CENTER ON INSTRUCTION

Improving Instruction through the Use of Data

Part I: How to Use Your Data to Inform Mathematics Instruction

Dr. Russell Gersten and Dr. Ben Clarke
with Ms. Christy Murray and Dr. Mabel Rivera

October 11, 2011

The Center on Instruction is operated by RMC Research Corporation in partnership with the Florida Center for Reading Research at Florida State University; Instructional Research Group; Lawrence Hall of Science at the University of California-Berkeley; the Texas Institute for Measurement, Evaluation, and Statistics at the University of Houston; and The Meadows Center for Preventing Educational Risk at the University of Texas at Austin.

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2011

About the Center on Instruction

- One of five national content centers, part of the Comprehensive Center network
- Funded by the Office of Elementary and Secondary Education and the Office of Special Education Programs at the U.S. Department of Education.
- Primary clients are the 16 Regional Comprehensive Centers and state departments of education
- Topics : Literacy, mathematics, science, special education, RTI, English language learning, eLearning, early childhood
- Our work: COI develops and identifies free research-based resources, including syntheses of recent research, practitioner guides, professional development materials, tools for educators, and examples from the field.
- Goal: Help RCCs and SEAs support schools and districts to close achievement gaps, raise student achievement, and improve teaching and learning for all students.
- www.centeroninstruction.org

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Using Data: Week 5

WEEK 5 (October 10-14): Improving Instruction through the Use of Data
Part I: How to Use Your Data to Inform Mathematics Instruction

Monday – Set the stage and post resources related to this topic

Tuesday – Webinar with experts

Wednesday – Opportunity to submit questions to COI; online discussion forum

Thursday – COI responds to your questions and answers

Friday – Summary

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Using Data: Week 6

WEEK 6 (October 17-21): Improving Instruction through the Use of Data
Part II: How to Use Your Data to Inform Literacy Instruction

The webinar on October 18th will focus on using data to make decisions to improve literacy instruction in the core instructional program, and to provide targeted instruction for short-term intervention and intensive interventions. Presenters and panelists will help you look at the different sets of assessments and data you readily have at hand and determine what additional information and support is needed to help teachers use and apply the information from the data collected. Experts in the fields of special education and English language learning will join the panel for discussion.

Presenters: Dr. Barbara Foorman, with Debby Houston Miller, Christy Murray, and Mabel Rivera

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Today's Presenters and Panelists

Presenters:

Dr. Russell Gersten

Dr. Ben Clarke

Panelists:

Ms. Christy Murray

Dr. Mabel Rivera

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Thinking Smart About K-8 Math Assessment in Turnaround Schools

Lessons from the IES Practice Guide - Response to Intervention in Mathematics

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Director, Mathematics Work at the Center on Instruction

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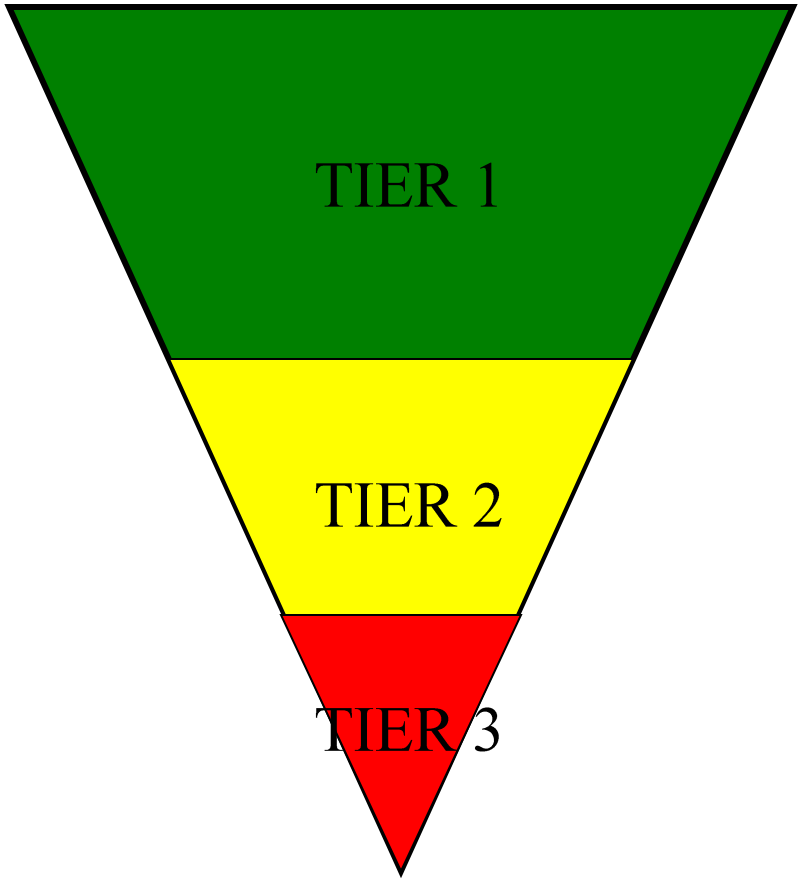
Critical Similarities between Effective Work in Turnaround Schools and RTI models

