Expanding RtI Procedures to Math

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LPS RtI Status

- RtI procedures are being implemented in reading with elementary students
  - The culmination of several years’ work
  - District norms for reading fluency were established using the DIBELS
- RtI procedures are being piloted in written expression in several elementary schools
- RtI procedures for middle school in reading are being piloted as well

Math: The Next Frontier

- RtI procedures can be expanded to math without great difficulty
- Similar goal: prevent and/or intervene early with students who struggle in math
- Less comprehensive research is available about the specific, component skills and the hierarchy of skills in math

Pyramids of Interventions & High Performing Schools

- Why?
  - Some students need more time for learning
  - Some need more support for learning
- How?
  - Use systematic, school-wide processes ensure that students are treated equitably
  - Use timely procedures to identify needs so additional time and support can be provided
  - Provide not just offer directive interventions
  - Monitor individual student progress

What is Math Achievement?

- Five strands according to the National Research Council (2001)
  - Understanding (mathematical concepts, operations and relations)
  - Computing (using math procedures)
  - Applying (formulate problems and strategies for solving them)
  - Reasoning (using logic to explain & justify solutions and extend from known to unknown)
  - Engaging (seeing math as sensible, useful and doable)

What is Math Achievement? (cont’d)

- Two broad areas according to the Learning Disability literature (Geary, 2003, 2004)
  - Mathematics calculations (recalling basic facts, fact fluency, recalling procedures, steps to be followed, properties and rules for calculations, attending to and following signs and symbols)
  - Mathematics problem-solving (understanding math vocabulary, reading word problems, sorting essential from nonessential information, using a multi-step plan to solve problems, choosing the correct calculation to solve problems)
Focus of This Pilot Project

- Three Tier instructional RTI model
- Math Calculation Skills starting point
  - Not just math fact skills although fact fluency contributes to multi-skill calculation success
  - Select and try out probes for benchmarking and progress monitoring
- Math Application Skills (word problems and other concepts) will be included when norming is done
  (Fuchs, Fuchs, Compton, Bryant, Hamlet & Seethaler, 2007)

Monitoring Basic Skills Progress (MBSP)

- Selected for Grades 1-5
- Advantages:
  - Brief math calculation checks
  - Multiple skills included in each probe
  - Already developed and available
  - Widely used and cited
  - Sufficient numbers of probes to avoid a learning effect and to measure progress over time

MBSP

- Disadvantages:
  - Not applicable to Kindergarten students
  - High difficulty level 1st semester and for students struggling in math
  - Variations in scoring (problems vs. digits correct)
  - Scoring large numbers of probes is time-consuming

MBSP Alignment with Curriculum

- Lead math teachers found good alignment between the MBSP probes and the math curriculum at each grade level
- Instruction for some of the skills occurs later in the year so there is sufficient ceiling in the probes
- The items on each probe are arranged randomly sampling the whole year of skills

Sample MBSP Computation Problems

Gr. 1: \[ 6 \quad 52 \quad 7 \quad 8 \]
\[-3 \quad +12 \quad +0 \quad 1 \quad +0 \]
- Each probe has 25 problems
- 2 minute per probe at grades 1 & 2
- 3 minute per probes at grades 3 & 4
- 5 minute per probes at grade 5
- 30 alternate forms per grade level

Kindergarten Probes

- VanDerHeyden (2001): number sense
  - Circle number probe (1 min.)
  - Write number probe (1 min.)
  - Draw circles probe (1 min.)
- Key concept focus for Kindergarten
  - Kdg. teachers validated the importance
- Options by other researchers
  - missing numbers, number identification, oral counting, quantity discrimination (Clarke & Shinn, 2004)
The VanDerHeyden number sense probes are positively correlated with other measures (VanDerHeyden, Witt, Naquin, & Noell, 2001).

Critical features of number sense and its role in mathematics is offered by Gersten and Chard (1999).

- A child’s fluidity and flexibility with numbers, the sense of what numbers mean, and an ability to perform mental mathematics and to look at the world and make comparisons.

