were based around what was learned at the elementary level.

_Middle and Secondary RtI Programs_

Middle schools and secondary schools face different circumstances than elementary schools, which make the implementation of the RtI challenging for administrators, teachers and other school personnel. Different factors and challenges come into play with the RtI model in the middle and secondary level. In their study, Pyle and Vaughn (2012) shared the following challenges that middle schools face with implementing RtI: scheduling, organization, culture of a school, staff members’ roles and responsibilities, needs of students, and lack of motivation of students at this age. All of these factors and challenges, plus many more, play a role in RtI programs at this educational stage.

Programs or frameworks of RtI in the middle school, according to Johnson and Smith, should promote diverse teaching strategies, create a safe environment, use assessment data, use a multifaceted support system, and have collaborative leadership with a shared vision (Johnson & Smith, 2011). At this point, the academic deficiencies of students are more prevalent and easier to identify because of assessments and screening. RtI will differ at middle and secondary levels because “middle and high school students deal with a demanding curriculum no longer focused on the acquisition of basic skills” (Johnson & Smith, 2008, p. 46). Therefore the Response to Intervention model used at the middle and secondary level should have different features compared to the elementary model; however, most models are still based around research from elementary studies. “At the middle grades, the differences in school structure and operations at these levels mean RtI at the middle level will probably look different than it does at the elementary level” (Johnson & Smith, 2011, p. 24). Middle schools and other secondary schools
should adopt proven elementary strategies and adapt them to meet the needs of their students.

Components such as screening and progress monitoring are linchpins to any RtI framework. Screening allows teachers to identify specific needs at the elementary, middle, and secondary level. At the middle level, screening allows educators to identify specific student deficiencies. According to Fuchs, Fuchs, and Compton “academic deficits are well established at this age” (Fuchs, Fuchs, & Compton, 2010). From this point it is up to teacher(s) and the administrative team to establish a plan for students. A well-designed RtI model emphasizes progress monitoring as a key component (Stecker, Fuchs, & Fuchs, 2008).

The teacher at the middle and secondary becomes a primary factor to this process. Screening will indicate the student needs and deficiencies but teacher’s progress monitoring, input and judgment are necessary for the intervention process. Fuchs, Fuchs, and Compton (2010) believe “it makes more sense to rely on teacher nomination or existing assessment data to identify students with manifest academic difficulties” (p.24). Teachers need to incorporate quality instruction and instructional strategies and incorporate data to resolve whether they need to modify instructional strategies, curriculum and materials (Fuchs & Fuchs, 2006).

The movement of students within tiers of an RtI program in a middle school or secondary school falls more on the decision of the teacher. Screening and assessments along with data based decisions make up this procedure. In their study Ketterlin-Gellar, Chard, and Fien (2008) emphasized the importance of a teacher using his/her professional judgment when making decisions when using screening data and progress monitoring of student needs just as a physician would when treating a patient.

At this point “the focus of RtI in secondary settings is on remediation, supplemental support, and content recovery, with the outcomes being to pass core courses/examinations and to
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graduate” (Pyle & Vaughn, 2012, p. 275). RtI frameworks, at the middle and secondary level, use screening, progress monitoring, quality instruction, and professional judgment of teachers as central attributes of RtI frameworks at the level. Many are proven attributes that have been studied extensively at the elementary level.

Mathematics RtI

The majority of studies in RtI have focused on assisting students who struggle with reading. Students who struggle with reading frequently have difficulties with mathematics (Lembke, Hampton, & Beyers, 2012). The increased disappointment in mathematics and science scores in the United States has put an emphasis on improving mathematics comprehension. According to the Institute of Educational Sciences, a national concern has developed about low achievement in mathematics scores of United States students on the Trends in International Mathematics and Science Study and the Program for International Students Assessment (Gersten, et al., 2009).