- Incorporate prevention and early intervention rather than waiting until grades 2-3
- Include to identify student needs
- Effective practices implemented class-wide in general education (primary intervention or Tier 1)
- Successive levels of support increasing in intensity and specificity provided to students as needed (secondary/tertiary intervention)

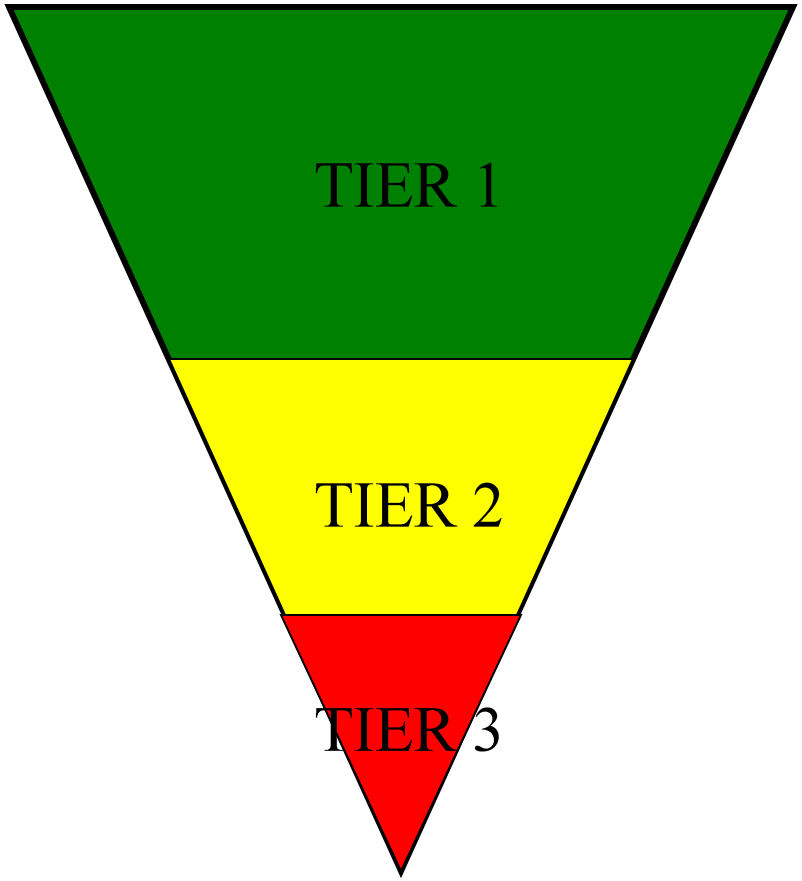
(Dickson & Bursuck, 1999; McMaster, Fuchs, Fuchs, & Compton, 2005; O'Connor, 2000; O'Connor, Fulmer, Harty, & Bell, 2005; O'Connor, Harty, Fulmer, 2005; Vaughn, Linan-Thompson, & Hickman, 2003)

