NOTE PAGE

Section	Questions, Comments, Concerns
RtI background, principles, and implementation	
Math issues facing students with LD	
New numeracy standards for all	
Intervention principles for numeracy	
Numeracy intervention / students with LD	

Chart 1: 6 RTI Components

# of Intervention Tiers	Tier 1: Primary Prevention. General education core.	Tier 2: Secondary Prevention. Small-group tutoring.	Tier 3: Tertiary Prevention. Individualized program, progress monitoring.
Targeting students for Tier 2 or Tier 3	Tier 2: CBM < 25%ile; weekly progress monitoring increase <.50 or <5 points after 4 weeks Tier 3: CBM < 10%ile; weekly progress monitoring score <.50 or <5 points after 8 weeks		
Nature of Tier 2	Preventative intervention (e.g., tutoring, small group, individualized)		
Classifying RTI	No change or decrease in weekly progress monitoring score after 10 weeks, then move Tier 3		
Nature of evaluation prior to Tier 3	Multidisciplinary, comprehensive, specific to student's functioning in Tier 1 or 2; adaptive behavior & IQ for relationships between LD, MR, SLI; teacher/classroom ratings & observations, family interviews.		
Tier 3 function, design (special education, e.g.)	Addresses individual needs through flexible service, systematic movement in and out of Tier as student's needs change in relation to demands of the general education curriculum.		

Adapted from Fuchs, L., & Fuchs, D. (2007). A model for implementing responsiveness to intervention. Teaching Exceptional Children, 39, 14-20.

Chart 2: Implementing RTI in Mathematics

	Tier 1	Tier 2	Tier 3
Definition	Instructional programs, professional development	Intervention to supplement, enhance, and support Tier 1	Individualized instruction extending beyond the time allocated for Tier 1
Focus	All general education students	Students w/ math difficulties unresponsive to Tier 1	Students with math difficulties/ disabilities unresponsive to Tier 1, 2
Program	Scientifically based math instruction/ curriculum; emphasis on concepts, skills, applications	Specialized, scientifically based math instruction and curriculum; emphasis on concepts, skills, applications	Sustained, intensive, scientifically based math instruction/curriculum; highly responsive to students' individual needs
Instruction	Practice opportunities throughout school day	Additional attention, focus, support, practice opportunities; Pre-teach, review skills	Carefully designed & implemented, explicit, systematic instruction
Instructor	General education classroom teacher	Classroom teacher, specialist, trained personnel	Specialized math teacher, special education teacher
Setting	Classroom	Appropriate setting in school	Appropriate setting in school
Grouping	Flexible grouping	Small group instruction (1:3-1:5)	Individual instruction (1:1, 1:2)
Time	60 min per day minimum	20-30 min plus Tier 1, minimum	50 min sessions, minimum depending on participation in Tier 1
Assessment	Benchmarks (3 x year)	Weekly target skill monitoring to ensure progress & learning	Weekly target skill monitoring to ensure progress & learning

Note. Adapted from Vaughn Gross Center for Reading and Language Arts at the University of Texas at Austin. (2005). Implementing the 3-tier reading model: Reducing reading difficulties for kindergarten through third grade students (2nd Ed.). Austin, TX: Author.

Chart 3: Customizing RTI

Tier	Student needs / School services in place	Instructional Setting	Behavior	Assessment	Curriculum	Instructional Strategies
Tier 3						
Tier 2						
Tier 1						

Chart 4: Learning Difficulties Affecting Math Performance of Students with LD

Learning Difficulty		Math-Related Problem
Perceptual	Figure-Ground	Loses place on worksheet; doesn't finish problems on a page
	Discrimination	Differentiating between numbers (6/9, 2/5, 17/71)
	Spatial	Copying shapes or problems; direction in algorithms (up/down, left/right); spacing manipulatives into sets, patterns, using number line
Memory	Short-term	Retaining math facts; remembering steps in algorithms; meaning of abstract symbols (+, =)
	Long-term	Mastering facts over time; remembering algorithms; completing mixed probes
	Sequential	Counting one-to-one; completing multistep sequences
Language	Receptive	Understanding meaning (minus, difference, sum, addend, carry, borrow, regroup, times)
	Expressive	Using math vocabulary; oral math facts; verbalizing steps in problem solving
Behavior Patterns	Impulsive	Mistakes in computation; fast and inaccurate response to math facts; Lack of attention to detail in problem solving
	Short-attention	Completing work on time; leaving problems unfinished; off-task
	Perseveration	Switching from one operation to another; works very slowly and reviews several times
Auditory		Oral drills; counting on from within a sequence; writing numbers from dictation; hearing number patterns
Reasoning		Comparison of size, quantity; understanding symbols (=, +, -, <, >); abstract level of math concepts and operations
Motor		Writing numbers legibly (speed and accuracy); writing numbers in small space (writes large)

Adapted from: Mercer, C. (1994). *Students with learning disabilities* (3rd. Ed.). Austin, TX: Pro-Ed.

