The Math Process: Kansas MTSS

Paula Hough, Kansas MTSS State Trainer

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Objectives of Session

At the end of this session, participants will have an understanding of the:

• Critical concepts and proficiencies in teaching mathematics
• Need for a strong core and evidence based instructional strategies
• Purpose and use of a math screener, other assessments, and intervention curricula
• KS MTSS grouping process
Myths about Mathematics

• Not everyone is capable of learning math.

• Math is something you do alone.

• Math is for boys.

• Math is about memorization and speed.
“Mathematics is one of humanity’s great achievements. By enhancing the capabilities of the human mind, mathematics has facilitated the development of science, technology, engineering, business, and government. Mathematics is also an intellectual achievement of great sophistication and beauty that epitomizes the power of deductive reasoning. For people to participate fully in society, they must know basic mathematics. Citizens who cannot reason mathematically are cut off from whole realms of human endeavor. Innumeracy deprives them not only of opportunity but also of competence in everyday tasks.”

- National Research Council (2001)
Demand for Math

• 80% of United States’ fastest growing companies require proficiency in mathematics and/or science. (Murray, 2009)

• Less than half of both 4th grade and 8th grade students achieved high standards on the 2011 TIMSS. (TIMMS, 2011)

• STEM occupations 3x the growth of non-STEM jobs from 2002 – 2012. (Murray, 2013)

• U.S. ranked 26/38 in the 2012 PISA. (OECD, 2015)
Angel Romero Jr @AngelRome · Jan 9

Them- "You have the unique opportunity to go back to a high school undercover to learn more about issues effecting students today"
Me- "Sweet"
Them- "Also, you'll have to do algebra again..."
Me- "I'm sorry, what..."
...If I were on #UndercoverHigh
Core Beliefs of Mathematics

• All Students Can be Mathematically Proficient.

• All Students Need a High-Quality Mathematics Program.

• Effective Mathematics Programs Must Teach Conceptual Understanding, Procedural Fluency, Factual Knowledge, and Problem-Solving Skills.
Core Beliefs of Mathematics

• Effective Instruction Matters and Significantly Impacts Student Learning.

• Teachers use a Balance of “Student-Centered” and “Teacher-Directed” Instruction Within the Core.
Mathematics Core
Number and Operations Progression

- Operations and Algebraic Thinking
- Number and Operations—Base Ten
- Number and Operations—Fractions
- Expressions and Equations
- The Number System
- Algebra
Mathematical Proficiency Strands

- Conceptual Understanding
- Strategic Competence
- Procedural Fluency
- Adaptive Reasoning
- Productive Disposition

www.ksdetasn.org/mtss
What does a Mathematically Proficient Student look like?

<table>
<thead>
<tr>
<th>Proficiency Strand</th>
<th>Definition of Proficiency Strand</th>
<th>Mathematical Practice #</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Comprehension of mathematical concepts, operations and relations</td>
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<td>Skill in carrying out procedures flexibly, accurately, efficiently and appropriately</td>
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<td>Ability to formulate, represent and solve mathematical problems</td>
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<td>Capacity for logical thought, reflection, explanation and justification</td>
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<td>Habitual inclination to see mathematics as sensible, useful and worthwhile, coupled with a belief in diligence and one’s own efficacy</td>
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Strands of Mathematical Proficiency

❖ **Conceptual Understanding** – comprehension of mathematical concepts, operations, and relations

❖ **Procedural Fluency** – skill in carrying out procedures flexibly, accurately, efficiently, and appropriately

❖ **Strategic Competence** – ability to formulate, represent, and solve mathematical problems

❖ **Adaptive Reasoning** – capacity for logical thought, reflection, explanation, and justification

❖ **Productive Disposition** – habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one’s own efficacy.
Adaptive Reasoning
Productive Disposition

ONLY IN MATH PROBLEMS CAN YOU BUY GO CANTALOUPES AND NO ONE ASKS WHAT THE HELL IS WRONG WITH YOU.
The CORE

• 50 – 60 min each day
• Research/Evidence based curriculum
• Research/Evidence based instructional practices
• 10 min of differentiated computational fluency
• Ensure fidelity to the program
• Professional Development
Instructional Strategies

• **Explicit Instruction**
• CRA--Concrete/Representational/Abstract
• Opportunities to Respond
  • Scaffolding
  • Immediate Feedback
  • Scheme Based Instruction
Principles of Explicit Instruction

1. **Optimize engaged time/time on task.** The more time students are actively participating in instructional activities, the more they learn.

2. **Promote high levels of success.** The more successful (i.e., correct/accurate) students are when they engage in an academic task, the more they achieve.

3. **Increase content coverage.** The more academic content covered effectively and efficiently, the greater potential for student learning.