**LPS Math Curriculum (Tier 1)**

- **Houghton-Mifflin Math** (Harcourt in Kindergarten)
  - Thorough and research-based
  - Intensive field-testing before adopted by LPS
  - Focuses on conceptual understanding as well as skill practice
  - 75 minutes per day, heterogeneous groupings

- **High expectations for all children**
  - Supported and “enforced” by district leadership (No excuses!)
  - Strict pacing is used to make sure students receive instruction on essential objectives

**LPS Math Curriculum - cont’d**

- **H-M Math adopted fairly recently**
  - Learning curve for teachers
  - Older students have some gaps

- **Systematic re-teaching of skills**
  - Required of all classroom teachers for students who do not meet district expectations for core objectives
  - Re-teaching & re-learning may take 50-75 minutes per week
  - May occur within or outside of math class
  - Students are then re-tested on the skills

**What if Skills are Not Mastered? Tier 2 Key Issues**

- Use screening methods and decision rules to identify these students
- Thorough screening based on:
  - Recommendations from teachers at the end of the previous school year
  - Analysis of report card (1’s & 2’s), students who need numerous re-teachings or have consistently failed to meet district expectations despite re-teaching
- Ongoing communication between math interventionist and homeroom teacher is essential

**Overview of Intervention (Tier 2)**

- **Tier 2 Math Intervention**
  - Occurs in addition to classroom instruction (outside of regular math time)
  - Daily or at least 90 minutes per week
  - Small groups (5-7 students)

- **Establish baseline for math skills level (e.g., median of 3 probes)**
- **Monitor progress with weekly probes**
- **Graph weekly data to provide ongoing feedback for teachers and students**
Tier 2 - cont’d

• When?
  – Be creative - during unit studies, specials, etc.
• For how long?
  – Depends on the response to intervention
• Who administers?
  – Interventionist
  – RTI Para
  – Other trained staff members

What General Strategies Work?

(Gersten, Chard, Jayanthi, Baker & Lee, 2006)

• For low achieving students
  (in order of effect sizes large to moderate)
  – Structured peer-assisted learning in heterogeneous groupings (.62)
  – Systematic & explicit instruction (.58)
  – Formative assessment data provided to students (.57)
  – Formative data provided to teachers (.51)

What General Strategies Work?

(Gersten, Chard, Jayanthi, Baker & Lee, 2006)

• For special education students
  (in order of effect sizes large to moderate)
  – Systematic & explicit instruction (1.19)
  – Student think-alouds (.98)
  – Visual & graphic depictions (.50)
  – Structured peer-assisted learning in heterogeneous groupings (.42)
  – Data provided to students (.33)

Other Examples of Intervention

• Math chapter intervention materials
  (examples later)
• Specific math programs
  – Math Steps
  – Knowing Math
  – SRA Number Worlds

Math Steps

• Available for all grade levels
• Emphasis is on computation skills
• Individualized but not independent skill practice
• Small group intervention
• 30-45 minutes on 3-4 days per week
• Suggested that Math Steps be integrated with opportunities for conceptual understanding to increase deep understanding of the computational algorithms

SRA Number Worlds

• New researched based program
• Focuses heavily on the concept of number sense
• Appropriate for primary grades
• Will be used in one school next year to determine its usefulness
Response to Intervention
LPS Details
• Procedural details
• Implementation details
• Intervention details

Procedural Checklist for Response to Intervention Assessment/Placement

Student: ___________ School: ___________
Case Manager: ___________________

First Intervention (at least 8 weeks)
DATE: __/__/__ 1. A baseline and 8-week goal were established, using the guidelines provided in the RTI Technical Manual (see Table 1).

__/__/__ 2. A specific, research-based intervention was defined. This intervention was described and documented in the student’s file, and parents, teachers, and anyone else necessary were notified of the student’s involvement in the intervention.

__/__/__ 3. A support person directly observed, or otherwise documented the delivery of the intervention on at least two occasions, to determine whether the plan was delivered as specified. The Response to Intervention Integrity Check form was used.

__/__/__ 4. After at least 8 weeks, an endpoint was obtained and the plan was evaluated as to whether the student met the goal established in step 1.

In the event the student’s goal for the first eight-week intervention was not met, a meeting was convened as described below (see step 5).

Second Intervention (at least 8 weeks)
__/__/__ 5. A meeting was convened in which:
• The student’s progress from the first intervention was evaluated.
• A new 8-week goal was established using the procedures outlined in step 1, above.
• Changes to the intervention were made following guidelines in the Technical Manual.
• This intervention was described and documented in the student’s file. All necessary individuals were notified of changes made to the intervention.
• The Permission for Specialist’s Participation form was signed by parent.

__/__/__ 6. A support person directly observed, or otherwise documented the delivery of the intervention on at least two occasions, to determine whether the plan was delivered as specified. The Response to Intervention Integrity Check form was used.