Mathematics RtI in the elementary grades have increasingly become more commonplace. Studies have shown that there is increased screening at this age to incorporate programs for struggling learners. “Mathematical proficiency is essential for student success in school and postsecondary experiences” (Doable & Fien, 2013, p. 284). Elementary schools have been incorporating more mathematics interventions that primarily focus on calculation fluency. In the elementary grades reading RtI still is the primary focus.

Early intervention and instruction of mathematics in the elementary grades can aid and prevent many academic concerns in some students; however, RtI needs to carry over to middle grades and the secondary level. Starting in the elementary, studies have shown “deficits in calculation fluency appear to be a hallmark of mathematics difficulties” (Gersten, Jordan, &
Flojo, 2005, p. 296). Difficulties in calculation fluency that begin in the elementary grades for students carry over and appear to effect their ability to understand basic math strategies and more complex algebraic concepts (Gersten, Jordan, & Flojo, 2005).

**Summary**

Response to Intervention has proven to address the needs of struggling learners, avert labeling, and circumvent school failure at the elementary level. (Sanger, Friedli, Brunken, Snow, & Ritzman, 2012). Today, many schools and school districts use RtI as a way to meet the needs of struggling students. RtI programs and frameworks should have the following essential components according to the National Center on RtI: database decision making, screening, progress monitoring, and multi-level prevention system (McInerney & Elledge, 2013). Schools that incorporate these components have essential frameworks in place to help students. However, the implementation of these frameworks in the appropriate manner for middle and secondary levels is still in question.

Research in RtI at the middle school and secondary level is still at the beginning stages as well as the intervention in mathematics. Reading continues to be the primary focus in RtI. Many schools have adopted elementary frameworks to use at this level. “This approach makes sense in light of the lack of empirical data about how models might need to differ at middle school level” (Prewett, Mellard, Deshler, Allen, Alexander, & Stern, 2012, p. 127). Middle and secondary schools have focused on proven strategies from elementary research and applied them to fit RtI framework at this level (Prewett, Mellard, Deshler, Allen, Alexander, & Stern, 2012).

Middle schools and other secondary schools face inherent challenges with RtI that elementary schools do not face, nevertheless educators in this setting should develop a way to implement these RtI frameworks for struggling learners. Based on current and past studies, “RtI
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has the potential to be a practical and effective school-wide framework for ensuring academic and behavioral success for students” (Prewett, Mellard, Deshler, Allen, Alexander, & Stern, 2012, p. 146). The focus of this study is to determine if additional mathematics instruction and reinforcement through tier 2 intervention will have a positive effect on mathematics scores in this suburban Kansas City middle school.
CHAPTER 3

RESEARCH METHODOLOGY

Problem and Purposes Overview

Response to Intervention has been in schools and school districts for many years. The majority of the focus of RtI is at the elementary level with an emphasis on reading. Many studies have been done on RtI with elementary schools and reading. RtI research in middle and secondary levels is very limited.

The purpose of this study is to look at RtI in mathematics in a suburban Kansas City middle school. In the studies of Response to Intervention there is not a lot of research covering RtI in the middle grades and there is not as much research about mathematics interventions. This study will look at a semester long Response to Intervention class that is used at middle school. This suburban school district uses RtI in its elementary schools; however, the focus is on reading. Middle school is the first opportunity students who are at-risk get a chance to get tier 2 instructions in mathematics in this school district. This study was conducted to conclude if additional mathematics instruction has an effect on mathematics scores.

Research Design

The research study takes place in a Kansas City suburban middle school. This middle school has implemented an RtI class for a semester for struggling learners. Scores from mathematics common assessments and the STAR math assessments were used from three groups. An Analysis of Variance (ANOVA) was used to compare the scores of students who received tier 2 instruction, tier 1 instruction and the remainder of the population who did not receive tier 2 nor tier 1 interventions. An ANOVA was used because it allows the researcher to compare the means of two or more groups (Kranzler & Moursund, 1999, p. 127). For this study,
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an alpha level of 0.05 was used to determine whether to accept or fail to reject the null hypothesis. In this study, descriptive statistics were also used in part of the analysis of common assessment scores and STAR math scale scores.