4. **Have students spend more time in instructional groups.** The more time students participate in teacher-led, skill-level groups versus one-to-one teaching or seatwork activities, the more instruction they receive, and the more they learn.

5. **Scaffold instruction.** Providing support, structure, and guidance during instruction promotes academic success, and systematic fading of this support encourages students to become more independent learners.

6. **Address different forms of knowledge.** The ability to strategically use academic skills and knowledge often requires students to know different sorts of information at differing levels: the declarative level (*what* something is, factual information), the procedural level (*how* something is done or performed), and the conditional level (*when and where* to use the skill).
## Assessments

<table>
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<tr>
<th>Type</th>
<th>Who/Frequency</th>
<th>Purpose</th>
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<tbody>
<tr>
<td>Universal Screener</td>
<td>All students 3X a year</td>
<td>- Health of students</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Students making adequate progress</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Identification of students for intervention</td>
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<tr>
<td>Progress Monitor</td>
<td>Students not at benchmark Every 3-4 weeks</td>
<td>- Short, frequent skills based assessments</td>
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<td></td>
<td>- Determine if instruction/interventions are improving student learning</td>
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<tr>
<td>Diagnostic</td>
<td>Non-responding Students</td>
<td>- More in depth and specific information/problem solving</td>
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Data-based decision making should be ongoing. It provides information to improve instruction effectiveness and determine students' need for more instruction.

Adapted from *Response to Intervention* (2010), Witzel and Ricommini

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Typical Screener Topics for Early Childhood

• Timed assessments in:
  – Oral counting
  – 1 to 1 correspondence counting
  – Number naming
  – Quantity comparison

*EN skills are a predictor for both reading and math
Typical Screener Topics for Grades K-1

- Timed assessments in:
  - Number identification
  - Quantity discrimination
  - Strategic counting
    - Missing number
    - Match quantity
    - Decomposing
    - Number sequence
Typical Screener Topics for Grades 2-8+

- Computation (process)
- Concepts and applications
- Automaticity
- Focal points/domains
- Does not require individual administration
Grouping Process
Tier 1: 80%
Tier 2: 15%
Tier 3: 5%
K-12 Math Grouping Process

Universal Screener

- At or Above Benchmark
  - Core Instruction w/Differentiation*
  - Progress Monitor “Exit” Kids Monthly

- Below Benchmark (Tier II)
  - Placement Test
  - Group Based on Required Intervention
  - Begin Comprehensive Protocol Intervention
  - Progress Monitor
    - Yellow: On Grade Level
    - Red: On Instructional Level
  - Making Progress
    - Continue Intervention

- Below Benchmark (Tier III)
  - Backwards Test to Determine Instructional Level
  - Instructional Planning Report

* 50-60 minutes of Core w/Differentiation will be utilized across all tiers. Intervention periods stand alone outside of Core instruction.

If no curriculum placement test exists

Error Analysis and/or Formal Diagnostic

Customize & Continue Intervention
Math Grouping Process

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- Placement Test
  - Group Based on Required Intervention
  - Begin Comprehensive Protocol Intervention
  - Progress Monitor Yellow: On Grade Level
    - If progress:
      - Continue Intervention
  - Progress Monitor Red: On Instructional Level
    - No progress:
      - Error Analysis and/or Formal Diagnostic
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Below Benchmark (Tier III)
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Math Grouping Process

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- Placement Test
  - Group Based on Required Intervention
    - Begin Comprehensive Protocol Intervention
      - Progress Monitor
        - Yellow: On Grade Level
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        - Making Progress: Continue Intervention
        - No Progress: Error Analysis and/or Formal Diagnostic
          - Customize & Continue Intervention

Below Benchmark (Tier III)

- Below Benchmark (Tier III)
  - Backwards Test to Determine Instructional Level
    - Instructional Planning Report

If no curriculum placement test exists
# Enrichment Brief

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<th>Program</th>
<th>Description</th>
<th>Website</th>
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<tr>
<td>IB Math Explorations</td>
<td>Math Explorations provides a large list of exploratory topics around math concepts such as algebra, geometry, calculus, statistics, etc.</td>
<td><a href="https://ibmathsresources.com/maths-ia-maths-exploration-topics/">https://ibmathsresources.com/maths-ia-maths-exploration-topics/</a></td>
</tr>
<tr>
<td>Math without Borders</td>
<td>Math without Borders provides a series of videos that take math concepts beyond what is taught in the regular classroom for math.</td>
<td><a href="https://mathwithoutborders.com/math-explorations">https://mathwithoutborders.com/math-explorations</a></td>
</tr>
<tr>
<td>Math Counts</td>
<td>Math Counts is a free resource that is an actual curriculum that can be followed with students; it also has a competition embedded within it for teams to be created and students to compete around math content.</td>
<td>The National Math Club; <a href="https://www.mathcounts.org/">https://www.mathcounts.org/</a></td>
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Universal Screener

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- Below Benchmark (Tier II)
  - Placement Test

- Below Benchmark (Tier III)
  - Backwards Test to Determine Instructional Level

If no curriculum placement test exists
- Instructional Planning Report

* 50-60 minutes of Core w/Differentiation will be utilized across all tiers. Intervention periods stand alone outside of Core instruction.

