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Implementing Multi-Tiered Systems of Support in Mathematics: Findings from Two Schools

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This study examined the benefits and challenges associated with implementing RtI in the area of mathematics in an elementary and a middle school in a rural district in the northeastern United States. We sought to document the ways in which two schools approached implementation of RtI and to explore the issues they encountered with respect to instruction, intervention, and assessment. Five themes were identified that described implementation of the RtI framework: Shifting roles and changing structures, increasing opportunities for collaboration and communication, increasing instructional and assessment support for students who struggle in math, increasing knowledge of support strategies for learners who struggle with math, and "spreading the word" and enhancing the use of the model. The results of this study suggest that the RtI model has potential to improve how math instruction is approached in elementary and middle schools.

Keywords: Elementary Secondary Education, At Risk Students, Evaluation Methods, Curriculum

Response to Intervention (RtI) is an educational innovation and a multi-tiered system of support that is being used in many schools to organize curriculum, instruction, and assessment for the purpose of promoting school-wide success for all students (Batsche et al., 2006). While RtI models may vary by schools and may be known by other names (e.g., Response to Instruction, Multi-Tiered Systems of Support), the framework is based upon the use of scientifically-supported curricula in the general education classroom, universal screening for all students, and increasing levels of intervention along with continued progress monitoring for students failing to meet standards (Fuchs, Mock, Morgan, & Young, 2003). Schools using RtI models aim to provide high quality instruction and systematic approaches to classroom instruction and assessment that prevent school failure. When implemented with integrity, the RtI model can help teachers and parents determine whether a student's failure to progress is the result of inadequate instruction or a potential learning disability (Fletcher, Coulter, Reschly, &Vaughn, 2004; Gersten et al., 2009). Originally conceived as an alternative to the "severe discrepancy model" that has historically

been used to identify students as learning disabled, the RtI approach became more widely known and used in the United States following its adoption as a provision of the government's 2004 re-authorization of the Individuals with Disabilities Education Improvement Act (IDEIA, 2004; Yell & Drasgow, 2007).

Multi-tiered models may range from three to five levels of support; however, the majority of schools in the U.S. use a three-tiered framework in which interventions increase in intensity. The first tier involves the general education of all students and universal screening to identify potential progress issues. Instruction at this level must be of high quality and designed to meet the needs of all students, with its effectiveness supported through scientific research (Buffum, Mattos, & Weber, 2009). Students whose universal screening data indicate that they are failing to meet standards in Tier 1 may receive small group Tier 2 interventions, with regular progress monitoring (Gersten et al., 2009). When progress monitoring demonstrates that the student has responded to the intervention and no longer needs more intensive instruction, interventions may be discontinued and he or she may return to Tier 1 instruction (Shapiro & Clemens, 2009). Students who are found to not respond to original or revised Tier 2 intervention are generally considered for Tier 3 interventions, characterized by more intensive and individually delivered interventions and continued progress monitoring. In many states, Tier 3 intervention involves the determination of eligibility for special education (Buffum et al.).

Although the RtI model has been implemented in schools in various forms since the 1970's (Buffum et al., 2009), its increased use has been accompanied by an expanding research base that has focused on a variety of applications and associated outcomes. For example, a 2005 study (Burns & Ysseldyke) examining four large-scale RtI models implemented in four US states concluded that the model resulted in positive outcomes for the students. Two smaller scale studies of implementation of RtI models in rural schools (Shepherd & Salembier, 2010; Shepherd & Salembier, 2011) also identified promising trends with respect to faculty development and student outcomes. Numerous studies have explored effectiveness of the RtI model in the area of reading (Faggella-Luby & Wardwell, 2011; Flaum, 2009; Fuchs et al., 2007a; Schoenberger, 2010), and emerging areas of study focus on the use of RtI for students who are English Language Learners (Eversole, 2010; McIntosh, Graves, & Gersten, 2007).

There remains, however, a need for research on the use of RtI in areas outside of literacy and reading, including implementation of the approach in middle and secondary schools (Burns & Ysseldyke, 2005), applications for understanding the processes underlying skill deficits and strengths (also called neuropsychologically based RtI; Witsken & Stoeckel, 2008), professional development to promote implementation (Gilbertson, Witt, Singletary, & VanDerHeyden, 2007), technology use for assessment and data-based decision-making (Allsopp, McHatton, & Farmer, 2010), and mathematics instruction (Allsopp et al.; Fuchs et al., 2007a; Fuchs et al., 2007b).

