Teaching Strategies for Effective Fifth Grade Math Intervention

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Abstract

The purpose of the study is to determine what effects explicit and systematic math intervention instruction will have on student's performance on math assessments. The study will focus on a small group of fifth grade students that have been identified as needing targeted intervention (tier 2) and intensive interventions (tier 1) through the Response to Intervention (RtI) process. During a scheduled daily thirty minute math intervention block, the researcher will focus on using explicit and systematic instruction to help students make progress and close gaps in the area of mathematics. To track student data and ensure consistency, the researcher will utilize an instructional checklist, progress monitoring assessment, student interest survey, and behavior monitoring checklist. The desired outcome will produce results about instructional practices and strategies that help students with math deficiencies to make progress.

Introduction

Action research can be a powerful tool for teachers to improve their instruction and student learning. I plan to study effective math interventions instruction because I want identify specific teaching strategies so that I may better understand how my students can make improvements in math. The Response to Intervention (RtI) process is a critical component to student success, and I want to discover ways to improve upon my current practice. I implement math interventions in small groups to address areas of weakness for students on a daily basis, but see room for improvement in my structure and teaching strategies. Through my study, I hope to discover the most effective remedial instruction strategies in order to improve student performance and develop guidelines for other teachers that implement interventions. These findings will have a great impact on my students and will result in higher achievement in math by closing gaps.

As a researcher, my past experiences as a teacher and student will impact my perspective and influence my work. While I don't have specific experience in action research, I do make daily observations of my students to inform my teaching. I design lessons, activities, and groups based on my observations and anecdotal notes. This practical application of informal research will help to guide me through the more structured process of action research. I am looking forward to examining areas of improvement in my classroom to develop an action plan that can be shared with other teachers in my district. As defined by Mills (2014), "action research is any systematic inquiry conducted by teachers, researchers, principals, school counselors, or other stakeholders in the teaching/learning environment to gather information about how their particular schools operate, how they teach, and how well their students learn" (p. 21).

When considering the current math interventions used in my building, I must consider the demographics of my teaching assignment. I am currently in my fifth year teaching fourth and

fifth grade in a rural school district. I teach math to both grades and greatly enjoy the opportunity to service two grade levels. The town has a wide spectrum of socioeconomic demographics and my elementary represents our most at risk community. Our building is a Title I school in response to the eighty-six percent of students that receive free and reduced lunch. While the socioeconomic status is wide, the cultural and racial demographics of the community and our school are quite narrow, with ninety-one percent of the students white and only seven percent Hispanic. These low socioeconomic and at risk demographics greatly impact our students and how we teach.

Beyond the demographic characteristics of my school and district, there is a wide variety of intellectual ability and developmental levels within my classroom. This year nineteen percent of my students are labeled as Learning Disabled with IEPs. While these students receive some pull out support from our Special Education Teacher, much of their instruction takes place in my general education classroom. In addition to these students, I have several other students that are identified by the RTI process as "at risk", meaning they do not qualify for Special Education services, but are not performing at grade level. Beyond academic and developmental differences, many of my students receive Social Work and Counseling to help them cope with challenges they face and develop strategies to manage their behavior. These behaviors greatly impact my classroom environment, and I must consider these behaviors when planning lessons. This diverse makeup of abilities forces me to differentiate my instruction to the extreme to meet the needs of all students. My most effective way of providing math support to these students is through daily math interventions. The intervention block is crucial to improving students' success in math.

When conducting action research, teachers as researchers need to be cautious and aware of potential ethical considerations. As I research to understand effective math interventions, protecting my students' confidentiality and anonymity will be of top priority. Mills (2014) describes, "[f]reedom from harm is focused on not exposing students to risks. It involves issues of confidentiality and issues related to personal privacy" (p. 32). For this reason, I will not use student names as part of the study and will instead will assign students numbers to keep information confidential and protect student's anonymity. Another ethical consideration I will focus on, is ensuring that all data and reporting is accurate and free of exaggeration or bias. Collecting and reflecting on accurate information will provide the best representation of the current problems with math interventions in my classroom and will lead to the most successful action plan. A final ethical consideration I will address is gaining proper consent from students and other involved parties. Students should be aware of the purpose for data collection and have the ability to provide consent for their participation.

As I look critically at my students and current math intervention strategies being used in my classroom, I will need to be aware of biases I may have. Identifying potential bias as a researcher can help create a proactive approach to ensure those said biases will not impact results. Many of the students I work with in the remedial setting are below grade level in math and often lack motivation to improve. As I work on my action research project, I will need to focus on ways to separate true academic ability from motivation. I often have frustration with students that don't put forth effort or fully apply themselves academically and recognize this as a bias. Another bias I have in relation to my research topic is professional frustrations with the organization and management of our intervention block during the school day. I will need to look at these challenges in an objective way and not let my personal frustrations cloud my

interpretation of results. A final potential bias in my study is in the way I informally collect data through formative assessments and observation. While these data collection methods provide important anecdotal notes, it represents a small snapshot of the student, and may not represent their true ability.

Reflecting on myself as a researcher has helped me to identify elements that will impact my research, such as demographics, ethical considerations, and biases. Being consciously aware of these contributing factors will help me to be a better researcher. Examining math intervention practices within my classroom will help me to identify ways to improve the overall structure of my intervention block, as well as specific instructional strategies that will help my students to make gains in math. Implementing the most effective math interventions possible will make the biggest impact on students receiving targeted interventions (tier 2) and intensive interventions (tier 3) and close growing gaps. I look forward to sharing my findings and action plan with other teachers to maximize the impact.

Literature Review

A central theme in research for determining effective math interventions was identifying deficiencies and the specific skills that struggling students' lack. Several researchers, including Bryant and Bryant (2010) and Bongiorno (2011), outlined four critical areas that cause low performance in math, consisting of number sense and conceptual understanding, basic computation, fact fluency, and problem solving strategies. Other researchers, like Wolfe (2010) take a more scientific approach to understanding why students fall behind in math. Wolfe (2010) explores functions of the brain and describes how to target deficiencies and assist struggling students. She describes the effectiveness of making curriculum meaningful through hands on simulations as well as using the visual and auditory senses to enhance learning. Similarly, Steedly (2008) and Fuchs (2008) use brain research to make observations and recommendations for students with learning disabilities. Together, these authors examine the relationship between sensory memory, working memory, and long-term memory and the effects it has on students' learning and ability to succeed in math. In the study of third grade math students conducted by Fuchs (2008), "He identified predictors of computation (inhibition or controlled attention, vocabulary knowledge, visual-spatial working memory) that differed from problems solving (working memory's executive system; i.e., listening span, backward digit span, and digit/sentence span)" (p. 3).

In order to best support students with mathematical deficiencies, it is important to have a strong understanding of what defines proficiency in math. To target these deficiencies and learning disabilities, Steedly (2008) refers to The National Research Council's Concept of "Mathematical Proficiency". As noted by Steedly (2008), "The integrated and balanced development of all five strands of mathematical proficiency… should guide the teaching and learning of school mathematics" (p. 3). The list of proficient behaviors includes conceptual

understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition. This description of proficiency complements the work of other researchers, including Bryant and Bryant (2010) and Bongiorno (2011), and provides a benchmark for discerning students that require additional support in math. Bongiorno (2011) describes math proficiency in terms of foundational arithmetic skills, including depth of knowledge about whole numbers, word problems and fact fluency. Bryant and Bryant (2010) take a similar approach by describing the importance of students' ability to remain flexible with numbers, fluently implementing arithmetic combinations, and decomposing numbers. Students with deficiencies and delays need to strengthen their current stills to build foundational math skills, leading them to proficiency.

Response to Intervention (RtI) is frequently used as a framework to identify students needing supplemental and intensive interventions and the supports that are provided. VanDerHeyden (2008) describes, "Response to Intervention (RtI) has become a vehicle for system reform because it provides a framework in which data can be relied on as the basis for making relative judgments and for distributing instructional resources to promote the greatest good for the greatest number of students" (p. 1). Fisher and Frey (2010) detail the critical components of RtI and how to implement it in the most effective way in their book *Enhancing RTI.* Other researchers, such as VanDerHeyden (2008) and Bongiorno (2011) provide guidelines and checklists for RtI as it relates specifically to math interventions. Together, these researchers emphasize the need for a screening and progress monitoring measure that can help determine the students that require intensive and targeted interventions and also for measuring the progress students make while in an intervention. A common theme among all three researchers was the importance of a comprehensive RtI framework that is supported by a leadership team and

professional development. As Bongiorno (2011) explains, "District teams are able to provide guidance to schools in evaluating and selecting core programs and assessment measures, managing data collection and reporting, and coordinating professional development opportunities and instructional resources across schools" (p. 8).

Once students have been identified through RtI framework as needing additional support in math, researchers proposed instructional strategies to provide support and target those skills. Marzano and Pickering (2001) use brain research to outline teaching strategies for increasing student achievement. Bryant and Bryant (2010) also echo the importance of research based teaching strategies, but argue that core instruction is not enough and stress the importance of strategy instruction, explicit and systematic instruction, and conceptual understanding. Fuchs (2008), Gersten (2009), and other researchers reiterate the importance of research based teaching and support elements of the 7 Principles of Effective Intervention for Students with Mathematics Disabilities. The principles include instructional explicitness, instructional design to minimize the learning challenge, strong conceptual basis, drill and practice, cumulative review, motivators to help students regulate their own attention and behavior to work hard, and ongoing progress monitoring. Other researchers, like Steedly (2008) and Gersten (2007), give examples of specific strategies that support the 7 Principles of Effective Intervention as it relates to math. In addition to these principles, Steedly (2008) and others suggest placing emphasis on providing detailed feedback, teaching at an appropriate pace, allowing students time to process, providing opportunities for students to respond, and monitoring those responses. These specific teaching strategies will help me to create a comprehensive and detailed action plan for implementing effective math interventions in my district.

With an understanding of why students struggle in math, how the RtI framework helps to identify students needing support, and effective instructional strategies to help students increase performance, the final step is to select an intervention program. Marzano (2007) describes best practices for teachers that strongly impact student achievement in his book *The Art and Science of Teaching*, stating, "Among elements such as a well-articulated curriculum and a safe and orderly environment, the one factor that surfaced as the single most influential component of an effective school is the individual teachers within that school" (p. 1). This sentiment is noted by nearly every researcher, describing the power of individual teachers. Considering the above mentioned 7 Principles of Effective Intervention for Students with Mathematics Disabilities, the most frequently mentioned teaching practice, which I plan to implement, is explicit and systematic instruction. Steedly (2008) defines explicit and systematic instruction, "[e]xplicit instruction, often called direct instruction, refers to an instructional practice that carefully constructs interactions between students and their teacher" (p. 4). Bryant and Bryant (2010) site the National Mathematics Advisory Panel's recommendation of explicit and systematic instruction and provide a comprehensive framework for remedial instruction, including lesson previews, modeled practice, guided practice, independent practice and cumulative review. Bongiorno (2011) expands on the implementation of explicit and systematic instruction by stressing the importance of providing immediate corrective feedback during guided practice and the use of visual representation to explain math concepts. Gersten (2007) expands on the use of visual representations and suggests using graphic organizers and models accompanied by student and teacher think alouds as a way of effectively using explicit and systematic instruction. Wright (2007) provides specific explicit and systematic teaching strategies and examples of implementation related to applied problems, math computation, homework, problem solving,

review and vocabulary. While there are many teaching strategies suggested by researchers to improve student achievement, none were as common or as supported as explicit and systematic instruction. When teachers take into consideration the work of researchers like Wolfe (2010) to understand brain development, Fuchs (2008) to understand students with disabilities, Bongiorno (2011) to understand areas of math deficiency, and VanDerHeyden (2008) and Fisher and Frey (2010) to understand the RtI framework for identifying students with math difficulties, the implementation of explicit and systematic instruction is an easy conclusion to come to when focusing on improving student achievement in math.