Mathematics common assessment scores were collected and used because they are designed to meet the requirements of district curriculum, grade level expectations, and common core standards.

This study has weaknesses which include, but are not limited to: length of study, study group size, no state assessment used in the study, the STAR math assessment, and the variance of socio-economic background of students. The STAR math assessment is an adaptive test, which adjusts to correct and incorrect responses for every student. The number of questions that every students answers is low; therefore, the test is not completely standardized. The test only allows three minutes per problem, which can be problematic for students who have difficulties with reading due to the nature of story problems that are included with assessment. Despite these challenges, the literature supports the need for this study to fill a gap in the existing knowledge.

Variables Used in the Study

In this study the independent variables in the ANOVA will be students indicated as group 1: students who are receiving tier 2 intervention, group 2: students who are receiving tier 1 intervention, group 3: students who are receiving no tier 2 intervention nor tier 1 intervention. The dependent variable used in the first ANOVA will be student common assessment scores. The dependent variable used in the second ANOVA will be student STAR math test scores. The independent variables in each test are the three groups which make up the study.
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Research Questions

RQ1: Is there a significant difference between math common assessments scores of 6th grade RtI students (tier 2) who are enrolled in RtI compared to the 6th grade students (tier 1) who might be enrolled in RtI the following semester at a suburban Kansas City middle school?

H₀₁: There is no significant difference between math common assessments scores of 6th grade RtI students (tier 2) who are enrolled in RtI compared to the 6th grade students (tier 1) who might be enrolled in RtI the following semester at a suburban Kansas City middle school.

RQ2: Is there a significant difference between math common assessments scores of 6th grade students (tier 2) who are enrolled in RtI compared to the rest of the 6th grade population at a suburban Kansas City middle school?

H₀₂: There is no significant difference between math common assessments scores of 6th grade students (tier 2) who are enrolled in RtI compared to the rest of the 6th grade population at a suburban Kansas City middle school.

RQ3: Is there a significant difference between student scale scores of the STAR Math Assessments scores of 6th grade students (tier 2) who are enrolled in RtI compared to the 6th grade RtI students (tier 1) who might be enrolled in RtI the following semester at a suburban Kansas City middle school?

H₀₃: There is no significant difference between student scale scores of the STAR Math Assessments scores of 6th grade students (tier 2) who are enrolled in RtI compared to the 6th grade RtI students (tier 1) who might be enrolled in RtI the following semester at a suburban Kansas City middle school.

RQ4: Is there a significant difference between student scale scores of the STAR Math Assessments scores of 6th grade students (tier 2) who are enrolled in RtI compared to the rest of the
6th grade population at a suburban Kansas City middle school?

H₀: There is no significant difference between student scale scores of the STAR Math Assessments scores of 6th grade students (tier 2) who are enrolled in RtI compared to the rest of the 6th grade population at a suburban Kansas City middle school.

Study Group

The study group consisted of 278 sixth grade students from a middle school in a school district located in a suburb of Kansas City, Missouri. In this school district there is only one middle school, which contains 6th and 7th grade students. The district has four K-5 elementary schools that feed into the middle school.

The study group was assessed three times during the first semester of the 2013-2014 using the STAR assessment program. This is the first year for the implementation of the STAR assessment program.

During the first semester the study groups were assessed on seven common mathematics assessments that are taken by all sixth grade students. Mathematics common assessment scores were collected and used because they are designed to meet the requirements of district curriculum, grade level expectations, and common core standards. Common assessment scores were averaged to give one common assessment score.

Students in the study fell under three different classifications; group 1 (27-29 students) were students who received tier 2 interventions, group 2 (34 students) students received tier 1 interventions and were progress monitored, and group 3 (215 students) the rest of the student population who were screened but did not receive progress monitoring.

Students in group 1 were enrolled into an RtI class for the first semester. These students were on an a/b schedule with alternating Fridays. Students enrolled in the RtI class received
additional ninety to one hundred thirty-five minutes of additional mathematics instruction per week.