Group Based on Required Intervention

Begin Comprehensive Protocol Intervention

- Progress Monitor
  - Yellow: On Grade Level
  - Red: On Instructional Level

Making Progress
- Continue Intervention

No Progress
- Error Analysis and/or Formal Diagnostic
- Customize & Continue Intervention
Identifying a Placement Test

• Should be in intervention curriculum

If not...

• Look for in core curriculum

• If no placement test exists, look at universal screener instructional planning report
Math Grouping Process

Universal Screener

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Steps for Determining Instructional Level for Tier 3 Support

1. Administer probes from previous grade
2. Continue previous probes until all Spring target scores are achieved
3. Instructional level is one grade above that level
# Backwards Testing Worksheet

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<tr>
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<th>Assessments Given</th>
<th>Target Score for Spring</th>
<th>Testing Notes</th>
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<tbody>
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<td>8th-12th</td>
<td>M-COMP</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M-CAP</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>7th</td>
<td>M-COMP</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M-CAP</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>6th</td>
<td>M-COMP</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M-CAP</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>5th</td>
<td>M-COMP</td>
<td>32</td>
<td>If the student is below target on either subtest, give both subtests the next grade level below.</td>
</tr>
<tr>
<td></td>
<td>M-CAP</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>4th</td>
<td>M-COMP</td>
<td>57</td>
<td></td>
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<td>M-COMP</td>
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<td></td>
<td>M-CAP</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>M-COMP</td>
<td>40</td>
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</tr>
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<td></td>
<td>M-CAP</td>
<td>21</td>
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<tr>
<td>1st</td>
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<td>94</td>
<td>If a student is above target on ALL early numeracy measures (first 4 measures), the student would be placed in a first grade comprehensive intervention with a focus on computation.</td>
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<td></td>
<td>Number ID</td>
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<td></td>
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<td>If a student is below target on ANY of the early numeracy measures, the student is placed in an early numeracy comprehensive intervention.</td>
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</table>
Practice

4\textsuperscript{th} grader Mason scores reflect need for Tier 3 Support... What now?
Practice

4th grader Mason scores reflect need for Tier 3 Support...

3rd Grade Probes...
MCAP = 12
MCOMP = 50
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If the student is below target on either subtest, give both subtests the next grade level below.

M-Comp 50
M-CAP 12

If a student is above target on ALL early numeracy measures (first 4 measures), the student would be placed in a first grade comprehensive intervention with a focus on computation.

If a student is below target on ANY of the early numeracy measures, the student is placed in an early numeracy comprehensive intervention.
Practice

4th grader Mason scores reflect need for Tier 3 Support...

2nd Grade Probes...
MCAP = 22
MCOMP = 40
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If the student is below target on either subtest, give both subtests the next grade level below. M-Comp 40 M-CAP 22
Universal Screener

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- Below Benchmark (Tier II)
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        - Progress Monitor
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            - Making Progress
              - Continue Intervention
            - No Progress
              - Error Analysis and/or Formal Diagnostic
                - Customize & Continue Intervention

* 50-60 minutes of Core w/Differentiation will be utilized across all tiers. Intervention periods stand alone outside of Core instruction.
**K-12 Math Grouping Process**

**Universal Screener**

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  - Backwards Test to Determine Instructional Level
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**www.ksdetasn.org/mtss**

**TASN**

Kansas MTSS
Dibels - Backwards Testing

With a partner...
Complete the 3rd Grade Middle of Year Data Analysis
What is Intervention?

• Process of providing **early, systematic, research based and appropriately intensive** assistance to children who are at risk for or are already underperforming as compared to appropriate grade- or age-level standards.
Mathematics Intervention is:

- Small group instruction **in addition** to the Core — Recommended 30-45 min 4+ days/week
- **More** opportunities for response and feedback
- Evidence based programs and curriculum
- Data Driven
- Comprehensive & focused on critical concepts
- Procedural and conceptual
Interventions

• Students are grouped by instructional need \textbf{not}, chronological age or grade
• Evidence based programs and curriculum
What Intervention is NOT

• Re-teaching
• Stand-alone tricks
• Slower and Louder
• Based on what is being currently taught in the Core
• Only procedures
• Intended to fill the gap quickly and move forward
8 Aspects of Effective Intervention