TIER 1: Core Class Instruction



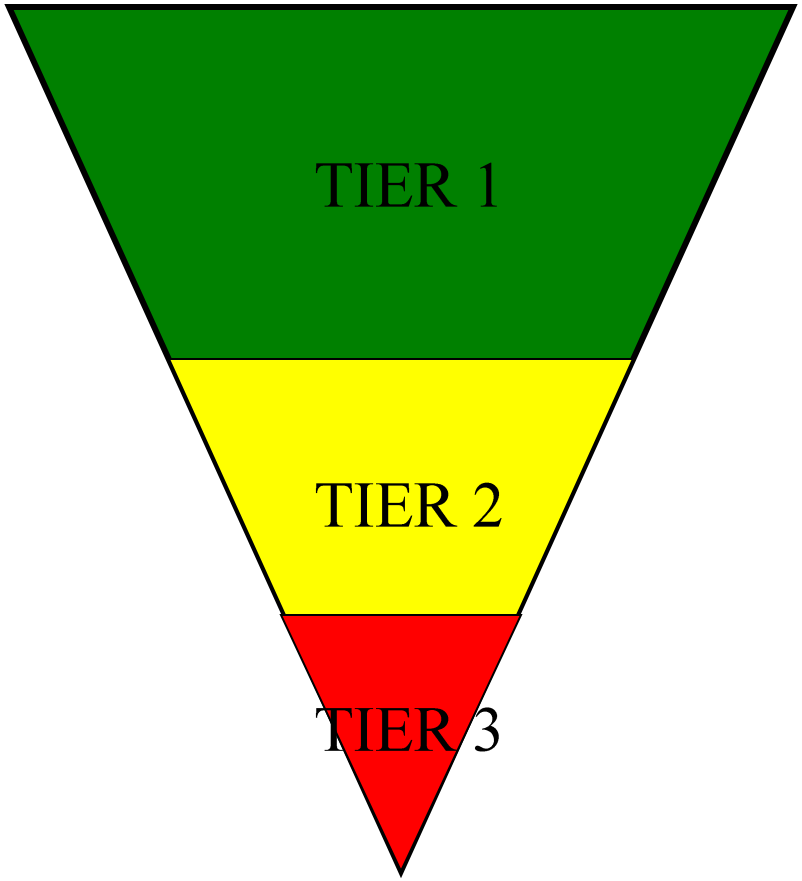
- Tier I is defined differently by experts
- Only common feature:
  - Universal screening of all students
- Other possible components:
  - Ongoing professional development for classroom teachers on how to use research
  - Differentiated instruction
  - High quality mathematics instruction
  - Scientifically based mathematics instruction

TIER 2: Small Group Instruction



- Tier 2 is individual or small-group intervention in addition to the time allotted for core mathematics instruction.
- Tier 2 includes curriculum, strategies, and procedures designed to *supplement, enhance, and support* Tier 1.
- Can backtrack and/or elaborate/reinforce classroom curriculum.
- Progress monitoring of students "at risk" on a monthly or weekly basis

TIER 3: Intensive Intervention



- Tier 3 is specifically designed and customized individual or small-group mathematics instruction that is extended beyond the time allocated for Tier 1 and Tier 2.
- NOTE: Some states/districts use 3 tiers and other states use 4 tiers.

Assessment for Different Purposes

- An effective, comprehensive mathematics assessment program includes assessments for four purposes:
  - Outcome
  - Screening
  - Progress Monitoring
  - Diagnostic

Outcome Assessment

- Purpose: To determine level of proficiency in relation to norm or criterion.
- When: Typically administered at end of year. Can be administered pre/post to assess overall growth.
- Who: All students
- Relation to instruction: Provides index of overall efficacy but limited timely instructional information.