Research Question and Data Collection Tools

For the purpose of this study, I will be examining the following research question: What effects will explicit and systematic math intervention instruction have on students' performance on math assessments? Researching effective math intervention instruction requires careful examination of several components. While designing data collection tools for the purpose of this research, I considered the independent, dependent and control variables. With these in mind, I found assessment tools that target these areas and will yield data to determine the success of my action plan. Together, these data collection tools complement each other and represent triangulation, described by Mills (2014) as, "a variety of data sources and different methods are compared with one another to cross-check data" (p. 116)

Data Analysis & Results

Part I: Triangulation of Data

Researching effective math intervention instruction requires careful examination of several components. While designing data collection tools for the purpose of this research, I considered the independent, dependent and control variables. With these in mind, I found assessment tools that target these areas and will yield data to determine the success of my action plan. Together, these data collection tools complement each other and represent triangulation, described by Mills (2014) as, "a variety of data sources and different methods are compared with one another to cross-check data" (p. 116)

The first data collection instrument used was an instructional strategy checklist. This source directly addressed the independent variable of my research question, systematic and explicit instruction. Systematic and explicit instruction involves many instructional strategies that can be used to help students be successful. Steedly (2008) explains, "explicit instruction, often called direct instruction, refers to an instructional practice that carefully constructs interactions between students and their teacher" (p. 4). To monitor my use of all the different strategies, I used a checklist of instructional strategies to monitor the frequency and effectiveness of individual strategies. With the help of the checklist, I used a variety of instructional strategies, all under the umbrella of systematic and explicit instruction, to best meet the needs of my students and the content being taught. After each intervention lesson, I filled out the instructional strategy checklist to reflect the strategies used in the lesson and made qualitative notes about the implementation. This data collection tool provided me with both quantitative and qualitative data. I was able to calculate the frequency of individual instructional strategies to

gather specific numerical data. The checklist also provided qualitative data from the implementation notes about my feelings of each strategy.

The second data collection instrument was the diagnostic assessment and progress monitoring tool. This source directly addressed the dependent variable of my research question, students' performance on math assessments. While I monitored student progress on a daily basis through formative assessments and observation, summative assessments and progress monitoring tools provided concrete data that allowed me to track individual progress on specific skills and concepts. The diagnostic assessment I created for my data collection tool was designed specifically for intervention students and includes third, fourth, and fifth grade common core standards. This differentiated assessment provided accurate data that identified areas of deficiency.

My study began with a pre-assessment that provided helpful baseline data, followed by frequent progress monitoring tests to collect ongoing data to drive instruction. Finally, my study concluded with a final progress monitoring assessment that allowed me to determine the overall success of each student and the effect of systematic and explicit instruction. As VanDerHeyden (2008) explains,

> The most rigorous analysis of whether the intervention has successfully solved a learning problem is to consider post-intervention performance on both the original and an updated screening task and evidence that the learning improvements caused by the intervention generalized to improved classroom performance and learning. (p. 7)

All progress monitoring assessments used the same testing format, but with modified numbers to ensure each assessment was unique. This data collection tool provided me with informative

quantitative data that helped me to make concrete conclusions about the effect of instructional strategies.

The third data collection tool was the student interest survey. This source addressed my research question by considering the students in my study as whole learners, taking into account not only their academic performance on assessments, but their attitudes and feelings about math as well. Students that struggle in math and require tier two intervention support typically do not have positive attitudes about math. This simple and quick interest survey helped me to better understand my students as mathematicians and as learners. By gaining a deeper understanding of their interest and attitude about math, I was able to tailor my teaching to their individual needs. Helping students to improve their math skills is important, but improving their attitude about math can be even more powerful. This data collection tool provided helpful qualitative data about students' feelings and yielded information that informed my teaching to target the individual needs of students.

The final data collection instrument was student behavior notes gathered through Class Dojo. This website allows teachers to record positive and negative student behaviors in an electronic form and produce graphs of results and overall percentages of specific behaviors. This source addressed my research question by providing qualitative and quantitative data of student behavior and application of skills both daily and over time. Class Dojo helped track the frequency of negative behaviors, but for the purpose of this study, I was most interested in the positive behaviors I observed during interventions. Many of the explicit and systematic teaching strategies rely on student participation, math talk, and collaboration. The frequency of positive and negative behaviors allowed me to monitor how students applied the strategies they were taught. Throughout the intervention block, I regularly monitored and recorded student

behaviors, both positive and negative, based on my observations. This tool was motivating to students and encouraged them to earn points in order to earn class rewards.

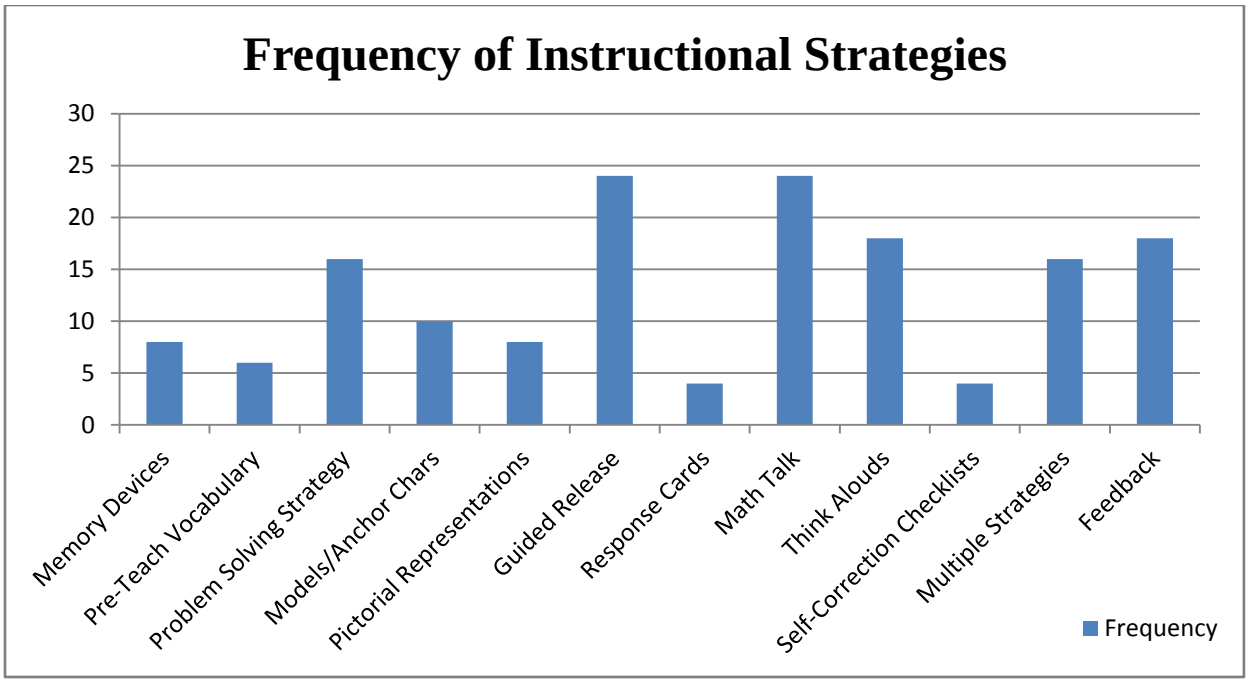
Part II: Analysis of Data

Quantitative and qualitative data both have advantages and disadvantages when collecting and analyzing data for research. Qualitative data collection focuses on measurable data and provides numerical results that can be easily interpreted in a way that is free of exaggeration or bias. While this data is reliable and important, not all critical components of research can be captured in black and white with numbers. Qualitative data collection focuses on descriptions that can be observed, but not measured. Observations can produce very powerful data that leads to conclusions and interpretations. Quantitative and Qualitative data are most powerful when used in conjunction. Together these types of data collection complement each other and create well-rounded data for review.

The Instructional Strategy Checklist data collection tool provided quantitative data that led me to make several inferences regarding explicit and systematic teaching strategies. The data collected over a ten week period of math intervention instruction showed that the teaching strategies were incorporated into lessons frequently and consistently. The data showed that on average, 4 explicit and systematic strategies were used each day during math interventions, 16 strategies per week, and a total of 160 over the course of the study. This quantitative data shows that these identified instructional strategies can easily be incorporated into any lesson to ensure consistency.

While each explicit and systematic instructional strategy was used, there was varying frequency of individual strategies. The average frequency and median of instructional strategies

was 13. The data did not show any outliers, but did produce an interesting data range. The maximum use of a specific strategy was 24 and the minimum use was 4, creating a wide range of 20. Some strategies were easily incorporated into conversation and daily teaching and occurred more frequently, while others required a more deliberate, content specific approach and occurred less often. The most commonly used strategies were "math talk" and guided release. These two strategies are less specific and require less preparation to incorporate into lessons. The use of math talk became an expectation in the intervention setting and was modeled and encouraged in nearly every activity. Guided release is an instructional strategy that refers to whole group instruction, followed by group work or scaffolding, and then finally independent practice. Guided release is a very natural fit for the intervention setting and is easily used with a variety of lessons and activities. The two least used instructional strategies were response cards and individualized self-correction checklists. I was sensitive to the use of response cards because I wanted to protect struggling students from sharing answers with the group before they were proficient with concepts. Instead, student work was monitored and formatively assessed in other ways, including observation and student conferencing. Self-correction checklists appeared to be used less frequently because once the checklist was created it could be reused and referred to over several weeks as students continued to work on the specific skill.