1. Strong motivation
2. Reliable system for identifying students
3. Reliable system for monitoring effectiveness
4. Regular team meetings
   - Leadership enforces use of data
5. Regular adjustments to interventions
6. Personnel to intervene with sufficient intensity
7. Evidence-based programs and materials
8. Training, support, and monitoring for fidelity

(Torgeson, 2006)
Key Structures of Intervention Curriculum

• Meet all instructional levels of the students
• Placement test to establish the entry point for the student at hand
• Frequent pre/post testing to ensure the student is progressing through the curriculum adequately
• Explicitly structured lessons
Intervention Goal: Accelerate Learning

• If acceleration is not happening, the intervention needs adjusted.
• Collaborative teams need to be taught to:
  – Analyze students’ progress
  – Make adjustments to instruction
  – Utilize the Self-Correcting Feedback Loop for communication.
Comprehensive Intervention

• Comprehensive coverage of crucial domains or progressions of mathematics
• Address and build proficiency of procedural and conceptual aspects
  – Adequately balance the two facets of mathematical development
  – Begin at most remedial needs to avoid rogue procedural knowledge
Universal Screening Data--Computation

School: Wayside Elementary
Grade: Third Grade
Year: 2016-2017
Class: Mrs. Gorf

Well Below Benchmark: 35.0%
Below Benchmark: 20.0%
Benchmark: 45.0%
Universal Screening Data--Computation

School: Wayside Elementary
Grade: Third Grade
Year: 2016-2017
Class: Mrs. Gorf
* Schedule Time Recommendations

<table>
<thead>
<tr>
<th>Academics</th>
<th>Tier 1-ALL</th>
<th>Tier 2-Small group</th>
<th>Tier 3-Smaller group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grade</td>
<td>Time</td>
<td>Grade</td>
</tr>
<tr>
<td>Reading</td>
<td>Pre K</td>
<td>Per Curriculum</td>
<td>Pre K</td>
</tr>
<tr>
<td></td>
<td>K-3</td>
<td>90</td>
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</tr>
<tr>
<td></td>
<td>4-12</td>
<td>45-60</td>
<td>4-12</td>
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<tr>
<td>Math</td>
<td>Pre K</td>
<td>Per Curriculum</td>
<td>Pre K</td>
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<td></td>
<td>K-1</td>
<td>50</td>
<td>K-1</td>
</tr>
<tr>
<td></td>
<td>2-12</td>
<td>50-60</td>
<td></td>
</tr>
</tbody>
</table>

*Follow Curriculum Recommendations first!*
Example ways to accommodate intervention groups

**Elementary**
- All students walk to intervention model
- Classroom intervention model
- Co-teaching model

**Secondary**
- Additional course/skinnies
- Advisory or seminar time
- Additional 20 min. flash class
  - i.e. after lunch in Middle schools 2x a week
<table>
<thead>
<tr>
<th>Staff Member A</th>
<th>Staff Member C</th>
<th>Sample Walk-To Math Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students who are Benchmark and Beyond</td>
<td>Students receiving Intervention at grade level.</td>
<td></td>
</tr>
<tr>
<td><strong>21</strong></td>
<td><strong>6</strong></td>
<td></td>
</tr>
<tr>
<td>Staff Member B</td>
<td>Staff Member C</td>
<td></td>
</tr>
<tr>
<td>Students who are Benchmark and Beyond</td>
<td>Students receiving Intervention off grade level</td>
<td></td>
</tr>
<tr>
<td><strong>22</strong></td>
<td><strong>4</strong></td>
<td></td>
</tr>
</tbody>
</table>
Sample Secondary Intervention Classroom

Teacher led intervention lesson.

Students working on customized learning software program or independent practice.

Procedural fluency activities facilitated by aide/para.
Institute of Education Science
Intervention Recommendations
for Math

1. Screen all
2. Material include whole numbers and rational numbers
3. Explicit & Systematic instruction
4. Word problems
5. Visual representation
6. Spend 10 min. building fluency of basic facts
7. Progress monitoring
8. Motivational strategies

www.ksdetasn.org/mtss
Pre/Post Testing & Progress Monitoring

Pre/Post Tests Measure (unit/chapter based):
• Student growth within a specific program, or
• Whether a student has mastered specific skills

Progress monitoring measures (monthly):
• Whether growth is occurring on critical skills
• Whether sufficient growth is occurring for students to close the gap
Benefits of Progress Monitoring:

• Accelerated learning because students are receiving a more appropriate instruction;
• more informed instructional decisions;
• Documentation of student progress for accountability purposes;
• More efficient communication with families and colleagues about student progress;
• And, higher expectations for students by teachers
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