Using State Test Data for Initial Screening

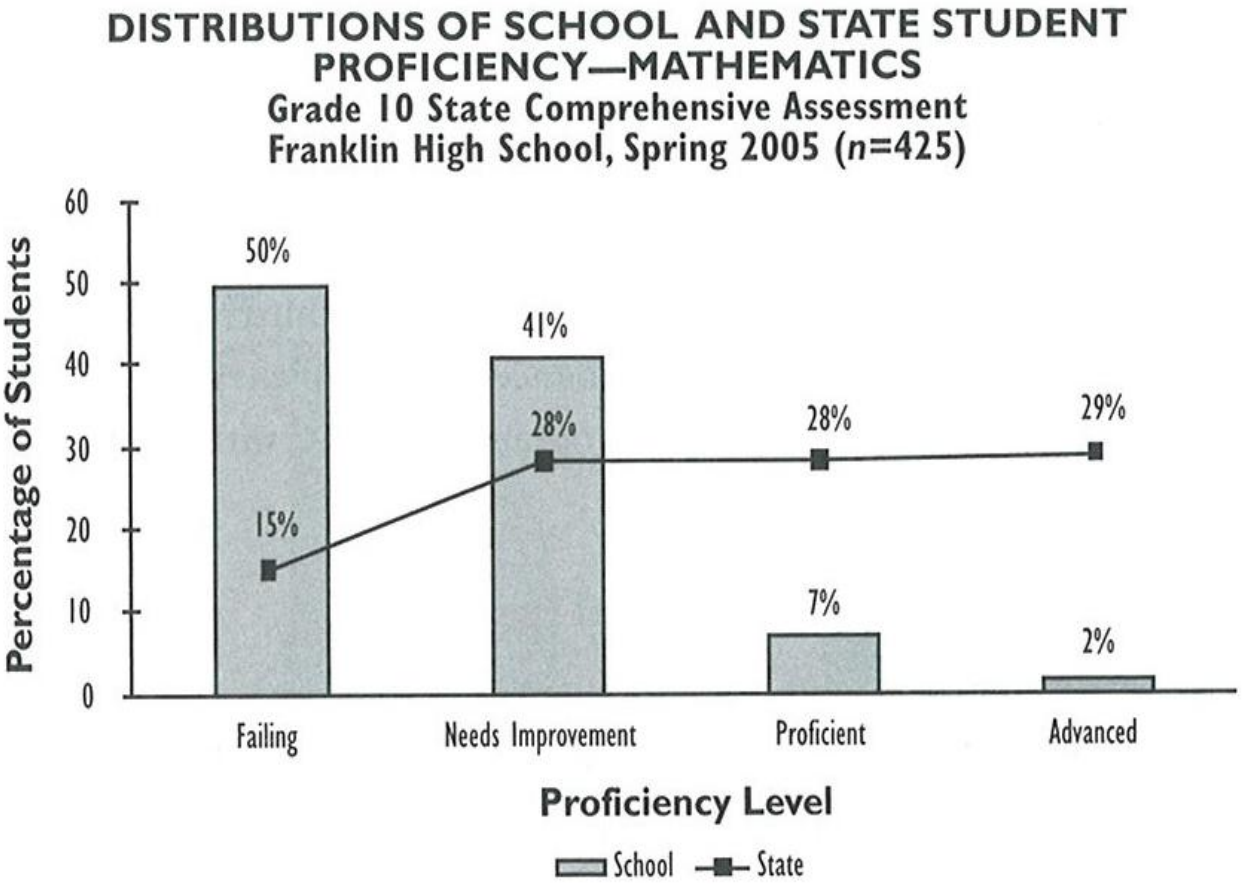
Distribution of scores of Franklin High School 10th grade students on state comprehensive assessment in Mathematics

MATHEMATICS

GRADE 10	Total Number of Students	Proficiency Level (%)			
		Advanced	Proficient	Needs Improvement	Failing
All Students	425	2	7	41	50
Regular	259	3	8	43	46
With Disabilities	85	1	6	39	54
English Language Learners	81	1	5	35	59