RtI represents a possible framework for increasing all students' mathematics performance and providing assistance to students with difficulties in mathematics; however, the evidence base to support use of school-wide RtI mathematics models across grade levels is relatively new. Fuchs and colleagues (2007a, 2007b) have conducted the most extensive research on RtI in the

context of mathematics, with one study exploring the effectiveness of a specific program in mathematics in over 160 first- and third-grade classrooms. Results suggested that this particular approach to RtI decreased failure rates in math problem solving and held promise for identifying and preventing math difficulties in elementary school students (Fuchs et al., 2007a,b). Clarke and colleagues (2011) also identified positive outcomes for kindergarten students involved in a large scale study of implementation of an RtI mathematics model in over 60 kindergarten classrooms.

A number of smaller studies have evaluated specific components of the RtI models aimed at increasing students' performance in the area of mathematics. Examples include research on the success of specific interventions for struggling students (Poncy et al., 2010), the implementation of the model for math in one grade level (Bottge et al., 2004), and comparisons of different intervention approaches (Duhon et al., 2009). These studies, like the larger studies, generally find support for the use of the RtI-based intervention programs and curriculum models (Duhon et al.; Poncy et al.); however, most have been limited to the study of specific interventions rather than systemic approaches to implementation, and nearly all have been conducted only at the elementary school level.

The current study was designed to contribute to the knowledge base on school-wide frameworks for RtI by examining the benefits and challenges associated with implementing RtI in the area of mathematics in an elementary and a middle school in a rural district in the northeastern United States. The district had begun implementation of the RtI model in mathematics six to twelve months prior to the study, and school administrators and math interventionists invited the co-authors to evaluate the early implementation of the model as a way to provide feedback and guide future implementation efforts. Our primary purpose was to document the ways in which two schools approached systemic implementation of RtI and to explore the issues they encountered with respect to instruction, intervention, and assessment as they addressed implementation within and beyond the elementary school level. In doing so, we hoped to develop and extend a base of knowledge for further exploration into math curricula and approaches that can be used to enhance students' responses to math instruction.

Method

The study used qualitative methods (Glesne, 2005; Patton, 2002), including observations and semi-structured interviews, and a case-study approach (Stake, 1995) to assess the implementation of RtI for mathematics at one elementary and one middle school. The elementary school had begun implementing the RtI model for mathematics instruction during the year prior to data collection, while the middle school had begun full implementation a few months prior to data collection. For reporting purposes, the elementary school will be referred to as "Maple Elementary," and the middle school as "Mountain Middle." Maple Elementary included kindergarten and grades one through six, with a total enrollment of approximately 300 students. The Mountain Middle school included grades seven and eight, with an enrollment of approximately 240 students. The majority of students who completed Maple Elementary School continued at Mountain Middle School, which also included students from four additional sending schools. Table 1 depicts key characteristics of the two schools.

Table 1.
School Characteristics

Characteristic	Maple Elementary	Mountain Middle
Grades	Kindergarten - 6	7-8
Population	300	240
% Students in Special Education or Support Services	26	21
% Students in Free and Reduced Lunch Program	48	28
Student:Teacher Ratio	10.5	9.7
% White Students	93.0	97.0

Six individuals were interviewed at the elementary school, including classroom math instructors, paraprofessionals, a math specialist, and the school principal. Eight individuals were interviewed at the middle school, including special educators, classroom math instructors, a math specialist, and the school principal. Table 2 depicts key characteristics of the interviewees, using pseudonyms.

Table 2.
Interviewee Characteristics

Name	School	Role	Certification	Experience	Gender
Paula	Middle	Special Educator	Special Education	5-10 years	Female
Helen	Middle	Special Educator	Special Education	5-10 years	Female
Ken	Middle	Math Teacher	Math Teacher	5-10 years	Male
Adam	Middle	Math Teacher	Math Teacher	Over 10 years	Male
Lance	Middle	Principal	Principal	Over 10 years	Male
Kris	Middle	Math Teacher	Math Teacher	0-5 years	Female
Peg	Middle	Math Teacher	Math Teacher	Over 10 years	Female
Karen	Middle	Math Specialist	Math Teacher	Over 10 years	Female
Kaitlyn	Elementary	Paraprofessional		5-10 years	Female
Jill	Elementary	Math Teacher	Math Teacher	5-10 years	Female