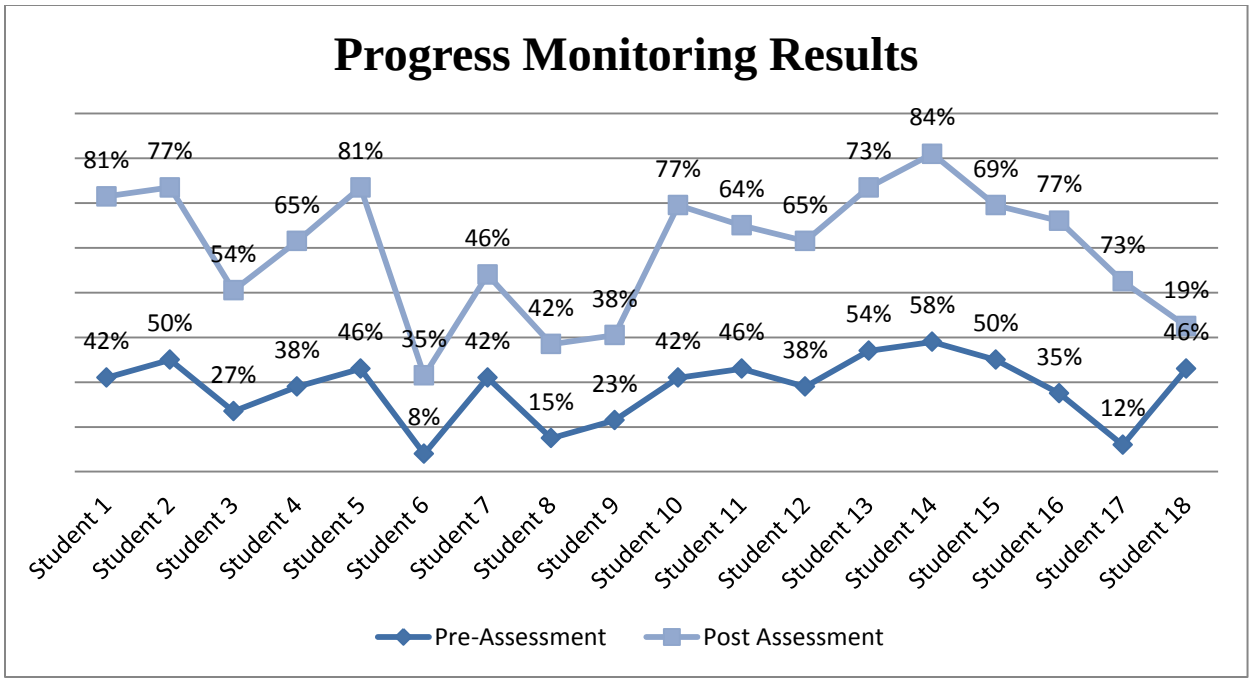


Data Table (Instructional Strategy Checklist)	
Mean:	13
Median:	13
Mode:	4, 8, 16, 18, 24
Range:	20
Outliers:	None

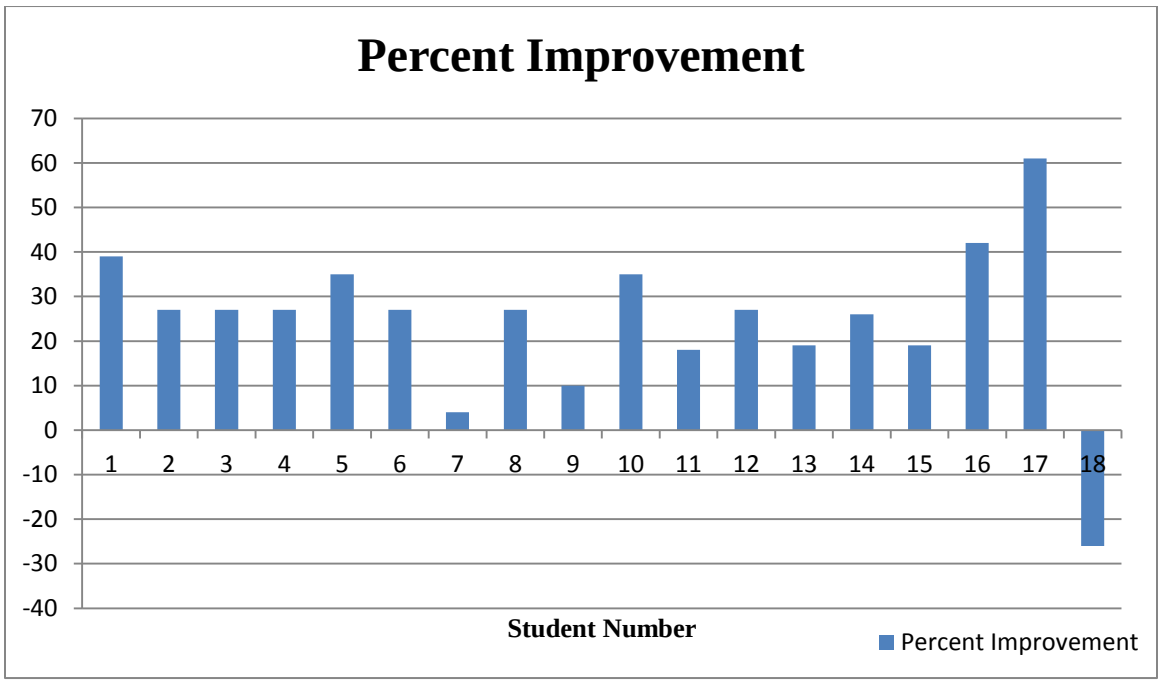
The Diagnostic Assessment and Progress Monitoring data collection tool produced some of the most significant quantitative data regarding the effects of explicit and systematic instruction on students' achievement in math interventions. The data shows that intervention students increased their average assessment score from 37% on the pre-assessment to 62% on the post assessment, resulting in an average increase of 25%. 94% of all students participating in the study showed growth and improvement of targeted skills. This data is very encouraging and shows the significant impact instructional strategies can have on students' performance in math interventions.

When examining the final assessment results, there were two sets of data that were clear outliers, one representing a much higher than average increase and the other a much lower than average increase. Student 17 showed an unusually high increase from the pre-assessment to the post-assessment, resulting in a 61% increase. This student differed from most intervention students in that the child is quite skilled in math, but was put in interventions to address large instructional gaps due to transiency. Student 18 represented the minimum score of -27% and was the only student that decreased in achievement. This student was also different from most students in my intervention block in that the child is labeled Emotionally Impaired. This disability causes the student to shut down and not complete work, as evident by the score on the post-assessment.

While students made overwhelming improvements, only half of the students were considered proficient on the post-assessment. To me, this data shows a flaw in the pre and post-assessment. The assessment included three different grade level standards and a total of 27 individual content standards. While the assessment provided me with information on skills that many students were deficient in, it may have been more effective to measure progress with shorter, more frequent assessments that focus only on one skill. The assessment was long and it took many students several days to complete, which does not represent best practice. Another issue with the assessment was that not all standards and skills listed on the assessment were taught. With unexpected events and schedule changes, the scope and sequence of skills was changed and did not align with the assessment.



Data Table (Assessment)		
	Pre-Assessment	Post-Assessment
Mean:	37%	62%
Median:	42%	69%
Mode:	42%	77%
Range:	50	65
Outliers:	8%	19%

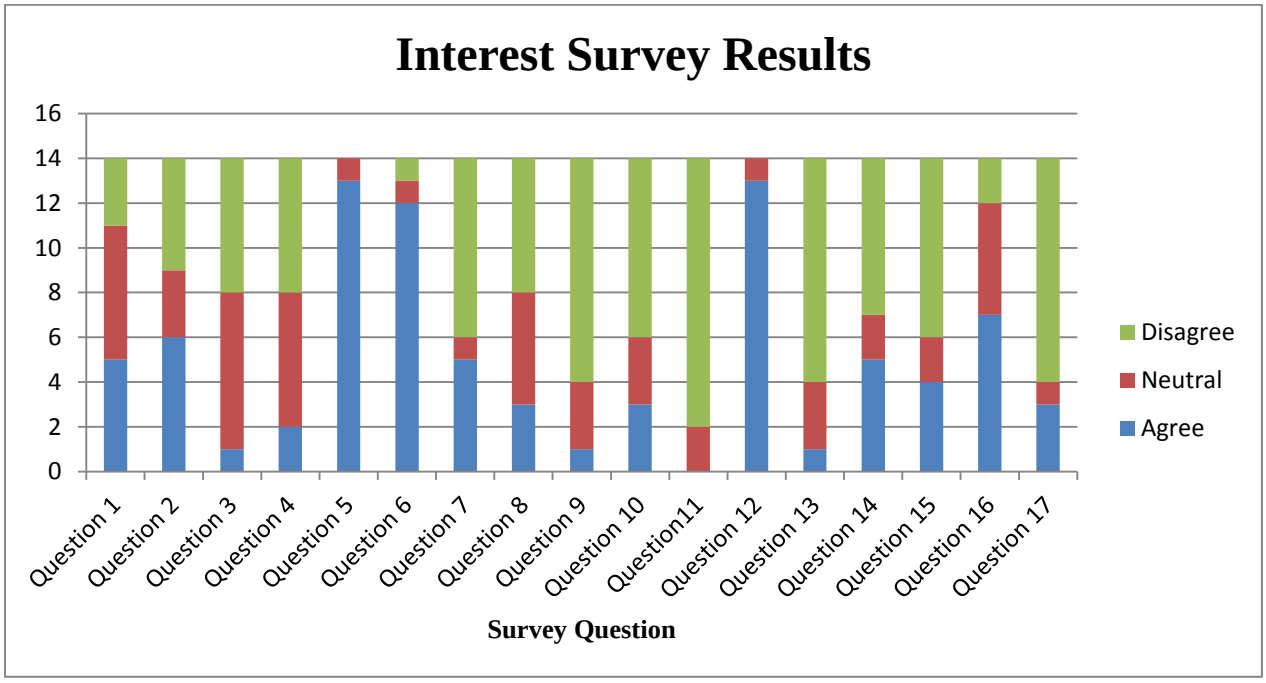


Data Table (Assessment)	
Mean:	25% increase
Median:	27
Mode:	27
Outliers:	-26 and 61

The Student Interest Survey data collection tool provided quantitative data that led me to understand my students as learners and make connections to their performance in math. The data showed that students requiring math interventions and remedial support did not view math in an overwhelmingly favorable way. Of the seventeen questions on the survey, an average of 5 students agreed with questions reflecting a positive response to math, an average of 6 students disagreed with questions reflecting a negative response to math, and an average of 3 students were neutral. The data helped me to realize that students showed frustrations with computation and problems solving, but maintained a relatively positive attitude about the subject itself.

The results helped me to understand, in detail, the parts of math students struggled with the most; this information helped me to tailor my instruction to address these learning interests and needs. One of the most insightful pieces of data centered on the question that asked, "Is math confusing?" resulting in 73% of the students saying yes. Another question asked, "Are you afraid of problem solving (story problems)?" resulting in half of the student saying yes. Half of the students also responded yes to the question, "Do you get tired of working with numbers?" Finally, 79% of students disagreed with the question, "Do you enjoy the challenge of a hard math problem?" Together, the data from these questions helped me to understand a level of anxiety students' face when it comes to solving problems. It helped me to identify an underlying need for students to understand concepts and standards on a deeper level to be successful and limit frustration.

While students responded to questions in a way that showed frustrations in math, there were several questions that showed an overwhelmingly positive attitude about math and a desire to improve. This insight into students' feelings helped me to customize my teaching and meet the needs of all students in my intervention block. One of the most encouraging pieces of quantitative data was the 100% positive response to the question asking, "Do you enjoy doing problems when you know how to work them out?" Similarly, in response to the question, "Do you want to do better in math?" 100% of students responded yes. A final piece of data that correlated with the above mentioned questions was the 93% of students that said they were not afraid of math. Together, these survey responses helped me to see that students are interested in math and have a desire to improve. This data showed me that when students have the needed skills to understand and accurately solve problems, they enjoy the subject and are motivated to improve.