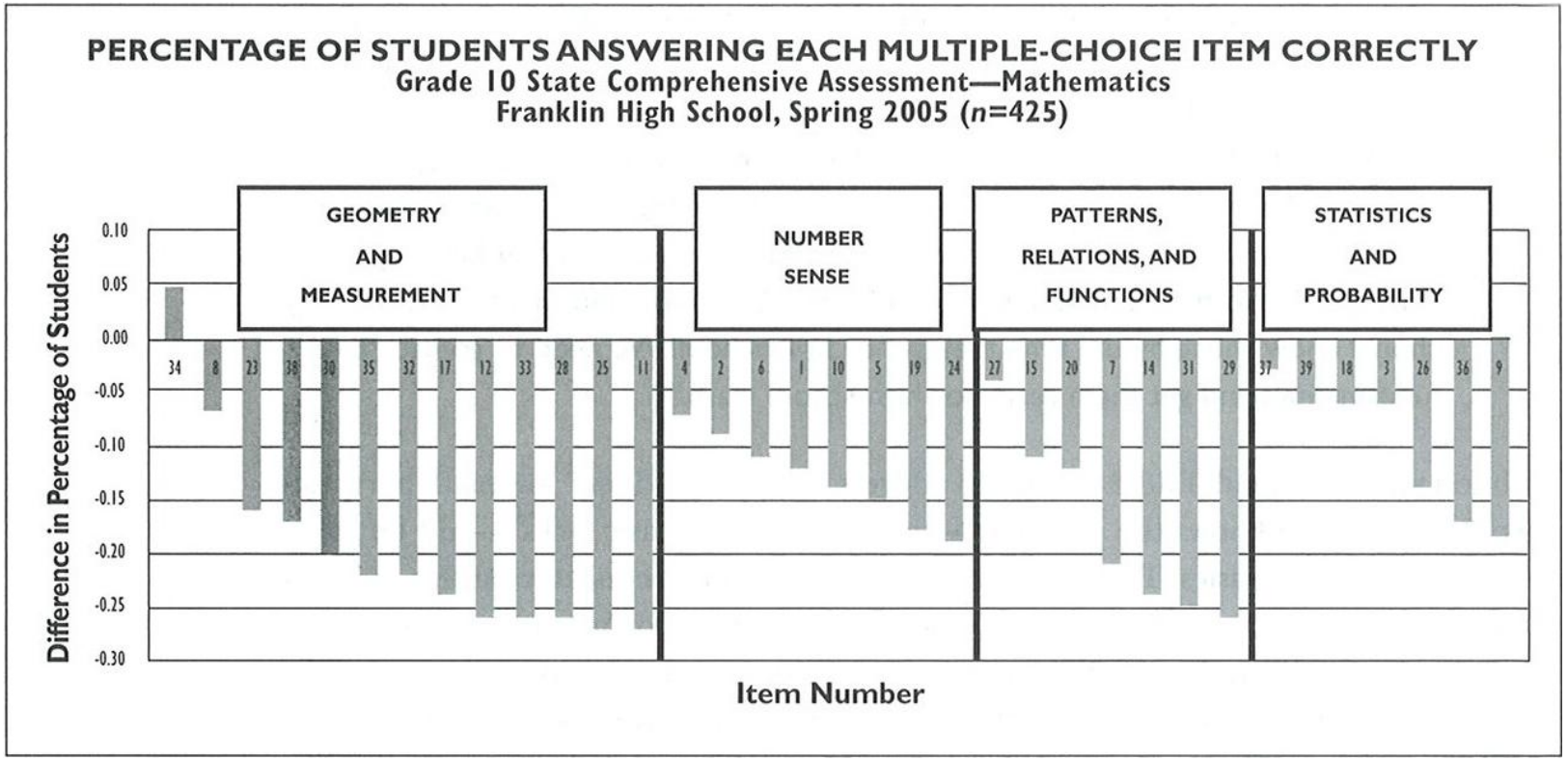
Source: Boudett, City, and Murnane (2010)

Using State Data for Critical Comparisons



Source: Boudett, City, and Murnane (2010)

Using State Test Data to ID Key Areas for Systemic Intervention (Tier 1)



Source: Boudett, City, and Murnane (2010)

Screening Assessment

- Purpose: To determine children who are likely to require additional instructional support (predictive validity).
- When: Early in the academic year or when new students enter school. May be repeated in the Winter and Spring.
- Who: All students
- Relation to instruction: Most valuable when used to identify children who may need further assessment or additional instructional *support*.

Progress Monitoring Assessment

- Purpose: Frequent, timely measures to determine whether students are learning enough of critical skills.
- When: Weekly or Monthly
- Who: At-risk students
- Relation to Instruction: Indicates student response to instruction.

Diagnostic Assessment

- Purpose: To provide specific information on skills and strategy needs of individual students.
- When: Following screening or at points during the year when students are not making adequate progress.
- Who: Selected students as indicated by screening or progress monitoring measures or teacher judgment.
- Relation to Instruction: Provided specific information on *target skills*; highly relevant.

Coherent Assessment Systems

- Each type of assessment has a purpose
- The design of the tool should match the purpose
  - What are the implications for screening tools used with all students?
- Think purpose not tool
- How do each of these purposes fit together?

Do the Schools You Work With Collect Data to Make Decisions or to Collect Data?

- Common pitfalls
  - Focus is on procedure
  - Data collected don’ t match purpose for collecting data (e.g. collecting diagnostic data on all students)
  - Layering of data sources
  - Different data for different programs (e.g. Title 1)

Question Break and Things to Consider

- Do the turnaround schools you work with have coherent assessment systems?
  - Does each assessment tool match the purpose it is used for?
  - Does the system link together in a logical manner?
  - How can you aid them in this process?

Recommendation 1

Screen all students to identify those at risk for potential mathematics difficulties and provide interventions to students identified as at risk.