Students in group 2 were monitored and received additional help in the mathematics class and seminar times. Students in group 2 may be enrolled into an RtI class second semester or continue to be monitored. Students who make up group 2 were not enrolled into RtI class due to scheduling or numbers.

After completion of the fall 2013 semester the researcher received STAR math assessment data from district central office and common assessment data from building lead teacher; researcher organized data into Microsoft Excel and performed statistical calculations using EZ Analyze software (Poynton, 2011). The researcher only received scores of 27 students of the STAR math assessment of group 1(tier 2) due to student movement from the district.

Data Collection and Instrumentation

This is the first year for the district to use the online STAR math assessment. The district will use the STAR math assessment for screening students and collecting data for databased decisions. The STAR math assessment is a computer based adaptive test that adjusts difficulty level based on correct and incorrect responses. The assessment contains 34 problems and students are given three minutes per problem.

Common assessments are designed by sixth grade mathematics teachers to match local curriculum, common core standards and grade level expectations for the Missouri Assessment Program. In this study 6th grade, common assessments were given to all sixth grade students. Common assessments are broken down into two categories: individual unit assessment and benchmarks, which cover two to three units. Both categories make up the common assessment data. The common assessments are either fifteen question or twenty questions depending on the
size of the unit. Common assessments are given at the completion of each unit. Each unit length was approximately two to three weeks in length. Common assessments were given in September, October November and December of 2013.

Data Analysis Strategies

After completion of the fall 2013 semester, the researcher received STAR math assessment data from district central office and common assessment data from building lead teacher; the researcher organized data into Microsoft Excel and performed statistical calculations using EZ Analyze software (Poynton, 2011). EZ Analyze was used to run an ANOVA and find central tendencies of the data. An ANOVA was chosen because there were three groups, therefore the researcher did not have to run separate t Tests which concludes the mean of two groups (Kranzler & Moursund, 1999, p. 112). Two ANOVA tests of significance were run. The first ANOVA test was used to run data from mathematics common assessment scores. The second ANOVA test was used for research to run data from STAR mathematics assessment.

Summary

This study will determine if there is significance between students who are receiving tier 2 interventions compared to those who are receiving tier 1 interventions while determining an answer to the question. Are the students who are receiving tier 2 interventions performing better than those students who only receive tier 1 interventions? The study will also look at those students in tier 2 to determine if there is significance with students who receive no interventions.
Results for Research Questions #1 and #2

RQ1: Is there a significant difference between math common assessment scores of 6th grade RtI students (tier 2) who are enrolled in RtI compared to the 6th grade students (tier 1) who might be enrolled in RtI the following semester?

RQ2: Is there a significant difference between math common assessments scores of 6th grade students (tier 2) who are enrolled in RtI compared to the rest of the 6th grade population?

Research question one inquires whether there is a difference between students who receive tier 2 interventions and tier 1 interventions math common assessment scores. Group 3 were students who did not need mathematics interventions. An ANOVA was applied to the data to determine if there was a statistically significant difference between the three groups.

Table one gives the descriptive statistics summary of math common assessment scores. Group 1 were students who received tier 2 interventions in the fall of 2013. Group 2 were students who received tier 1 interventions during the fall of 2013. Group 1 consisted of 29 students and had a mean score of 74.274. Group 2 consisted of 34 students and had a mean score of 66.992. Group 3 consisted of 215 students who had a mean score of 87.154. Students who received tier 2 (group 1) interventions performed at a higher level than those who receive tier 1 interventions. The table and the figures below provide further analysis of the topics.
Table 1

Summary of Descriptive Statistics for Math Common Assessment Scores

<table>
<thead>
<tr>
<th>Assessment Groups</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1 (tier 2)</td>
<td>29</td>
<td>74.274</td>
<td>10.648</td>
</tr>
<tr>
<td>Group 2 (tier 1)</td>
<td>34</td>
<td>66.992</td>
<td>9.454</td>
</tr>
<tr>
<td>Group 3 (no interventions)</td>
<td>215</td>
<td>87.154</td>
<td>8.882</td>
</tr>
</tbody>
</table>