Chart 5: Intervention Principles

Intervention Principles	Tier 1	Tier 2	Tier 3	Relevant Research
Student-teacher ratio	Large group instruction (2:30)	Designed for small group instruction (1:3-6)	Designed for group and one-to-one instruction (1:1-3)	Butler et al. (2001) Kroesenberg & Van Luit (2003)
Repetition	Lessons focus on concept, application, and extension. Independent reinforcement of concepts (homework).	Content repeated within lesson clusters. Lessons provide opportunities for repeated practice; reflect instructional patterning/repetition of order, approach, and delivery from one lesson to the next.		Mayfield & Chase (2002) Miller & Mercer (1997) Sood & Jitendra (2006) Garnett (1998)
Scripted lessons	Combination of discovery and didactic learning approaches.	Step-by-step instructional procedures form the core of every lesson; prompts are provided.		Gersten & Chard (1999) Carnine (1997) Witzel et al. (2003)
Pace	Rapid presentation with skills and objectives embedded into learning activities.	Slow pace is governed by lesson detail, the large number of lessons that address the same content, and the mastery requirement.		Cawley & Miller (1989) Woodward (2004) Woodward & Montague (2002)
Sequence	Spiral, non linear where concepts/topics may be reintroduced.	Lessons are carefully sequenced to fill existing knowledge gaps and to prevent new ones from developing. Every content piece is broken down into the smallest possible units of learning.		Darch et al. (1984) Jones et al. (1997) (Whitehurst, 2003)
Concrete representation	Multiple physical models used; implicit generalization	A single, common physical model (Unifix, Cuisinaire, KP tiles) is used to teach every concept and associated skill.		Kroesenberg & Van Luit (2003) Fennel & Landis (1994)

Chart 6: Assisting Students Struggling with Mathematics: Response to Intervention (RtI) for Elementary and Middle Schools

Institute of Education Sciences Recommendations	
1	Screen all students to identify those at risk for potential mathematics difficulties and provide interventions to students identified as at risk.
2	Instructional materials for students receiving interventions should focus intensely on in-depth treatment of whole numbers in kindergarten through grade 5 and on rational numbers in grades 4 through 8. These materials should be selected by committee.
3	Instruction during the intervention should be explicit and systematic. This includes providing models of proficient problem solving, verbalization of thought processes, guided practice, corrective feedback, and frequent cumulative review.
4	Interventions should include instruction on solving word problems that is based on common underlying structures.
5	Intervention materials should include opportunities for students to work with visual representations of mathematical ideas and interventionists should be proficient in the use of visual representations of mathematical ideas.
6	Interventions at all grade levels should devote about 10 minutes in each session to building fluent retrieval of basic arithmetic facts.
7	Monitor the progress of students receiving supplemental instruction and other students who are at risk.
8	Include motivational strategies in tier 2 and tier 3 interventions.

From: What Works Clearinghouse / Institute of Education Sciences (IES) http://ies.ed.gov/ncee/wwc/pdf/practiceguides/rti_math_pg_042109.pdf

Chart 7: An "Ideal" Curriculum Addresses Learning Difficulties

Curriculum Feature (from NCTM, NRC, NMAP, CCSS)	Intervention Principle (from Chart 5)	Learning Difficulty (from Chart 4)						
		Perceptual	Memory	Language	Behavior	Auditory	Reasoning	Motor
Diagnostic assessment to identify gaps in knowledge and skill	Student-teacher ratio, Sequence	√	√	√	√	√	√	√
Coherent, sequenced instruction	Repetition, Pace, Sequence		√	√	√		√	
Explicit focus on base-ten system	Repetition, Pace, Sequence, Concrete representation		√	√	√		√	
Every topic anchored to place value	Repetition, Pace, Sequence, Concrete representation		√	√	√		√	
Concrete-**R**epresentational-**A**bstract approach throughout	Pace, Sequence, Concrete representation	√	√	√	√		√	√
Common physical model	Concrete representation	√	√	√	√		√	√
Development of reasoning skills through questioning and discussion	Student-teacher ratio, Scripted lessons, Pace, Sequence		√	√		√	√	
Ample opportunity for students to communicate math understanding	Student-teacher ratio, Scripted lessons, Pace, Sequence		√	√	√	√	√	
Targeted progress monitoring	Student-teacher ratio, Repetition, Pace, Sequence, Concrete representation	√	√	√	√	√	√	√
Application of math concepts to contextual problems	Student-teacher ratio, Repetition, Pace, Sequence, Concrete representation	√	√	√			√	
Transitional strategies	Repetition, Scripted lessons, Pace, Sequence	√	√	√	√		√	√
Frequent practice	Repetition, Pace, Concrete representation	√	√	√	√	√	√	√