Lynn	Elementary	Paraprofessional		5-10 years	Female
Kara	Elementary	Math Teacher	Math Teacher	0-5 years	Female
Candace	Elementary	Principal	Principal	Over 10 years	Female
Kelly	Elementary	Math Specialist	Math Teacher	Over 10 years	Female

Data Collection

The authors collected data through two-day site visits at each of the schools. Interviews of the participants at each school were semi-structured in nature, and consisted of six to nine open-ended questions. Questions were intended to determine the interviewees' perspectives on how the RtI model was being implemented for mathematics instruction at their school, the strengths and weaknesses of the implementation, and the level of understanding of the RtI model at the school. All interviews were tape recorded and transcribed. In addition to these interviews, the authors conducted hour-long observations of classroom math instruction and math interventions. At Mountain Middle, two co-taught general education math classes, and two math intervention classes were observed. At Maple Elementary, one co-taught general education math class, two general education math classes with math interventionists' support, and two math intervention classes were observed. Math intervention classes were additional math instruction provided to students who were identified as struggling in math. These classes took place outside of the general classroom math instruction. The researchers were also provided with various math instructional and assessment materials used by instructors at the schools for review, including a quiz, several in-class exercises, and a pre-lesson assessment test.

Data Analysis

Qualitative thematic analysis was used to analyze interview transcripts, interviewers' observation notes, and reviews of instructional materials (Patton, 2002). The two researchers conducted initial analyses individually, and then met and discussed the early findings to establish a common coding scheme and understanding of the data. No formal inter-rater reliability analysis was conducted, but the researchers began the coding process by independently coding three transcripts and comparing their degree of consistency in coding. They discussed coding commonalities and differences to establish the final coding scheme. Based upon this analysis, 18 coding categories were developed and all data were coded with this scheme. After this initial coding, the two researchers again met and the coded data were further analyzed together for overarching themes (Gibbs, 2007) that described the RtI models being implemented for math at these schools.

Results

Model Approaches

Maple Elementary and Mountain Middle schools had achieved significant progress in implementing RtI models for math instruction. The two schools had taken slightly different approaches toward implementing RtI models and were still in the process of tailoring the models to fit their schools' needs. Both schools used several methods to screen students for failure to meet standards in math, but specific screeners varied between the schools. Maple Elementary used district-wide math exams and/or a computer-based assessment program depending upon

students' grade-levels, while Mountain Middle school utilized a method of sending teacher-assessments and recommendations to a math specialist for screening. Both schools also relied on students' scores on a common statewide, standards-based assessment test given once a year. Progress monitoring of students receiving interventions at Maple Elementary was based on short tests given before and after unit lessons, while Mountain Middle used a continuously individualized, computer-based intervention and progress monitoring program. Despite these differences in approaches, math instructors and interventionists and school administrators at both schools expressed positivity towards the model implementation and associated changes at their schools.

Like the differences in screening and progress monitoring, the structure of the RtI model tiers also varied between the schools. Maple Elementary had integrated the support of math interventionists into Tier 1 classrooms. For Tier 2 interventions at Maple Elementary, students were given more individualized support by math interventionists in the classroom or were given supplemental small-group instruction that occurred outside of the classroom and was differentiated to the students' needs. Out-of-class support occurred in a specialized classroom referred to as the math lab, and students received instruction for 45 minutes either before regular classes in the morning or during a free class period. Tier 3 included this small-group instruction and more individualized time adjusted to the students' skill level. If students failed to progress with Tier 3 supports, they were recommended for a special education evaluation.

Mountain Middle school had implemented materials differentiation and a co-teaching approach to provide extra support to students who needed minor accommodations and/or differentiation of instruction in general education mathematics classes at Tier 1. Tier 2 interventions were delivered via additional co-teaching and a supplemental session of math instruction given in small groups at the end of the school day. For students needing Tier 3 supports at Mountain Middle, a daily one-on-one session with a math specialist was added to the co-teaching classes and small group instruction to further reinforce materials.

Identified Themes

Five themes were identified through data analysis that described implementation of the RtI framework at the two schools. These themes encompass both the interviewees' and researchers' perceptions of the RtI framework as it is being used in these schools. These themes include:

1. Shifting roles and changing structures;
2. Increasing opportunities for collaboration and communication;
3. Increasing instructional and assessment support for students who struggle in math;
4. Increasing knowledge of support strategies for learners who struggle with math; and
5. "Spreading the word" and enhancing the use of the model.

Theme 1: Shifting roles and changing structures. The first theme describes how RtI implementation led to transformations in the responsibilities of the educators and leaders at the schools. Implementing the RtI model for math instruction at these schools changed how math classes were structured and how teachers approached math education in many ways. For example, several classes had adopted co-teaching methods, both schools had formed math intervention teams, and both schools had strong leaders of these math intervention teams who were actively

involved in further implementing the RtI model for math.

The math intervention teams consisted of math instructors, math specialists, and paraprofessionals. The team members were, in several cases, recruited explicitly for these roles and provided with unique specialized training; thus, these educators were perceived to be uniquely prepared to deliver specialized math instruction. One major benefit of having these specialized math instructors at the schools was better time management for developing math curricula and for supporting individual students. Math interventionists aided in this development by providing additional intensive support outside of the classroom to struggling students, which allowed classroom teachers more time to focus on building fundamental skills. In addition, classroom teachers reported that they did not have much time to develop supplemental and differentiated instructional materials, and so developing these materials was another task taken up by the math teams. The classroom teachers expressed great appreciation towards the math interventionists' work on this task, as these materials were seen as very helpful. One classroom teacher of mathematics observed that:

"I can't do it every day and specifically she's (the math intervention team leader) done it when there's three levels and there's just no way I could do that with my 8th grade; come up with three different levels for one class unless I spent, I don't know, all of Thanksgiving break doing it."

Nearly all the interviewees also commented that the strong leadership provided by the math team leaders at the two schools had propelled changes in math instruction. The math specialists at each school functioned primarily as consultants for the classroom math instructors for program and instructional development, and served as teacher-leaders for the RtI programs in math at their schools. These teacher-leaders were largely responsible for the development of the math intervention teams at their schools and were a valuable resource for the other math instructors for motivation and information towards continued positive change. Each teacher-leader had received graduate level training in mathematics instruction and systems-level change processes, and each had, over the past few years, been allowed to shift their roles as teachers of mathematics to take on a more significant role in implementing RtI in their schools. This specialized training played a significant role in their being chosen to spearhead the RtI implementation processes in their schools. The team leaders built the math intervention teams based upon their visions for an RtI-based math instructional model and prepared the teams to implement the framework in their newly structured math departments. The Maple Elementary teacher-leader described the change process in this way:

"I look for people that are willing to learn. That are really respectful to kids. And believe that kids can grow and can learn. At whatever their pace is. I don't care what pace it is but that they're going to move. I can teach you the math. I can teach you how to teach math or I can get you the right professional development but if you have a closed mind, it doesn't matter, I can't do it".

However, the interviewees noted that there were barriers in the implementation of the RtI model. Although classroom teachers noted that the RtI models adopted in each of the two schools allowed them to save time with respect to the development of materials and methods, the math interventionists commented that the amount of time they dedicated to implementing the model might not be sustainable. To them, it remained a question whether the math teams could

continue the same level of model implementation over a longer time period and whether it would be beneficial for classroom teachers to gradually take over some of this responsibility.

Theme 2: Increasing opportunities for collaboration and communication. The second theme represents the potential for the RtI model to help create a more cohesive structure for mathematics instruction at all levels of student ability. The changes in roles and structures described in the previous section (e.g., co-teaching arrangements, the appointment of head math specialist positions at both schools, and the creation of teams of math interventionists) were accompanied by increased opportunities for teachers and math specialists to communicate and collaborate with one another in ways that were thought to improve instruction and provide additional supports for students who had previously struggled in math.

The instructors, interventionists, and principals at both schools perceived that the model had led to more of an overall "team approach" to the math curriculum. The math intervention teams met regularly to plan lessons, review student progress, and develop instructional materials. These meetings were viewed by the math teams as very important for their successful model implementation; the Maple Elementary team had meetings every day and the Mountain Middle team met four days a week. This team approach resulted in increased consistency in teaching practices across classrooms and greater communication among the math specialists and interventionists. In addition, co-taught classrooms allowed the math specialists and special educators to increase their knowledge of the classroom curriculum and to support students during math class instruction, as well as to reinforce and re-teach during math intervention time. The model as a whole was identified by the interviewees as fostering a community approach to teaching and providing students with more individualized attention to their learning needs. Communication with parents of struggling math students was also reported to have increased due to better identification and monitoring of math skills problem areas by the math teams. One of the principals expressed his observations of the model implementation and a related increase in collaborative practices, noting that:

"I think our excitement about the RtI is that it pushes us to think about improving instructional practices at the classroom level to support all teachers, to support all students, and that requires some things. It requires consistency in approach and communication, collaboration with the teachers and so on, so the excitement is that it forces us to improve instructional practice that will support all students to learn and it then pushes us beyond that to really figure out where the gaps are when students are struggling and how do we respond to that and at what point do we need to then be moving students into different levels of support."

The interviewees did, however, identify some challenges related to increased collaboration. Some members of the mathematics intervention teams reported that finding adequate times for formal planning meetings was often difficult. In spite of the regularly planned team meetings, members of the math intervention teams at both schools observed that the hectic nature of a school day also affected their ability to meet formally with each other and with classroom teachers for curriculum planning as often as they would have preferred. Several of the interviewees perceived that classroom teachers also lacked the time necessary to communicate with the math specialists about those students receiving supplemental instruction

or who were struggling in math. This resulted in a "disconnect" between students' math work with the specialists and their regular classroom teacher.

Another challenge identified by the interviewees was that of identifying times in teachers' and students' schedules that allowed for the provision of math support for students receiving Tier 2 interventions. This was a particular challenge at Mountain Middle, where most students participating in Tier 2 interventions had to miss one of their electives in order to receive supplemental instruction. Students at the Maple Elementary were released from some of the classroom instructional time in order to participate in Tier 2 instruction.

Theme 3: Increasing instructional and assessment support for students who struggle in math. The third theme encompassed the ways in which the implementation of the RtI model resulted in an increased focus on providing students who struggled in mathematics with the appropriate supports needed in the general education curriculum. In order to identify students who were struggling in math, both schools had implemented universal screening tools, as well as methods to monitor the progress of students who were receiving supplemental supports or Tier 2 and 3 interventions. Each of the two schools had spent considerable time identifying universal screening and progress monitoring systems that seemed appropriate for the students they served. At the Maple Elementary School, universal screening included reviews of annual district-level mathematics assessments, as well as statewide assessments. A standards-based curriculum-based assessment was also given in four grades. In addition, students' scores on pre-tests for specific units were used to identify students in need of specific interventions. At Mountain Middle, the scores of incoming 7th graders on district level and statewide testing were reviewed as the first step in determining whether or not students needed to receive Tier 2 or Tier 3 interventions. Both schools also took into account teacher recommendations for identifying struggling students, although this practice was more common at Mountain Middle than at Maple Elementary.

Once struggling students were identified and provided with additional supports for math instruction, both schools utilized various methods to measure their progress in the interventions. Maple Elementary based progress monitoring on the math curriculum; comparing unit pre- and post-tests used to determine if students had adequately learned the material. The middle school used a computer-based program that provided students with individualized math lessons and assessments. The program provided continuously updated progress monitoring as students worked through the lessons.

The interviewees reported that since the initiation of the model, their approaches to assessment had become more intentional and consistent. The math teams spent a great deal of time designing math instructional materials that were differentiated to create individualized programs of instruction for students at all levels of ability. As described earlier, teachers reported that they appreciated the math teams' work in materials development as they did not have the time to develop differentiated materials themselves and the materials proved to be very beneficial in their classrooms.

In addition to developing instructional materials for use in the classroom, the math teams developed and implemented Tier 2 out-of-classroom interventions to assist struggling students. A variety of instructional methods were used in these interventions, including small group lessons, peer assistance, games, individual tutoring, and computer-based math

programs. The interviewees perceived that these interventions were very beneficial to students, and had received positive feedback from both classroom teachers and the students themselves. They reported that students who received the interventions showed increased confidence, perseverance, and skill levels. One math specialist reported,

"From the teachers, from their own observations about how much more confidence these kids have, they're willing to try something where before they would have just immediately shut down. So we hear back through them especially that what we're doing is affecting their regular math class in a positive way. So, that's really cool."

Another math specialist at Mountain Middle reported:

"I have had at least two kids say to me, can you make sure I can do it? Can I do it again next semester? I mean, can you imagine a kid who hated math, who has been subjected now to double the math for one half the year, asking if they can do it again?"

There were several challenges identified with this theme. First, screening for students struggling in math was largely dependent upon standardized assessments which were only given to some grade levels once a year. Further, these screeners were not based on the schools' curricula, and thus could not pinpoint the specific areas in which students needed additional assistance. Relatedly, it was noted at Mountain Middle that students, once identified as struggling, were placed in interventions for at least a full semester before being assessed for adequate progress to leave the intervention. Flexibility and responsiveness to students' progress were thus challenges in this model.

Theme 4: Increasing knowledge of support strategies for learners who struggle with math. The fourth theme identified was the increased use of professional development opportunities designed to expand teachers' knowledge of strategies for supporting learners who struggle with math. The teacher leaders at each school were viewed by the other faculty and staff as having a great deal of expertise in mathematics instruction, and in addition to leading RtI implementation in their schools they were frequently sought out by other teachers to provide information and support regarding mathematics instruction. Members of the math team at Maple Elementary also participated in coursework through a math education institute affiliated with a local university to enhance their math knowledge and skills. Further, it was noted that educators at both schools had individually sought out professional development on RtI and math skills after observing the improvement in their students as a result of the math intervention teams' work.

Participation in professional development opportunities was seen as challenging, but also as a privilege and very beneficial for skill development. Several of the interviewees were proud of their accomplishments in continuing their educations through these opportunities. For example, one math specialist expressed, "we do a lot, a lot of professional development and it's not easy professional development. I mean, it's months' work and homework and three hour courses and nobody sees that portion of it".

Despite the great benefit derived from having the RtI teacher leaders and many of their math intervention team members participate in professional development opportunities, neither school had been able to provide the same level of opportunity for all math personnel, making it challenging to ensure school-wide implementation of the model. Professional development classes were often quite costly, so the two schools struggled with balancing

opportunities for their teachers to increase their skills in mathematics instruction with all other budget considerations. Further, both teacher leaders acknowledged that professional development related to increasing teachers' knowledge of evidence-based practices in mathematics needed to be supplemented with knowledge of the RtI model itself. While courses that combined the development of teachers' skills in mathematics instruction with knowledge of RtI were described as being extremely beneficial to teachers, financial and scheduling constraints were of great concern to teachers and administrators concerned with RtI implementation.

Theme 5: "Spreading the word" and enhancing use of the model. The final theme emerging in the data encompasses both the progress that has been made, and the challenges that remain, to further RtI model implementation for math at the two schools. At the time of the study, the two schools had made a great deal of progress in implementing an RtI model. The interviewees expressed pride in the changes that had been made in how math instruction was approached in the schools. They were pleased with how RtI had helped to reshape their math curricula and bring about positive change for students at all levels in math instruction. One interviewee expressed:

"My excitement is that it brings it back down to the classroom level and brings it to instructional practices that really will be supportive of all students, which is what we want... And at this point we've been able to do that better with math than we've have been with, as far as, I don't know how to say it, I think we've done a better job with RTI in math than we have with our literacy."

However, the RtI models at both schools were still far from full implementation. For example, the interviewees noted that many of the teachers not directly involved with RtI implementation remained unaware of the terminology and its basic tenets; familiarity with the RtI model varied greatly by individual. Further, the principals of both Maple Elementary and Mountain Middle schools were supportive of the use of the RtI model for math; however, they had varied levels of knowledge of the actual details of RtI implementation and had encouraged the schools' math professionals to take the lead in this initiative. Additional development of an RtI model for math, and as a school-wide framework, would require resources, professional development, and commitment from school principals and other leaders. Interviewees' comments reflected the viewpoint that spreading the model may be beneficial, but would require widespread support: "I think the idea, this whole RTI thing and how can it work, it's gotta go across the school but it really has to be vertical too, up and down the grade levels".

Many challenges and lingering questions surrounded this theme. First, it remained a question whether RtI could, or should, be expanded at both schools. Full implementation of an RtI model as the organizing framework of these schools would require a great deal of changes, in addition to those that had already been made; many more resources, including professional development opportunities; time; and commitment from all school personnel. The math team leader at Mountain Middle noted that the school would like to expand the RtI math model to the high school, but that more work was needed to have the middle school model well-established and functioning smoothly first. Additionally, the leaders at Maple Elementary were discussing expanding their RtI model to other elementary schools in their district. While the implementation of the model for math had thus far been perceived as very beneficial at both of the schools examined in this study, further

exploration is needed into the costs and benefits of school-wide implementation and outside expansion.

Discussion and Implications

Both of the schools involved in this study had made significant progress in implementing an RtI framework for improving mathematics instruction for students at all levels of learning. Overall, it appeared that implementation of the RtI model for math had resulted in positive changes at these two schools. RtI implementation had led to changes in the roles of school personnel, the structure of curricula and classrooms, and the focus of math instruction. Additionally, RtI implementation was reported to have led to increases in communication and collaboration among personnel, students, and parents; professional development; student assessment and support; and differentiation of instruction. The approaches taken to implementation differed between the schools, but both reported seeing gains in instructors' responsiveness to students' individual needs and students' confidence and skill levels. The schools had chosen strong, competent leaders to spearhead the implementation of RtI for math and had hand-selected teams of well-trained math professionals. These educators had ensured that their schools' RtI frameworks were developing positively and were tailored to their schools' unique environments.

The results of this study suggest that the RtI model has potential to improve how math instruction is approached in elementary and middle schools. The administrators, instructors, math specialists, and students at these schools were optimistic about the changes that they had experienced in their schools' math curricula since the implementation of the RtI framework. There were concerns expressed, however, and both schools still faced lingering questions and challenges related to sustaining these improvements and achieving broader model implementation. While these schools had seen benefits from their RtI models for math, the models had not yet been broadly implemented across grades and levels of math instruction. Many of the challenges faced by the schools could be traced to this incomplete RtI model implementation, such as the classroom teachers' lack of training in RtI and communication with the math teams.

Implementing the RtI model for math is a time and work-intensive process. The schools examined were fortunate to have well-trained and motivated leaders who had been successful in their efforts to bring about positive changes with RtI implementation, but the model still faced challenges related to time, personnel, and funding constraints that prevented the model and the instructors from reaching their full potential. The schools had made great strides in implementing the model for math in a short period of time, largely spurred by the math intervention teams and their leaders. However, leaders at higher levels could initiate greater and more widespread change, and could help to ensure that the models would be sustained in the schools. RtI implementation requires systemic, widespread changes in order to be most effective, and these schools were still in the early stages of working with this complex model.

Another lingering question was how the changing roles of educators and structures in the schools brought about by the implementation of the RtI model were affecting the classroom environment. In other words, how did the students perceive the changing roles and structures within their schools? Also, how were the changes (for example, co-teaching models) affecting the flow of the day in the classrooms,

teachers' skills, and how students and teachers interact in their classrooms? The interviewees seemed to view the changing roles and structures positively, but further research should investigate additional perspectives on these changes.

Further challenges identified in the data were the differentiation between Tiers 2 and 3 and a lack of adequate screening tools to identify students who were struggling in math. Our observations found few distinguishing features between Tiers 2 and 3 in the schools' RtI models, and it was unclear how students with more intensive needs, such as learning impairment or autism, were being considered in the implementation of the RtI model for math instruction. It is important for full and proper model implementation to have clear distinctions in how students are identified for different levels of intervention and how instruction varies across tiers in the model. In addition, both Maple Elementary and Mountain Middle were using standardized assessments as screening tools. These exams were seen as inadequate screening methods for several reason, such as they were only given once per year and not based on the schools' curricula. However, the interviewees also noted that they had proven to be quite accurate at identifying struggling students. Despite this, screening methods that were given more often and were based on the schools' curricula would allow for more flexibility and individualization towards students' needs.

Other schools and researchers can benefit from the findings of this study. The RtI model is not yet widely used for math instruction, but is suggested to become more common (Gersten et al., 2009a). This report offers an overview of both the benefits and challenges that schools may encounter when first implementing this framework in their math departments. The personnel perceived that their students were being more individually served in their math needs by the model, and that teachers were learning new ways to approach math instruction to reach a greater number of their students. But schools may also face strains on their time and resources when implementing the RtI model. This study is limited by its narrow focus, as only two schools were examined in one rural area in the Northeast. In addition, only a small proportion of the math and administrative personnel at those schools were interviewed or observed. Future studies should expand to a larger number of schools in a wider study area. Future studies may also benefit from interviewing and observing students at all levels of math ability for a broader scope of perspectives on RtI implementation for math. Despite these weaknesses, this study offers a preliminary look at how schools are utilizing the RtI model to restructure their approach to math instruction. The experiences of these schools represent the possible widespread change in how students are taught math in the not-so-distant future, and hopefully how math will become more accessible to students at all ability levels.

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