Figure 1

Figure 1: A chart displaying the mean of math common assessment scores of three groups.
Figure 2

Table 2 covers a summary of ANOVA test of significance results for mathematics common assessment scores of 6th grade students. The independent variables were the three groups being analyzed. The dependent variable was the math common assessment scores. The sum of squares for the groups was 14598.143 and the degrees of freedom was 2. The sum of squares for the math common assessment scores was 23006.587 and the degrees of freedom was 275.000. The mean square for math common assessment scores was 83.660. The f value, which indicated variance of the group means was 87.247. The alpha level was set 0.05 and the p-value was .000. The null hypothesis was rejected because the p-value was less than the alpha level, reflecting there is a statistically significant difference. A post hoc pair wise comparison analysis was done and was summarized below comparing the difference between the three groups.
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Table 2

Summary of ANOVA Test of Significance Results for Mathematics Common Assessment Scores

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups</td>
<td>14598.143</td>
<td>2.000</td>
<td>7299.072</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math Common Assessment</td>
<td>23006.587</td>
<td>275.000</td>
<td>83.660</td>
<td>87.247</td>
<td>.000</td>
</tr>
</tbody>
</table>

Note: Significance = < 0.05

Table 3 is a summary of the Post Hoc Analysis for the math common assessment scores. Group one represents students who received tier 2 interventions. Group two represents students who received tier 1 interventions. Group three represents students who did not need interventions.

The first row summarized the comparison between groups one and two. The mean difference between groups one and two was 7.283. The null hypothesis stated there was no statistically significant difference in assessment scores for groups one and two. The p-value was .006 and the alpha level was 0.05. The p-value was less than the alpha level so the null was rejected; there was a statistically significant difference in math common assessment scores between group one and group two.

The second row summarized the comparison between groups one and three. The mean difference between groups one and three was 12.880. The null hypothesis stated that there was no statistically significant difference in assessment scores for groups one and three. The p-value was .000 and the alpha level was 0.05. The p-value was less than the alpha level so the null was rejected; there was a statistically significant difference in math common assessment scores between group one and group three.

The third row summarized the comparison between groups two and three. This row is additional data that was not part of original research questions; however, the data was substantial information that should be analyzed by the researcher. The mean difference between groups two
Running Head: Response to Intervention

and three was 20.162. The p-value was .000 and the alpha level was 0.05. The p-value was less than the alpha level so the null would have been rejected; there was a statistically significant difference in math common assessment scores between group two and group three.

Table 3

Summary Post Hoc Analysis Results for Math Common Assessments

<table>
<thead>
<tr>
<th>Group</th>
<th>Group</th>
<th>Mean D</th>
<th>Std. Error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (tier 2)</td>
<td>2 (tier 1)</td>
<td>7.283</td>
<td>.119</td>
<td>.006</td>
</tr>
<tr>
<td>1 (tier 2)</td>
<td>3</td>
<td>12.880</td>
<td>.174</td>
<td>.000</td>
</tr>
<tr>
<td>2 (tier 1)</td>
<td>3</td>
<td>20.162</td>
<td>.376</td>
<td>.000</td>
</tr>
</tbody>
</table>

Note: Significance = < 0.05

Results for Research Questions #3 and #4

RQ3: Is there a significant difference between student scale scores of the STAR Math Assessments scores of 6th grade students (tier 2) who are enrolled in RtI compared to the 6th grade RtI students (tier 1) who might be enrolled in RtI the following semester?

RQ4: Is there a significant difference between student scale scores of the STAR Math Assessments scores of 6th grade students (tier 2) who are enrolled in RtI compared to the rest of the 6th grade population?

Research question three inquires whether there was a difference between students who receive tier 2 interventions and tier 1 interventions STAR math scale scores. Research question four inquires whether there was a difference between students who receive tier 2 interventions and tier 1 interventions STAR math scale scores. An ANOVA was applied to the data to determine if there was a statistically significant difference between the three groups.