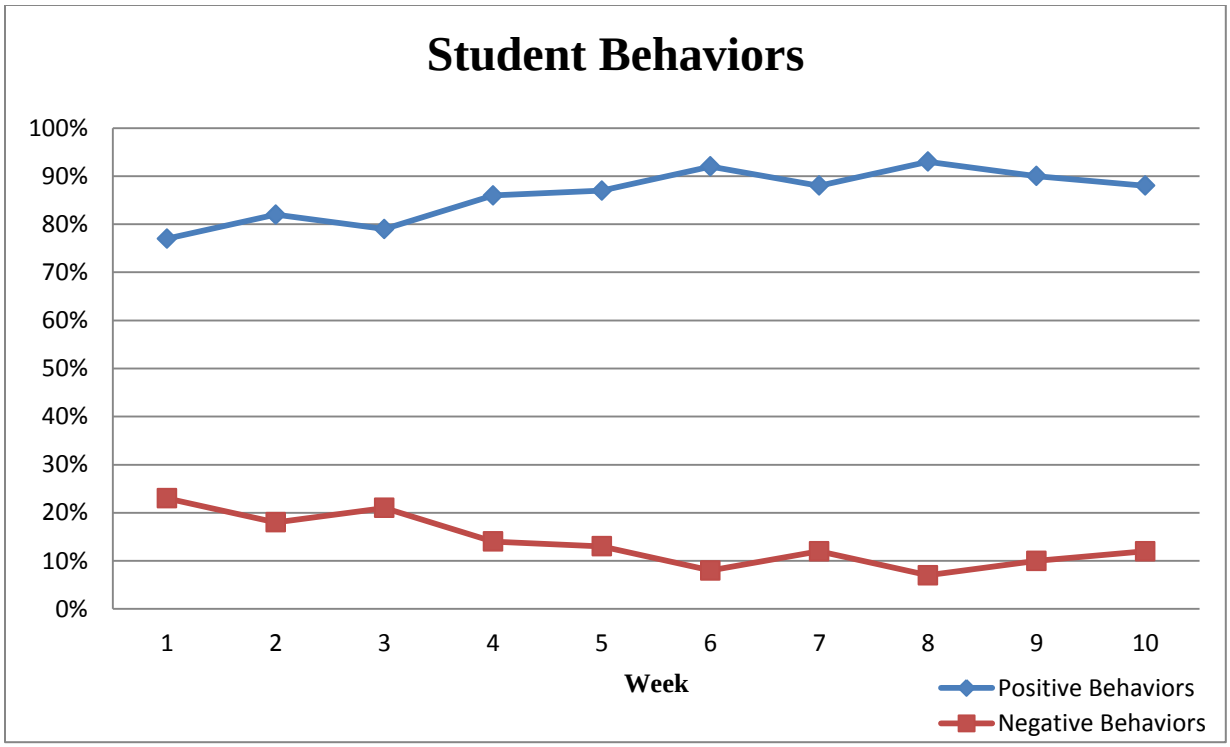
Data Table (Interest Survey)			
	Agree	Neutral	Disagree
Mean:	5	3	6
Median:	4	6	3
Mode:	1 and 3	6, 8 and 10	3

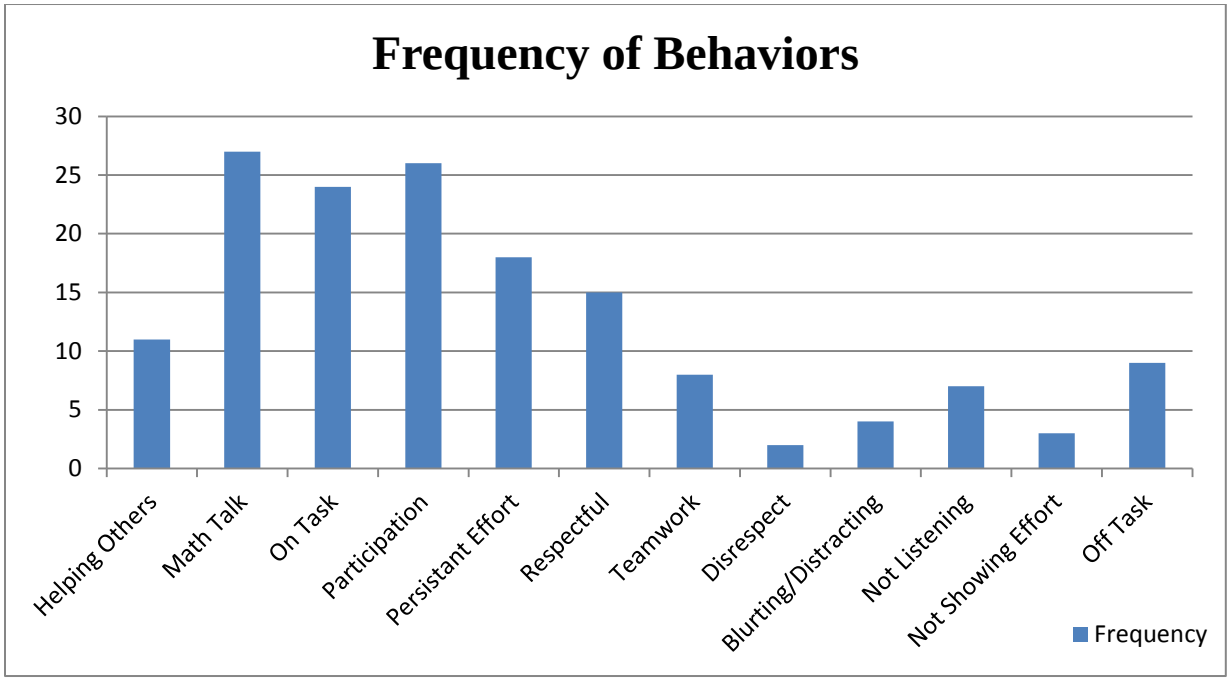
The Student Behavior data collection tool via Class Dojo produced quantitative data regarding the effects of explicit and systematic instruction on students' behavior in math interventions. The data shows that student behavior was overwhelmingly positive and still showed growth over the ten week period. On average, students demonstrated positive behavior 86% of the time. Over the course of the study, positive behaviors ranged from 77% to as high as 93%. Likewise, the class average for negative behaviors was 13% and ranged from 23% to as low as 7%. I was pleased to see that as students became more confident with math skills, they became more engaged in lessons and behaved better each week.

While examining the positive behaviors more closely, it was apparent that many of these behaviors reflected consistent use of explicit and systematic instruction strategies. One of the most significant pieces of quantitative behavior data showed the frequency of math talk, on task behavior, teamwork and participation. Over the course of the study, students most commonly used "math talk", higher level thinking that uses vocabulary and explanation of strategies to explain processing, a total of twenty-seven times. This translates to math talk being used in interventions every other day. Through guided release and small group instruction, students demonstrated "teamwork" and "helping others" a total of nineteen times. Finally, students frequently showed "persistent effort" eighteen times while applying four-step problems solving strategies and multiple strategies to various problems. This data provides additional evidence of

students applying strategies as a result of explicit and systematic instruction and the impact it can have on student behavior and achievement.

While data showed positive behavior 87% of the time, there were occasional negative behaviors recorded. While all students contributed to those positive behaviors, there were only a few students that contributed to the average 13% of negative behaviors. Of the participating students in my intervention block, three students, or 16% of students have behavior plans to monitor regular negative behavior. One student in particular has a behavior plan targeting best effort and work completion to motivate and monitor her behaviors as a result of her emotional impairments. She accounted for all nine instances of being "off task" and the three instances of "not showing effort". The other two students with behavior plans show impulsive behavior that often results in blurting and occasional disrespect as reflected in the six instances of this behavior. While this data needs to be included and carefully considered, it is important to note that this student can be categorized as an outlier compared to other students.





Data Table (Student Behavior)		
	Positive Behavior	Negative Behavior
Mean:	86%	13%
Median:	87.5%	12.5%
Mode:	88%	12
Range:	77%-93%	23%-7%

The Instructional Strategy Checklist data source provided data that showed frequent use of a variety of teaching strategies that supported explicit and systematic instruction. Individual strategies were used several times in a given intervention block. The use of these strategies depended heavily on the ability to incorporate them into the current math skills and lessons that were being taught. Other factors of implementation reflected teacher and student perception and feelings towards specific strategies.

The qualitative data produced by this source allowed me to identify several themes to make meaning of this information. One theme was the positive reception by me as the teacher. Planning and organizing math intervention groups can be a large task and I was apprehensive about finding time to incorporate several "new" things. As I began using explicit and systematic instructional strategies, I realized that I already used many of the strategies. I became more purposeful about my planning and use of the strategies and was pleased to find that it enhanced my current lessons. Many of the strategies, including "math talk" and guided release, adapted well to all lessons. I appreciated having the instructional checklist to reference and track frequency. There were many times I wouldn't have thought to teach a concept in a particular way if it weren't for seeing the strategies on the checklist. The following comment was recorded in my field notes, stating, "Love having a list of best practice strategies – need to create for other subjects for reference." I truly feel that the implementation of explicit and systematic instruction made me a more effective teacher.

Another evident theme in the data from the Instructional Strategy Checklist was the positive response by students. The strategies were easy for students to understand and apply.

The strategies worked for all types of math problems and they began to see their value. As students used the different instructional strategies, they quickly found that they helped them to improve and solve math problems more accurately. Students began to show excitement and pride in using the strategies to solve problems. The more we used and discussed the strategies, the more students became motivated to use them. As found in the field notes, a student was quoted saying, "Look Mrs. Zank, I used the poster to help me figure it out". Similarly, during small guided math groups I often observed students suggesting strategies to one another to help solve a problem. These observations helped me to realize that the outlined instructional strategies were powerful and were making a big difference in the way students thought about solving problems.

Ultimately, it was clear that consistent implementation of explicit and systematic instructional strategies creates a foundation for student achievement in math interventions. The positive reception by teacher and students alike helped to solidify its place in the math intervention setting. This helped to answer part of my research question, asking if explicit and systematic instruction will help students achieve in math interventions. I was able to conclude that it is possible to incorporate the instructional strategies into current teaching practices and lessons and that frequent use begins to establish a culture of positive problem solving.

The Progress Monitoring data source provided qualitative data that showed significant improvement in student achievement as a result of implementing effective math intervention. With the help of explicit and systematic instruction, students were able to apply strategies to become more efficient and accurate problem solvers. Some students made sizable gains, while others showed slow, steady progress. Reflection of the data and assessment brought to light several factors that impacted student achievement and success.

The data from the pre-assessment allowed me to recognize themes in student understanding and performance. There were evident challenges with the assessment length and content. Due to the length of the assessment, students became frustrated and worked for several days to complete the assessment. Because the assessment had diagnostic elements, there were several problems students didn't know how to solve which led to discouragement. As quoted in field notes, students said, "I'm not good at math." and "This is too hard." On the pre-assessment, there were many problems that students didn't even attempt because they didn't understand the question. While there were challenges with the pre-assessment, there were also positive outcomes. The results allowed me to gain a full picture of the skills students were proficient in, including previous grade level standards. The data allowed me to identify foundational skills that were affecting other, more complex skills. For example, many students were inconsistent with subtraction with regrouping, which affected their ability to be proficient in multi-step story problems and division. The wide range of skills covered on the assessment helped me to create a scope and sequence of progressive skills to target in the intervention block over the course of the study.

The post-assessment also provided data that allowed me to identify themes of student understanding and perception. There were noted differences between the pre and post-assessments. Students still showed frustration with the length of the assessment, but were less discouraged as they worked their way through the problems. As found in my field notes, a student was quoted saying, "This is so much easier this time!" There was less anxiety evident as they worked. Not only did students' performance increase, but there was an increase of student confidence. Similar to the pre-assessment, the results provided me with data to drive instruction. I was able to identify specific areas and skills that students improved on, and also concepts that

require more time and attention. Although the study has concluded, my efforts to improve student achievement have not. Using the data from the post-assessment, I am working with intervention students to improve on skills they are still not proficient in.

The Progress Monitoring Assessment provided me with valuable data regarding the specific skills students had, as well as insightful observations of student frustration and anxiety. This helped me to answer my research question, focusing on student achievement and the progress made by students before and after implementation of explicit and systematic instructional strategies. These instructional practices provided students with skills and practice to improve computation and strategies to tackle challenging problems. Together, these skills and strategies helped students to increase achievement and gain confidence in the area of math.

The Interest Survey data collection tool provided qualitative information regarding students' attitudes and perceptions of math. The results showed that students grew frustrated in math when they did not know how to solve a problem and often gave up when problems were challenging. The results also showed that students were eager to improve and still enjoyed the subject of math itself. The data produced by the Interest Survey provided me with valuable information about the feelings and attitudes of my students. I considered this information as I planned lessons and implemented explicit and systematic instructional strategies.

The data from the Interest Survey helped me to identify several themes surrounding the feelings my students had about math. One of the most common themes I noticed was an increase in pride and confidence as students worked on math problems. This confidence was evident in student comments, such as, "I'm good at this now!" and "I like math now!" This new found confidence helped students to remain persistent on challenging problems and became a

motivating factor during math interventions. I was pleased to see that this confidence spilled beyond our intervention block and became evident in our regular math block as well. Students were eager to share what they had learned during intervention lessons and were more successful during all math lessons throughout the day. This increased confidence had a large effect on student performance and behavior and was a key element to improving student achievement.

Another common theme found in the data from the Interest Survey was the change in frustration experienced by students. While students still experienced feelings of frustration from time to time, they did not let that frustration prevent them from completing a problem. I watched a new culture of learning slowly evolve during my intervention block where students began to embrace the challenge of an advance math problem. As students learned and applied the strategies of explicit and systematic instruction, they began to embrace challenge rather than feel defeated and frustrated. This culture change was powerful. Students became motivated to do better and began applying newly learned strategies to persevere through multi-step problems. Learning and applying the methods of explicit and systematic instruction equipped students with strategies to improve and avoid frustration. On several occasions, when our intervention block was over, there was an audible groan and students voicing a desire to continue working. I even had students ask, "Can I stay and finish this problem?" These observations helped to show the change in interest and attitude regarding math interventions.

This change in attitude paired with new problem solving strategies allowed students to become more motivated and committed students. Explicit and systematic instruction allowed students to feel more confident about math content, which in turn, gave students the work habits to increase their performance. This data addressed my research question by showing that when

students' interests and attitudes are considered, explicit and systematic instruction can improve student achievement in math.

The Student Behavior data source produced qualitative data that showed students participating in math interventions exhibited overwhelmingly positive behavior. Student Behavior data was collected through a classroom management tool called Class Dojo. These positive behaviors included desirable classroom behavior, but also targeted the use of explicit and systematic instructional strategies. Positive behavior increased two fold throughout the ten weeks of the study; students earned more Dojo points as they learned and used math strategies, but negative behaviors decreased as students became more proficient in math. With positive behavior during math interventions, a productive academic environment was created.

The student behavior data resulted in themes around the benefits of classroom management from the perspective of the teacher. Class Dojo helped to make classroom management fun and easy for the teacher and students, alike. The website is easy to use and provides reports and statistics that help to understand the behavior of a group and individual students. By carefully selecting behaviors to track, including academic and behavioral targets, students were motivated to improve. As a result, classroom management did not become the focus of my intervention block, and instead, teaching and learning became the central focus of each lesson. There was more teaching time with fewer interruptions and less frequent behavior problems. Ironically, by preparing and utilizing a detailed classroom management tool, I did not have to focus on classroom management.

Another common theme regarding student behavior was the positive reception by students in math interventions. Students found Class Dojo exciting and were motivated to earn

points. This motivation encouraged students to not only behave in a positive manner, but also to apply strategies they had learned. They even began to encourage others to behave in a positive manner by saying, "Stop messing around, or you're going to lose points." The concrete tracking and visuals provided through Class Dojo were helpful to all students, especially those with behavior goals. Typically, negative behaviors stem from frustration and avoidance, but as students became more confident and successful with math skills, their behavior improved because they were enjoying the process of learning.

The Student Behavior records provided me with valuable data regarding the importance of positive student behavior. Without the distractions and worry of controlling student behavior, more focus could be placed on applying instructional strategies and improving student performance. This helped me to answer my research question, focusing on the effects of explicit and systematic instructional strategies on student achievement. Student behavior is a critical component to math interventions. A thoughtfully crafted plan can encourage positive student behavior and motivate students to apply new mathematical strategies.

With careful analysis of all data sources and the quantitative and qualitative data they produced, I was able to gain a deeper understanding of the effects of explicit and systematic instruction on student achievement. As I discovered common themes and patterns within the data, I was able to interpret results to make greater meaning of them. Together, this information helped me to recognize elements of the study that contributed to the success of student achievement, and also identify elements that could be improved. My experiences and reflection have helped me to create an action plan to be utilized by myself and others in the future as we strive to improve math interventions.

Action Plan

Part I: Findings

When comparing the data analysis results to the prior studies discussed in the literature review, I discovered several similarities and differences. One big idea discussed in the literature review focused on the process and importance of identifying students' deficiencies in math. The researchers sited in the literature review discussed the need to identify and measure students' proficiency in conceptual understanding, basic computation, fact fluency, and problem solving. As I conducted my own research I carefully considered each of these factors. The progress monitoring tool I designed strongly targeted basic computation and provided detailed data on students' ability to solve a variety of problems. From the basic computation problems, I was also able to assess fact fluency by evaluating accuracy and strategies they applied. The progress monitoring assessment did not however provide opportunities for students to demonstrate their conceptual understanding or problem solving skills. While the assessment did not provide data in these areas, implementations of explicit and systematic instructional strategies allowed for students to reason and explain their thinking, providing formative assessment opportunities and detailed data that could drive instruction. The combination of strategies and assessments used, addressed the recommendations of the researchers sited in the literature review.

In the literature review, researchers also emphasized the need for a strong and comprehensive RtI framework. Researchers, such as VanDerHeyden (2008) and Bongiorno (2011) suggest guidelines and checklists for RtI as it relates specifically to math interventions. This strongly correlates with the creation and use of the Instructional Strategy Checklist that monitored the frequency and use of specific explicit and systematic instructional strategies for the purpose of the study. Researchers also emphasized the role of regular screening and progress

monitoring. As I implemented the study and collected data, I used a progress monitoring tool to assess student. While I was progress monitoring, I was not fully following the recommendations outlined by researchers; the length of the assessment discouraged me from assessing students as frequently as I had hoped. Ultimately, the suggestions of researchers drove the structure I created for my study and helped to ensure the results were used to strengthen the RtI framework in my district.

The final big idea that was emphasized in the literature review was the need for effective instructional strategies in an intervention setting. This concept was the backbone of my research and strongly aligns with the ideas outlined by researchers in the literature review. All researchers emphasized the need for instructional strategies that are research based. Specifically, Marzano (2007 and Steedly (2008) stressed the effectiveness of explicit and systematic instructional strategies. With this information in mind, I designed a checklist of explicit and systematic instructional strategies to monitor use and frequency. This tool helped create accountability and consistency as I collected data and implemented my study. The researchers also discussed the need for strategy instruction and balancing computation with conceptual understanding. As I conducted my research, I discovered that the use of explicit and systematic instructional strategies targeted problem solving and encouraged students to think conceptually. Instructional strategies such as four-step problem solving strategies, memory devices to remember strategies, pictorial representations of concepts, and math talk and think alouds that encourage reasoning and explanation all targeted problem solving and conceptual understanding. The results of my study also aligned with the researchers sited in the literature review, showing a strong correlation between quality instruction through the implementation of explicit and systematic instruction and student achievement in math interventions.

Part II: Recommended Action

Using the results of the research, there are simple recommended actions that will have a powerful impact on student learning. The research showed a positive impact on student achievement, behavior, and engagement with implementation of effective teaching strategies relating to systematic and explicit instruction. The effects were wide spread and improved student learning, engagement and behavior. As students learned skills and strategies to become more proficient in math, their engagement increased and behavior improved. Students were more engaged by the variety of instructional strategies that appeal to all learning styles, resulting in students being more intrinsically motivated as they experience success. By removing students barriers, such as frustration and avoidance, students' became more focused on personal growth during math interventions. These teaching strategies can be implemented for enhancement of math interventions but also during tier one instruction in all subjects

A key recommendation for future use of explicit and systematic instructional strategies in math interventions is the consistent use of an instructional checklist. For manageable implementation, schools and teachers should have an instructional strategy checklist available for reference and to monitor frequency of use. This checklist will help teachers to implement these strategies across the curriculum, in all grades, and all subjects to maximize student achievement. In addition to the checklist, teachers would benefit from explanations of how to implement and integrate individual strategies. Having concrete examples of each strategy will help teachers to be more comfortable with their use and create consistency among individuals.

A final recommendation for future use of instructional strategies to improve student achievement in math is the creation and use of quality assessment tools. Assessments are a critical component of an intervention, providing data to target instruction, meet the individual needs students, and track progress. After completing the study, I discovered a need to separate

the diagnostic and the progress monitoring assessment tools. This will result in shorter assessments and will reduce the testing time for each student. Each assessment should include questions that target basic computation with opportunities to evaluate use of basic facts as well as questions that require students to reason and explain their thinking to show understanding of concepts and problem solving. A further recommendation would be the creation of common assessments for each grade level with consistent wording and formatting to support the school-wide RtI framework. Together, these simple changes will maximize the useful data that teachers will gain from each assessment that can be used to drive and target instruction during math interventions.

Part III: School-Wide Improvement

Greenville Public Schools creates yearly school improvement plans for individual buildings and for the district as a whole. The school improvement plans determine the direction and clearly define the purpose for the year. Our school improvement plans all focus on three overreaching goals that focus on proficiency in reading, writing and math. To support those goals, the school improvement plans outline specific strategies and activities that will help improve proficiency in the core subjects. Furthermore, the plan determines staffing and funding needed to support initiatives relating to each goal.

The results of this research will help to support our goal of all students being proficient in math. One of the related activities describes and expectation and framework for math interventions in our building. The research findings could prompt an addition of a supporting strategy that requires the use of explicit and systematic instructional strategies to support math interventions and overall proficiency in math. The addition of this strategy could be supported by the intent to close achievement gaps in various subgroups and strengthen tier one and two

instruction. Adding this strategy to the school improvement plan creates an expectation to consistently implement systematic and explicit instruction by teachers and an expectation to provide resources to support the initiative by the district.

References

Bongiorno, D. (Ed.). (2011). Response to Intervention in Elementary-Middle Math. *Best Practices for Better Schools,* 10-10. Retrieved January 18, 2015, from http://www.naesp.org/sites/default/files/Math_Intervention_blue.pdf

Bryant, Ph.D., D., Bryant, Ph.D., B., & Hughes Pfannenstiel, Ph.D., K. (2010). Effective Mathematics Instruction. *The Meadows Center For Preventing Educational Risk,* 27-27. Retrieved January 18, 2015, from http://resources.buildingrti.utexas.org/PDF/math_intervention.pdf

Find What Works. (2015, January 1). Retrieved January 18, 2015, from http://ies.ed.gov/ncee/wwc/

Fisher, D., & Frey, N. (2010). *Enhancing RTI how to ensure success with effective classroom instruction & intervention*. Alexandria, Va.: ASCD.

Fuchs, Ph.D., L., Fuchs, Ph.D., D., Powell, M.S., S., Seethaler, M.S., P., Cirino, Ph.D., P., & Fletcher, Ph.D., J. (2008). Intensive Intervention for Students with Mathematics Disabilities: Seven Principles of Effective Practice. *National Institutes of Health,* 13-13. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2547080/

Gersten, R., Beckmann, S., Clarke, B., Foegen, A., Marsh, L., Star, J., & Witzel, B. (2009). Assisting Students Struggling with Mathematics: Response to Intervention (RtI) for Elementary and Middle Schools. *IES Practice Guide,* 98-98. Retrieved January 18, 2015, from http://ies.ed.gov/ncee/wwc/PracticeGuide.aspx?sid=2

Gersten, R., & Clarke, B. (2007). Effective Strategies for Teaching Students with Difficulties in Mathematics. *National Council of Teachers of Mathematics,* 2-2. Retrieved January 18, 2015, from http://www.nctm.org/news/content.aspx?id=8452

Marzano, R., & Pickering, D. (2001). *Classroom instruction that works: Research-based strategies for increasing student achievement*. Alexandria, Va.: Association for Supervision and Curriculum Development.

Marzano, R. (2007). *The art and science of teaching a comprehensive framework for effective instruction*. Alexandria, Va.: Association for Supervision and Curriculum Development.

Mills, G. E. (2000). Action research: A guide for the teacher researcher. Upper Saddle River, NJ: Merrill.

Sagor, R. (1992). How to conduct collaborative action research. Alexandria, VA: Association for Supervision and Curriculum Development

Steedly, Ph.D., K., Dragoo, M.Ed., K., Arafeh, Ph.D., S., & Luke, Ed.D., S. (2008). Effective Mathematics Instruction. *Evidence for Education, 3*(1), 11-11. Retrieved January 18, 2015, from http://www.parentcenterhub.org/repository/math/

VanDerHeyden, Ph.D., A. (2008, January 1). RTI and Math Instruction. Retrieved January 18, 2015, from http://www.rtinetwork.org/

Wolfe, P. (2010). *Brain matters translating research into classroom practice* (2nd ed.). Alexandria, Va.: ASCD, Association for Supervision and Curriculum Development.

Wright, Jim (2007). School-Wide Strategies for Managing... MATHEMATICS. (n.d.). *Teacher2Teacher*, 8-8. Retrieved January 18, 2015, from http://www.interventioncentral.org/academic-interventions/math/school-wide-strategies-managing-mathematics

Appendix A

Data Collection Matrix

Research Question:	Data Source			
	1	2	3	4
What effects will explicit and systematic math intervention instruction have on students' performance on math assessments?	Instructional Strategy Checklist: A tool to monitor the frequency and effectiveness of different explicit and systematic instructional strategies.	Diagnostic Assessment & Progress Monitoring Tool: A differentiated assessment tool to identify the current math ability of students as well as their specific deficits to be targeted in interventions.	Interest Survey: A tool to determine students' feelings and attitudes towards math.	Student Behavior Notes: A recording tool to track the motivation, participation, and behavior of students in math interventions.

Appendix B

Data Collection Tool 1: Instructional Strategy Checklist

The independent variable of my study will be the systematic and explicit instruction I will implement in math interventions. Systematic and explicit instruction involves many instructional strategies that can be used to help students be successful. Steedly (2008) explains, "explicit instruction, often called direct instruction, refers to an instructional practice that carefully constructs interactions between students and their teacher" (p. 4). To monitor my use of all the different strategies, I plan to use a checklist of instructional strategies that will monitor the frequency and effectiveness of individual strategies. With the help of the checklist, I hope to use a variety of instructional strategies, all under the umbrella of systematic and explicit instruction, to best meet the needs of my students and the content being taught. This data collection tool will provide me with both quantitative and qualitative data. I will be able to calculate the frequency of individual instructional strategies to gather specific numerical data. The checklist will also provide qualitative data as I make implementation notes about my feelings of its effectiveness and students response to individual strategies. After each intervention lesson, I will take time to fill out the instructional strategy checklist and make qualitative notes about the implementation.

Frequency	Instructional Strategy
	Memory devices to help students remember a strategy
	Implementation Notes:
	Pre-teach vocabulary/use everyday language
	Implementation Notes:
	4-Step problem solving strategy
	Implementation Notes:
	Step-by-Step Models/Anchor Charts
	Implementation Notes:
	Draw pictorial representations of problems and concepts
	Implementation Notes:
	Guided Release (whole group, groups, independent)
	Implementation Notes:
	Response cards (whiteboards)
	Implementation Notes:
	"Math Talk" (discussion of strategies used)
	Implementation Notes:
	Teacher and Student Think Alouds
	Implementation Notes:
	Individualized Self-Correction Checklists
	Implementation Notes:
	Teach multiple strategies for solving a problem
	Implementation Notes:
	Feedback
	Implementation Notes:

Appendix C

Data Collection Tool 2: Diagnostic Assessment/Progress Monitoring Tool

As I conduct research, I will be closely monitoring my dependent variable of students' performance on math assessments. While I will be monitoring student progress on a daily basis through formative assessments and observation, summative assessments and progress monitoring tools will provide concrete data that will allow me to track individual progress on specific skills and concepts. The diagnostic assessment I created for my data collection tool is designed specifically for intervention students and includes third, fourth, and fifth grade common core standards. This differentiated assessment will provide the most accurate data possible.

My study will begin with a pre-assessment that will provide helpful baseline data, followed by frequent progress monitoring tests to collect ongoing data to drive instruction. Finally, my study will end with a final progress monitoring assessment that will allow me to determine the overall success of student performance and the effect of systematic and explicit instruction. As VanDerHeyden (2008) explains,

> "the most rigorous analysis of whether the intervention has successfully solved a learning problem is to consider post-intervention performance on both the original and an updated screening task and evidence that the learning improvements caused by the intervention generalized to improved classroom performance and learning" (p. 7).

All progress monitoring assessments will use the same testing format, but with modified numbers to ensure each assessment is unique. This data collection tool will provide me with informative quantitative data that will help me to make concrete conclusions about the effect of instructional strategies.

Student Number: _____

Progress Monitoring Assessment		
Place Value		
3.NBT.1 Round 38 to the nearest ten. _____	3.NBT.1 Round 429 to the nearest hundred. _____	3.NBT.1 Round 783 to the nearest ten. _____
4.NBT.1 How many hundreds are in 4,000? _____	4.NBT.1 Write a number that is 10 times what the 3 represents in 6,537. _____	4.NBT.1 What is the value of the underlined digit? 3,<u>4</u>89,302 _____
4.NBT.2 Compare the two numbers. 235,891 ____ 253,891	4.NBT.3 Round 5,280 to the nearest thousand. _____	4.NBT.3 Round 87,683 to the nearest thousand. _____
5.NBT.1 How much larger is 3 than 0.3? _____	5.NBT.2 7.45×10^2 _____	5.NBT.2 734÷10 _____
5.NBT.3 Write 3.56 in expanded form. _____	5.NBT.3 Compare the decimals. 3.45 ____ 3.54 _____	5.NBT.2 What is 0.86 rounded to the nearest tenth. _____
Computation		
3.NBT.2 895 + 545= _____ 632 – 358= _____	4.NBT.4 5,467 + 6,489= _____ 5,032 + 2,384= _____	5.NBT.4 7.065 – 3.29= _____ 5.815 + 0.36= _____
3.OA.1 Solve 6x8 and represent it by using an array, number	3.OA.2 Solve 56÷8 and represent it by using an array, number	3.OA.4 4 x ___ = 36

sentence and repeated addition.	sentence, and repeated subtraction.	___÷ 8 = 7 6 x ___ = 54
4.OA.1 What is nine times larger than 22? _____	4.NBT.5 489 x 7 = _____	4.NBT.6 784 ÷ 4= _____
5.NBT.1 3,458 x 34 = _____	5.NBT.7 4.63 x 0.7= _____ 78.3 x 0.4= _____	5.NBT.6 436 ÷ 23= _____
3rd Grade Standards **_____/7**	**4th Grade Standards** **_____/10**	**5th Grade Standards** **_____/10**

Appendix D

Data Collection Tool 3: Interest Survey

Students that struggle in math and require tier 2 intervention support typically do not have positive attitudes about math. This simple and quick interest survey will help me to better understand my students as mathematicians and as learners. By gaining a deeper understanding of their interest and attitude about math, I will be able to tailor my teaching to their individual needs. I plan to have my students take the interest survey at the beginning of the study and again at the conclusion. I am interested to see how students' attitudes about math change as they receive more intentional math instruction to help them improve. Helping students to improve their math skills is important, but improving students' attitude about math can be even more powerful. This data collection tool will provide helpful qualitative data about students' feelings and will yield information that will inform teaching to target the individual needs of students.

How do YOU Feel About Math?		
Student Number:	**Agree**	**Disagree**
Math is confusing		
I like math, but I like other subjects just the same.		
Math is boring.		
I don't think math is fun.		
I want to do better in math.		
Math is just as important as any other subject.		
I like to do math "in my head".		
I enjoy the challenge of a hard math problem.		
I have always been afraid of math.		
I use math every day (outside of math class).		
I don't like math and avoid using it at all times.		
I enjoy doing problems when I know how to work them out.		
Math is my favorite subject - I like it more than any other subject.		
I get tired of working with numbers.		
I am afraid of problem solving (story problems).		
Math is very interesting.		
I have never liked math.		

Appendix E

Data Collection Tool 4: Student Behavior Notes

As students receive more effective math intervention instruction, I am interested to see the effect it will have on student behavior. As a classroom management tool, I use Class Dojo to monitor and track student behavior. This website allows teachers to customize and record positive and negative student behaviors in an electronic form. The results can be graphed to show the overall percentage of specific behaviors. This tool is motivating to students and encourages them to earn points in order to earn class rewards. This system is helpful in reducing negative behaviors, but for the purpose of this study, I am most interested in the positive behaviors I observe during interventions. Many of the teaching strategies rely on student participation, math talk, and collaboration. The positive and negative behavior list will be data collection tool to monitor how students how students apply the strategies they are taught. To protect students' confidentiality, their names will not be used on the website, rather the number they have been assigned for the purpose of the study. Throughout the intervention block, I will frequently monitor and record student behaviors, both positive and negative, based on my observations. This qualitative and quantitative data will help me to monitor the behavior and application of skills of individual students both daily and over time.

Class Dojo - Student Behaviors	
Positive Behavior	**Frequency**
Participation	
Math Talk	
Persistent Effort	
Teamwork	
Helping Others	
Respectful	
On Task	
Negative Behaviors	**Frequency**
Disrespect	
Distracting/Blurting	
Off Task	
Not Listening	
Not Showing Effort	

Appendix F

Data Collection Timeline

Below is a proposed timeline for implementing the various components of my study on effective math intervention instruction. The topics outlined in the timeline will be implemented during the daily thirty minute math intervention block. The timeline will remain flexible to the needs of the students, but will serve as a guide for assessing students regularly and implementing explicit and systematic instruction.

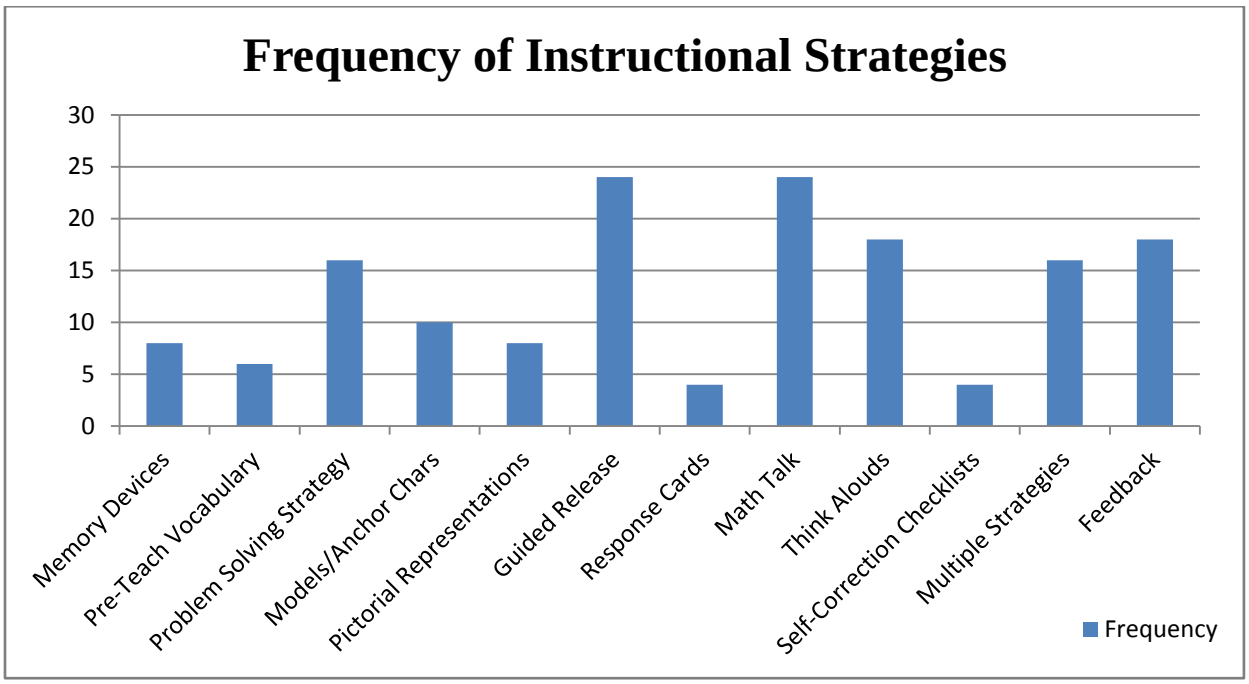
Timeline
Week One
Monday (3.9.15): Math Interest Survey
Tuesday (3.10.15): Pre-Assessment
Wednesday (3.11.15): Review assessment and survey data and determine area of focus to drive instruction
Thursday (3.12.15): Fact Boot Camp!
Friday (3.13.15): Begin targeted intervention with explicit and systematic instruction
Week Two
Monday (3.16.15): Targeted intervention with explicit and systematic instruction
Tuesday (3.17.15): Targeted intervention with explicit and systematic instruction
Wednesday (3.18.15): Targeted intervention with explicit and systematic instruction
Thursday (3.19.15): Fact Boot Camp! (Substitute Teacher – MAUCL Conference)
Friday (3.20.15): Review student work to determine area of focus for the next week. Review and update explicit and systematic instruction checklist.
Week Three:
Monday (3.23.15): Targeted intervention with explicit and systematic instruction
Tuesday (3.24.15): Targeted intervention with explicit and systematic instruction
Wednesday (3.25.15): Targeted intervention with explicit and systematic instruction
Thursday (3.26.15): Field Trip to the Capitol
Friday (3.27.15): Review student work to determine area of focus for the next week. Review and update explicit and systematic instruction checklist.
Week Four:
Monday (3.30.15): Targeted intervention with explicit and systematic instruction
Tuesday (3.31.15): Targeted intervention with explicit and systematic instruction
Wednesday (4.1.15): Targeted intervention with explicit and systematic instruction

Thursday (4.2.15): Progress Monitor (Aims Web Assessment Tool) - Review assessment data and determine areas of focus to drive instruction. Measure and evaluate student growth.
Friday (4.3.15): No School – Good Friday
Week Five:
Spring Break – No School
Week Six:
Monday (4.14.15): Targeted intervention with explicit and systematic instruction
Tuesday (4.15.15): Targeted intervention with explicit and systematic instruction
Wednesday (4.16.15): Targeted intervention with explicit and systematic instruction
Thursday (4.17.15): Fact Boot Camp!
Friday (4.18.15): Review student work to determine area of focus for the next week. Review and update explicit and systematic instruction checklist.
Week Seven:
Monday (4.20.15): Targeted intervention with explicit and systematic instruction
Tuesday (4.21.15): Targeted intervention with explicit and systematic instruction
Wednesday (4.22.15): Targeted intervention with explicit and systematic instruction
Thursday (4.23.15): Fact Boot Camp!
Friday (4.24.15): Review student work to determine area of focus for the next week. Review and update explicit and systematic instruction checklist.
Week Eight:
Monday (4.27.15): Targeted intervention with explicit and systematic instruction
Tuesday (4.28.15):
Wednesday (4.29.15): Targeted Intervention with explicit and systematic instruction
Thursday (4.30.15): Progress Monitor (Aims Web Assessment Tool) – Review assessment data and determine areas of focus to drive instruction. Measure and evaluate student growth.
Friday (5.1.15): No School – Professional Development
Week Nine:
Monday (5.4.15): Targeted intervention with explicit and systematic instruction
Tuesday (5.5.15): Targeted intervention with explicit and systematic instruction
Wednesday (5.6.15): Targeted intervention with explicit and systematic instruction
Thursday (5.7.15): Fact Boot Camp!
Friday (5.8.15): Review student work to determine area of focus for the next week. Review and update explicit and systematic instruction checklist.
Week Ten:
Monday (5.11.15): Targeted intervention with explicit and systematic instruction

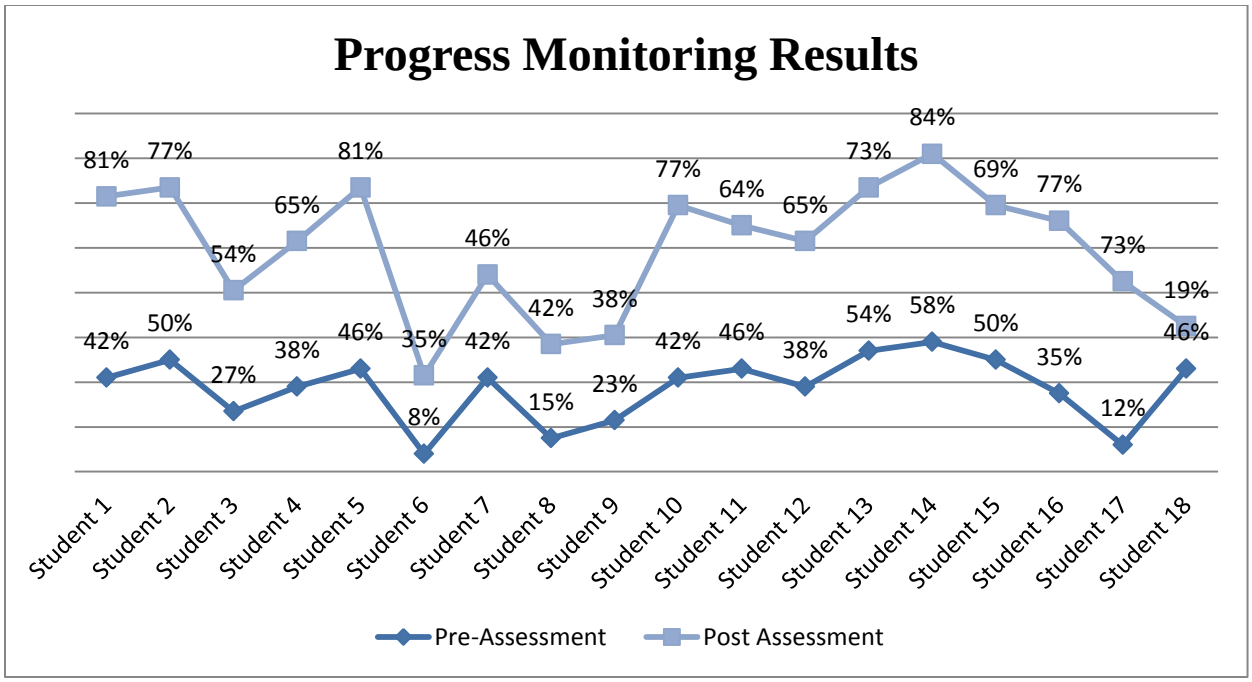
Tuesday (5.12.15): Targeted intervention with explicit and systematic instruction
Wednesday (5.13.15): Targeted intervention with explicit and systematic instruction
Thursday (5.14.15): Fact Boot Camp!
Friday (5.15.15): Review student work to determine area of focus for the next week. Review and update explicit and systematic instruction checklist.
Week Eleven:
Monday (5.18.15): Targeted intervention with explicit and systematic instruction
Tuesday (5.19.15): Targeted intervention with explicit and systematic instruction
Wednesday (5.20.15): Targeted intervention with explicit and systematic instruction
Thursday (5.21.15): Fact Boot Camp!
Friday (5.22.15): Progress Monitor (Aims Web Assessment Tool) - Review assessment data. Measure and evaluate student growth.

Appendix G

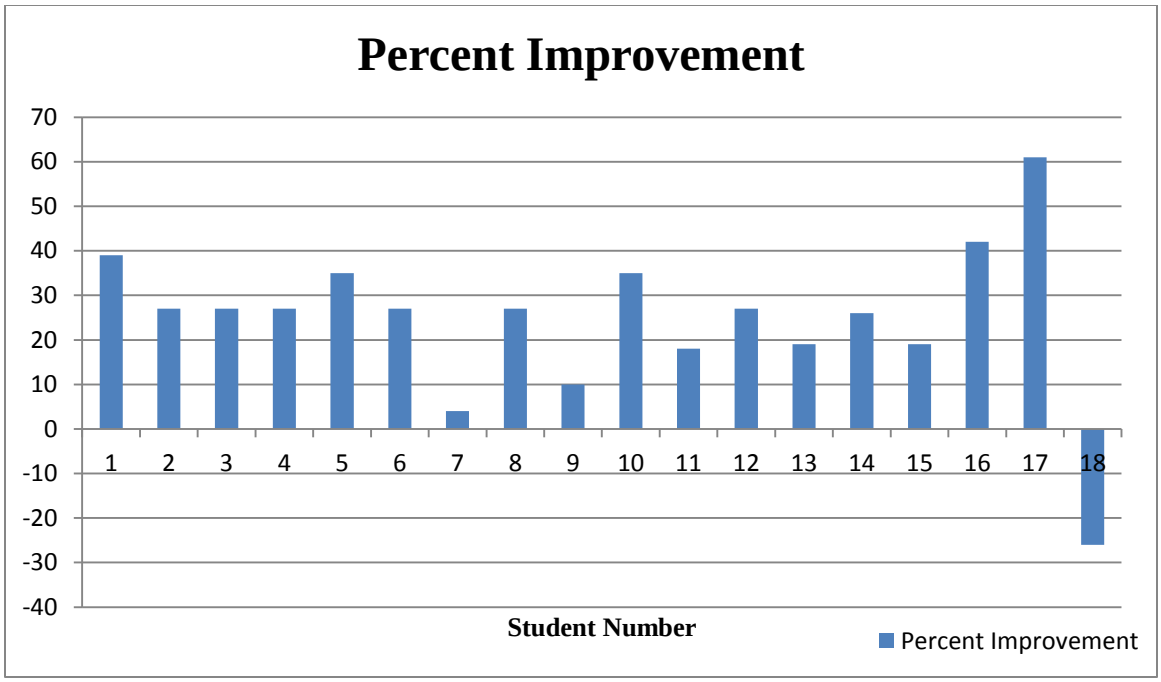
Data Tables



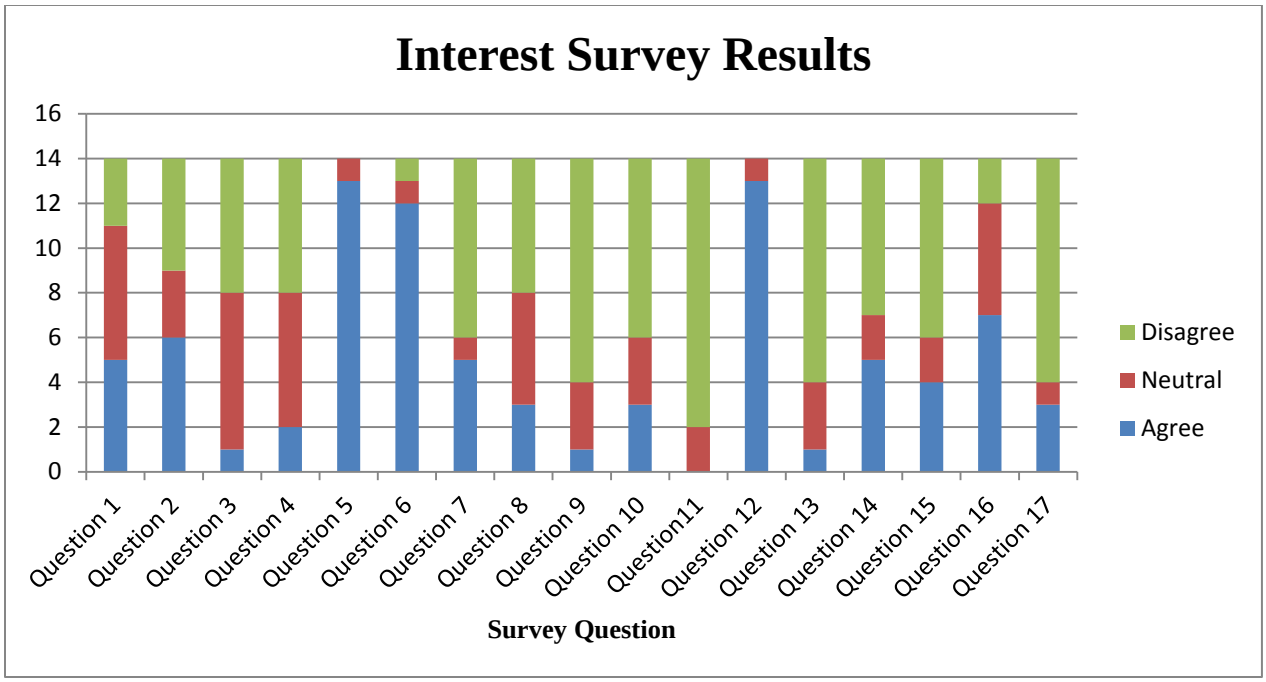
Data Table (Instructional Strategy Checklist)	
Mean:	13
Median:	13
Mode:	4, 8, 16, 18, 24
Range:	20
Outliers:	None



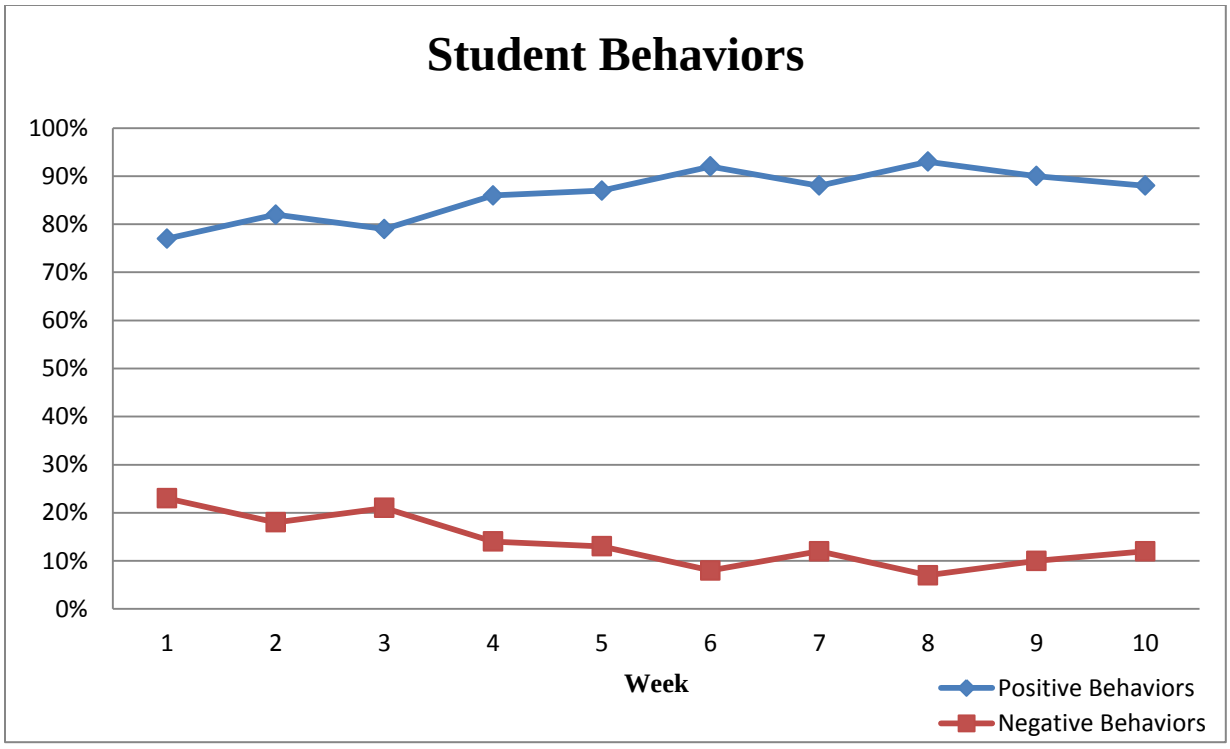
Data Table (Assessment)		
	Pre-Assessment	Post-Assessment
Mean:	37%	62%
Median:	42%	69%
Mode:	42%	77%
Range:	50	65
Outliers:	8%	19%

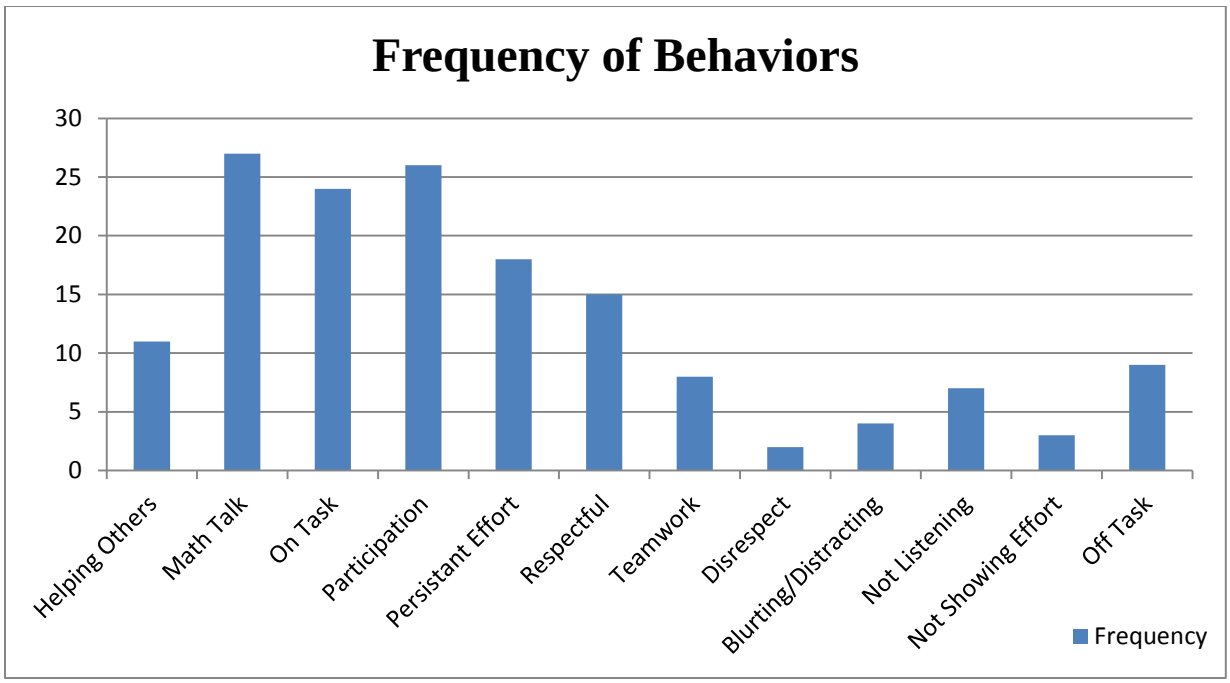


Data Table (Assessment)	
Mean:	25% increase
Median:	27
Mode:	27
Outliers:	-26 and 61



Data Table (Interest Survey)			
	Agree	Neutral	Disagree
Mean:	5	3	6
Median:	4	6	3
Mode:	1 and 3	6, 8 and 10	3
Outliers:	None	None	None





Data Table (Student Behavior)		
	Positive Behavior	Negative Behavior
Mean:	86%	13%
Median:	87.5%	12.5%
Mode:	88%	12
Outliers:	None	None