__/__/__ 7. After at least 8 weeks, the plan was evaluated as to whether the student met the goal established in step 5.
In the event the student’s goal for the second intervention period was not met and their endpoint was at or below the 12th percentile, the following procedures should be used if an MDT meeting is convened.

8. MDT Meeting
– The Consent for Evaluation Form (from the SRS system) was signed by the parent.
– A Multidisciplinary Team determined:
  o whether all procedures in this Procedural Checklist were followed,
  o whether the student meets the dual discrepancy criteria (i.e. the established goal as well as the level of achievement),
  o whether further evaluation needs to be conducted, and
  o whether an Individual Education Plan should be written and Special Education services should begin.
Examples of main objectives of the daily practice and re-teaching work

Ordering Numbers
A number line can help you count and order numbers.

These numbers come before 8.

These numbers come after 8.

Use the number line below. Complete the sentences.

1. ______ is just before 12.
2. 16 is just after ______.
3. ______ is one more than 12.
4. 15 is one less than ______.

Count forward. Write the missing numbers.

Count backward. Write the missing numbers.

Order is the way one thing follows another. When you count numbers, you count them in order.

These numbers are in order:

These numbers are not in order:

Circle the set of numbers that are in order.

1. 5, 6, 7, 8, 9
2. 4, 5, 6, 7, 8
3. 3, 4, 5, 6, 7
4. Write these numbers in order: 24, 23, 20, 22, 21

Ordering Numbers
Use the number line below. Complete the sentence.

21 is just before 21.

24 is just after 23.

Count forward. Write the missing numbers.

25, 26, 27, 28, 29

Count backward. Write the missing numbers.

30, 29, 28, 27, 26

Ordering Numbers
Read. Use the number line. Then draw or write to explain.

1. Name has 15 red stickers. She has 3 yellow stickers. How many stickers does Name have?

2. Next wrote to tell him that his class collected 19 other kittens. Then he wrote the number that came just before 19 to tell how many kittens Jon’s class collected. What number did Next write?

3. Write the number that comes just before 21. What two numbers come next?

4. Ed’s favorite number is the one that comes just before 23. What is Ed’s favorite number?

5. Angela’s sister is eleven years old.
Math Intervention at Everett Elementary

- Student enrollment is approximately 475, preschool through fifth grade.
- Title 1 school.
- 65% of students are minority students.
- 167 students participate in the English Language Learners (ELL) program. (35% of total student population) 79% Hispanic, 8% African American, 10% Asian
- 80% of students would be classified as coming from impoverished families.

2nd grade Intervention group

- Works with Kindergarten through 5th grade
- Occurs for 50 minutes per day, Monday-Friday
- Serves all students including English Language Learners and Special Education students that are identified in other areas such as reading, writing, or other verified disorders
- Delivered by certificated teacher
- 2nd grade group
  - 6 students (3 ELL, 1 SPED)

Key Components of Math Intervention

1. 5-7 minutes Greeting and Opening
   - students are presented with an opening question, a real world math problem. Often times this was a graphing question such as what toppings do you like on your pizza or who is your favorite teacher?

2. 30 minutes Main Objective of the Day
   - re-teaching of 1 or more objective(s) from math curriculum (objective had already been covered in the classroom)
   - involves pencil and paper practice pages from online curriculum resource

Key Components of Math Intervention

- Strong use of manipulatives, number lines, graphics and visual organizers and other teaching strategies to present the material in a different way than presented in class
- independent practice with corrective feedback

3. 10 minutes Fluency Practice
   - flashcards, math fact games

4. FFF – Fast Fact Friday

5. Intervention varies for each grade.
What if Skills are Still Not Mastered? (Tier 3)

- Intensive (Tier 3): Need for ongoing frequent and intense intervention
  - MDT reviews data due to insufficient response to intervention
  - Other diagnostic assessment as needed
  - May qualify for SPED if dual criteria is met:
    - Inadequate rate of growth and
    - Achievement is at or below the 12th percentile normatively

Example of Intervention (Tier 3)

- Knowing Math
  - Conceptually-based math program
  - Designed for students in grades 3-5
  - For students who are two or more grade levels below expected levels
  - Small group intervention
  - 45 minutes on 4-5 days per week
  - 15 weeks of lessons

Our Next Steps

- Statistical analysis of our pilot data (2007-08)
  - Correlations of probe data with grades and other measures
  - Explore additional interventions
  - Encourage progress monitoring of students receiving intervention
- District benchmark norm development (2008-09)

References


References - cont’d