Table 4 gives the descriptive statistics summary of STAR math assessment scale scores. Group 1 was students who received tier 2 interventions in the fall of 2013. Group 2 were students who received tier 1 interventions during the fall of 2013. Group 3 were students who did not
need mathematics interventions. Group 1 consisted of 27 students and had a mean score of 676.5064. Group 2 consisted of 34 students and had a mean score of 704.779. Group 3 consisted of 215 students who had a mean score of 782.098. Students who received tier 2 (group 1) interventions did not perform at a higher level than those who receive tier 1 interventions. The table and the figures below provide further analysis of the topics.

Table 4

Summary of Descriptive Statistics for STAR Math Assessment Scale Scores

<table>
<thead>
<tr>
<th>Assessment Groups</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1 (tier 2)</td>
<td>27</td>
<td>676.5064</td>
<td>44.969</td>
</tr>
<tr>
<td>Group 2 (tier 1)</td>
<td>34</td>
<td>704.779</td>
<td>48.208</td>
</tr>
<tr>
<td>Group 3 (no interventions)</td>
<td>215</td>
<td>782.098</td>
<td>50.280</td>
</tr>
</tbody>
</table>

Figure 3: A chart displaying the mean of STAR math assessment scale scores of three groups.
Figure 4: A chart displaying standard deviations disaggregated by groups.

Table 5 covers a summary of ANOVA test of significance results for STAR math assessment scale scores of 6th grade students. The independent variables were the three groups being analyzed. The dependent variable was the STAR math assessment scale scores. The sum of squares for the groups was 395496.611 and the degrees of freedom was 2. The sum of squares for the STAR math assessment scale scores was 670287.849 and the degrees of freedom was 273.000. The mean square for STAR math assessment scale scores was 2455.267. The f value, which indicated variance of the group means was 80.540. The alpha level was set 0.05 and the p-value was .000. The null hypothesis was rejected because the p-value was less than the alpha level, reflecting there is a statistically significant difference. A post hoc pair wise comparison analysis was done and was summarized below.
Table 5

Summary of ANOVA Test of Significance Results for STAR Math Assessment Scale Scores

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups</td>
<td>395496.611</td>
<td>2.000</td>
<td>197748.306</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAR scale scores</td>
<td>670287.849</td>
<td>273.000</td>
<td>2455.267</td>
<td>80.540</td>
<td>.000</td>
</tr>
</tbody>
</table>

Note: Significance = < 0.05

Table 6 is a summary of the Post Hoc Analysis for the STAR math assessment scale scores. Group one represents student who received tier 2 interventions. Group two represents students who received tier 1 interventions. Group three represents students who did not need interventions.

The first row summarized the comparison between groups one and two. The mean difference between groups one and two was 28.273. The null hypothesis stated there was no statistically significant difference in assessment scores for groups one and two. The p-value was .023 and the alpha level was 0.05. The p-value was less than the alpha level so the null was rejected; there was a statistically significant difference in STAR math assessment scale scores between group one and group two.

The second row summarized the comparison between groups one and three. The mean difference between groups one and three was 105.592. The null hypothesis stated that there was no statistically significant difference in assessment scores for groups one and three. The p-value was .000 and the alpha level was 0.05. The p-value was less than the alpha level so the null was rejected; there was a statistically significant difference in STAR math assessment scale scores between group one and group three.

The third row summarized the comparison between groups two and three. This row is additional data that was not part of the original research questions, however, the data was
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substantial information that should be analyzed by the researcher. The mean difference between
groups two and three was 77.318. The p-value was .000 and the alpha level was 0.05. The p-
value was less than the alpha level so the null would have been rejected; there was a statistically
significant difference in STAR math assessment scale scores between group two and group three.