- Level of Evidence: **Moderate**

Technical Evidence

- Correlational design studies
  - Greater evidence in the earlier grades
  - Reliability typically included inter-tester, internal consistency, test-retest, and alternate form
    - Most fall between r=.8 to .9
  - Validity primarily focused on criterion related with an emphasis on predictive validity
    - Most fall between r=.5 to .7
  - Measures are beginning to report on sensitivity and specificity

Content

- Content of Measures
  - Single aspect of number sense (e.g. strategic counting) – most common in earlier grades
  - Or Broad measures incorporating multiple aspects of number
    - Some measures are combination scores from multiple single aspect measures
  - Measures reflecting the computation and concepts and applications objectives for a specific grade level – most common later grades
    - Often referred to as CBM or General Outcome

Content

- Promising measures include:
  - Word problems
  - Pre-algebra and algebra skills
  - Based on state standards or NCTM/NMAP benchmarks

Features

- Short duration measures (1 minute fluency measures)
  - Note many measures that are short duration also used in progress monitoring.
- Longer duration measures (untimed up to 20 minutes) often examine multiple aspects of number sense
  - Issue of purpose is critical to examine
- Most research examines predictive validity from Fall to Spring.

Suggestions

- Have a building level team select measures based on critical criteria such as reliability, validity and efficiency.
  - Team should have measurement expertise (e.g. school psychologist) and mathematics (e.g. math specialist)
  - Set up a screening to occur twice a year (Fall and Winter)
  - Be aware of students who fall near the cut scores

Suggestions

- Select screening measures based on the content they cover with a emphasis on critical instructional objectives for each grade level.
  - Lower elementary: Whole Number
  - Upper elementary: Rational Number
  - Across grades: Computational Fluency (hallmark of MLD)

Suggestions

- In grades 4-8, use screening measures in combination with state testing data.
  - Use state testing data from the previous year as the first cut in a screening system.
  - Can then use a screening measure with a reduced pool of students or a more diagnostic measure linked to the intervention program for a second cut.

Suggestions

- Use the same screening tool across a district to enable analyzing results across schools
  - Districts may use results to determine the effectiveness of district initiatives.
  - May also be used to determine systematic areas of weakness and provide support in that area (e.g. fractions)

Example Roadblock

- Screening may identify large numbers of students who need support beyond the current resources of the school or district.
  - What roadblocks are turnaround schools likely to encounter?

Roadblocks (cont'd.)

- **Suggested Approach:** Schools and districts should
  - Allocate resources to the students with the most risk and at critical grade levels

and

  - Implement school wide interventions to all students in areas of school wide low performance (e.g. Fractions)

Question Break and Things to Consider

- What is the current screening process in the schools you work with?
- What measure(s) do they use?
- What works well in their systems?

Recommendation 7

Monitor the progress of students receiving supplemental instruction and other students who are at risk

- Level of evidence: **Low**

Evidence

- Non-experimental studies demonstrating the technical adequacy of progress monitoring measures.
  - Reliability and Validity are similar to that found for screening measures (often the same measure)
  - Growth has been typically examined by looking at average scores across time
  - Some evidence of use in instructional decision making and improved student outcomes
- Greater evidence in elementary grades

Content and Features

- General outcome measures reflecting concepts and computation objectives for the grade level.
  - Some limited evidence for single aspect measures (i.e. Magnitude comparison)
- All are timed and short duration

Suggestions

- Monitor the progress of tier 2, tier 3 and borderline tier 1 students at least once a month using grade appropriate general outcome measures.
  - Same team that worked on screening can also work on progress monitoring
  - Need to carefully consider capacity to model growth in the context of instructional decision making

Suggestions

- Use curriculum-embedded assessments in intervention materials
  - Frequency of measures can vary - every day to once every week
  - Will provide a more accurate index of whether or not the student is obtaining instructional objectives
  - Combined with progress monitoring provides a proximal and distal measure of performance

Question Break and Things to Consider

- What measure(s) do they use?
- What works well in their system?
- What roadblocks have they encountered?

How to Help Your Schools Get Started

- Focus on one grade or grade bands
  - Long term trajectories suggest end of K critical benchmark
  - May have more expertise/comfort with whole number approach
- Screening before progress monitoring
- Strategies for collecting data

Resources

- NMAP
  - http://www.ed.gov/about/bdscomm/list/mathpanel/index.html
- Center On Instruction
  - http://www.centeroninstruction.org
- NCTM focal points
  - http://www.platonicsolids.info/focal_points_by_grade.pdf
- National RtI Center
  - http://www.rti4success.org/
- IES RTI Guide
  - http://ies.ed.gov/ncee/wwc/publications/practiceguides/
- Doing What Works
  - http://dww.ed.gov/