MATHEMATICAL QUALITY OF INSTRUCTION (MQI)

LEARNING MATHEMATICS FOR TEACHING/MATHEMATICS INSTRUMENT DEVELOPMENT GROUP
HARVARD GRADUATE SCHOOL OF EDUCATION
What is the MQI?

- **MQI** is the Mathematical Quality of Instruction instrument
- Allows observers to evaluate the quality of the *mathematics* in instruction
- Captures the nature and quality of the mathematical content available to students as expressed in teacher-student, teacher-content, and student-content interactions
- Provides separate teacher scores for different dimensions of the mathematical work teachers do
Example: Pies

- Typical example of upper-elementary / lower middle school instruction (5th grade)
- Class has been working on “warm-up” problems
  \[
  -\frac{4}{3} + 1 - \frac{5}{6}
  \]
- Teacher notes student difficulty, calls class back together to solve
Example: Pies
Question

- What seems mathematically salient about this instruction?
Errors and Imprecision – capture teachers’ errors in doing/talking about mathematics, which can occur when solving problems, defining terms, launching tasks, in the notation that is used, etc

- Major Mathematical Errors or Serious Mathematical Oversights
- Imprecision in Language or Notation
- Lack of Clarity
- Overall Errors and Imprecision
Dimensions of the MQI

- **Richness** - capture the depth of the mathematics offered to students

*Meaning of Facts/Procedures*
- Linking/Connections
- Explanations

*Focus on Mathematical Practice*
- Multiple Procedures or solution methods
- Developing Mathematical Generalizations
- Mathematical Language
- Overall Richness
Dimensions of the MQI

- **Student Participation in Meaning-Making and Reasoning** – captures the ways in which students engage with mathematical content
  - Students provide explanations
  - Student mathematical questioning and reasoning
  - Enacted task cognitive activation
  - Overall Student Participation in Meaning-Making and Reasoning
Dimensions of the MQI

- **Working with Students** – captures whether teachers can “hear” and understand what students are saying, mathematically, and respond appropriately
  - Responding to Student Mathematical Productions in Instruction
  - Remediation of Student Errors and Difficulties
  - Overall Working with Students
Dimensions of the MQI

- **Classroom work is connected to mathematics**
  - Intended to identify “bad reform” lessons
  - Excessive behavioral management

- **Explicitness and thoroughness (9th grade)**
  - Intended to measure clarity and crispness of procedural instruction

- **Overall MQI**
  - Excellent, fair, poor
What makes MQI unique

- Teachers receive separate scores for each dimension as well as an “overall” score
  - Some dimensions more critical than others for personnel and professional development decisions
    - Errors vs. working with students
- Can be tailored to be agnostic with regard to teaching style
  - Can use as-is, which is standards-aligned
  - Or can eliminate dimensions designed to captured standards-aligned behaviors (SPMMR)
Teacher-level reliability, 3 lessons 2 raters

<table>
<thead>
<tr>
<th></th>
<th>Richness</th>
<th>Errors</th>
<th>Working with students</th>
<th>Student participation</th>
<th>Overall MQI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long MQI</td>
<td>0.80</td>
<td>0.75</td>
<td>0.68</td>
<td></td>
<td>0.82</td>
</tr>
<tr>
<td>MQI &quot;Lite&quot;*</td>
<td>0.85</td>
<td>0.77</td>
<td>0.69</td>
<td></td>
<td>0.76 0.77</td>
</tr>
</tbody>
</table>

* Likely based on past generalizability studies
MQI technical information

**Validity**
- MQI scores significantly related to teacher value-added scores
- MQI scores significantly related to teacher mathematical knowledge for teaching (MKT)
- Factor analyses suggest anticipated constructs do appear
MQI logistics

- MQI and MQI “Lite” both available for K-9 mathematics
- Uses recorded lessons
  - Greater accuracy when it comes to the mathematics
  - Provides evidence for challenge to scoring
  - thereNow, teachscape, lesson lab, even flip cameras
  - Comparing taped vs. live next year (?)
- Three lessons / teacher, two raters / lesson
  - Lessons must be spread out
- If it were our shop...$1600/teacher
  - Will drop as cost of video comes down further
- Not volunteering our shop
  - Volunteering ETS
  - Advantage: ETS knows what they are doing
  - Advantage: Objective view of teachers’ practice
Possible Uses of the MQI

- As extra check on low-value-added teachers
- As screen prior to promoting teachers to coaching positions
- For pre-tenure decisions/Tier 2 certification (?!)
- For teacher professional development
  - Provides specific feedback about strengths and weaknesses
  - Building professional development materials “on top” of the MQI
  - Looking for pilot districts with which to work