Table 6

*Summary Post Hoc Analysis Results for STAR Math Assessment Scale Scores*

<table>
<thead>
<tr>
<th>Group</th>
<th>Group</th>
<th>Mean D</th>
<th>Std. Error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (tier 2)</td>
<td>2 (tier 1)</td>
<td>28.273</td>
<td>.085</td>
<td>.023</td>
</tr>
<tr>
<td>1 (tier 2)</td>
<td>3</td>
<td>105.592</td>
<td>.311</td>
<td>.000</td>
</tr>
<tr>
<td>2 (tier 1)</td>
<td>3</td>
<td>77.318</td>
<td>.221</td>
<td>.000</td>
</tr>
</tbody>
</table>

Note: Significance = < 0.05
CHAPTER 5
OVERVIEW, FINDINGS AND RECOMMENDATIONS

Overview

The purpose of this study was designed to provide information and analysis of a Response to Intervention program to a suburban Kansas City middle school. A focus of this study was to determine if students who were receiving tier 2 interventions were scoring better than students only receiving tier 1 interventions. Another focus was to determine if those students who were receiving tier 2 interventions were closing the gap with students who did not need mathematics interventions. Tier 2 instruction and intervention should be systematic, clear, and supplemental to the core mathematics curriculum in order to close educational gaps (Lembke, Hampton, & Beyers, 2012). Overall the general design of the study was to determine the impact of RtI in mathematics and if tier 2 instruction and intervention was improving test scores.

Discussion of Findings and Conclusions

The results of this study suggested that there was a statistically significant difference in math common assessment scores at a suburban Kansas City middle school with sixth grade students from 2013-2014. Students who received tier 2 interventions had a mean of 74% on math common assessment scores compared to students who received tier 1 interventions who had a mean of 67%. Students who received tier 2 interventions showed better performance than students who were only receiving tier 1 interventions. Students who did not need interventions had a mean of 87%. The results showed there was a statistically significant difference between students who received tier 2 instruction and the population of students who did not need interventions. Students who received tier 2 interventions made improvements; however, they did
not excel as well as students who do not need interventions.

Results of this study also concluded that there was a statistically significant difference in STAR math assessment scores of students who received tier 2 interventions compared to students who received tier 1 interventions. However, the results showed better performance by those students who only received tier 1 interventions. Students who received tier 2 interventions had a mean scale score of 677 and students who received tier 1 interventions had a mean scale score of 705. Based on this information there was a statistically significant difference between students who received tier 2 instruction and the population of students who did not need interventions.

Further Research

Further research is necessary before any conclusions can be suggested to building administration or district administration. The study would benefit from a full year of study and analysis. The use of MAP assessment scores would be another component that would aid in the analysis and evaluation of RtI in mathematics at the middle school level. This is the first year for this Kansas City suburban district to use the STAR math assessment. Further research is necessary of the STAR math assessment program due to the adaptive nature of the test. The mixed results of this study indicate that additional research is necessary and would benefit the understanding and potential of RtI in the middle and secondary level.

Recommendations

At this time, the researcher has the following recommendations from the data and research from this study:

Recommendation One. This study resulted in varied results between math common assessment scores and STAR math assessment scale scores between group one and group two. Response to
Intervention instruction should continue to be implemented at the middle school level. Tier 2 intervention strategies should be a piece to support at-risk students. A successful RtI model is crucial at the middle school level because it signifies a critical point in a student’s academic career (Johnson & Smith, 2008). The program should continue to be studied and evaluated for continual improvement.

**Recommendation Two.** Building and district administrators should use building common assessments, the STAR assessment program, and state assessment scores when evaluating RtI at the middle school level. The MAP and future state assessments should not be the only way to evaluate students and programs.

**Summary**

Response to Intervention has a lack of research about mathematics in the middle school and secondary level. Research has shown most middle school and secondary RtI has been modified from elementary frameworks. RtI has the capabilities of being a practical and useful framework to ensure academic success for students in the middle school and secondary setting (Prewett, Mellard, Deshler, Allen, Alexander, & Stern, 2012). Continued studies need to be done on RtI in mathematics in the middle and secondary schools.
References


DESE, M. D. (2014, January 5). *Grade Level Assessment Resources*. Retrieved from Missouri Departmentment of Elementary and Secondary Education:


