Overall Lesson Codes: MQI and MKT

National Center for Teacher Effectiveness

Center for Education Policy Research
HARVARD UNIVERSITY

After watching and scoring a lesson

- We make a summative judgment about two dimensions…
  - Whole-lesson Mathematical Quality of Instruction (MQI)
    - Comprehensive decision about lesson
  - Lesson-based guess at teacher's Mathematical Knowledge for Teaching (MKT)

Whole-lesson MQI

- *Definition*: The quality of the mathematics as enacted across the entire lesson.
  - Major elements: Richness, errors, classroom work connected to mathematics
  - Recognize excellence in: SPMMR, Working with students and mathematics
- *Distinguish from*:
  - How the mathematics should have been taught (e.g., “the ideal way to teach adding fractions…”)
  - Non-mathematical qualities of the lesson (student discipline, teacher affect)

Whole-lesson MQI: Scoring

- Low (1) can be any one or combination of:
  - Presents key lesson concepts or procedures incorrectly
  - Makes presentations that are technically mathematically correct, but the presentation is so confusing as to be incomprehensible
  - Takes lesson off-track mathematically
  - Assigned busywork that is not connected to mathematics for majority of class

  - Also: Lessons contains numerous smaller errors in language or several instances of a lack of clarity; mathematical substance of the lesson is rendered cloudy by such errors

Whole-lesson MQI: Scoring

- High (3)
  - Mostly error-free (occasional language slips or a quick incorrectly solved practice problem that is not corrected)
  - AND some combination of:
    - Substantial meaning given to mathematical ideas and procedures
    - Substantial work on mathematical practices
    - Responsiveness to students' mathematical ideas

Whole-lesson MQI: Scoring

- Mid (2)
  - Largely routine instruction; little meaning-making or reasoning;
  - May be occasional explanations, linked representations, multiple methods, use of student ideas…but these will not be dominant in instruction
  - Few or no major errors, instances of language imprecision, lack of clarity
    - An isolated wrongly solved problem
    - A few instances of language imprecision
    - Lack of clarity that is brief, corrected, and/or not on key topics

Whole-lesson MQI: Notes

- Score only for *mathematical quality* – not teacher demeanor, classroom climate, etc.
- Include in the score the quality of materials teacher is working with if they substantially impacted his/her presentation of the lesson
- Score what happened, not what you wanted to see happen
- Use evidence from scored segments

Lesson-based guess at MKT

- *Definition*: What would this teacher's score be on our written assessment of mathematical knowledge for teaching?

What is MKT?

- Mathematical knowledge *for teaching*
  - Includes "common" knowledge of content being taught
    - Facts, procedures, basic conceptual knowledge
    - Necessary but not sufficient
  - Also includes "specialized" knowledge that enables the strong teaching of that content, e.g.,
    - Knowledge of mathematical explanations, reasons, representations
    - Knowledge of alternative solution methods and how they are related to standard methods and to one another
    - Knowledge of how mathematical practices (e.g., proof, developing generalizations from patterns) can be applied and developed in the school mathematics curriculum
  - Knowledge of student learning patterns/problems
  - Knowledge of content and teaching

How do we measure teacher MKT?

- Typically done with a multiple-choice assessment or set of cognitive interviews
- Items grounded in classroom practice
- Grade-level appropriate
- Examples of items
  - "Common" content knowledge – knowledge that educated adults would have
  - "Specialized" content knowledge – knowledge unique to teaching
  - Knowledge of content and students – how students learn mathematical content, the errors they make, what's easy and hard

Common Content Knowledge

Calculate:

$$\begin{array}{r} 35 \\ \times\ 25 \\ \hline \end{array}$$

Specialized content knowledge

Which of these students is using a method that could be used to multiply any two whole numbers?[1]

Student A	Student B	Student C
35 x25 125 +75 875	35 x25 175 +700 875	35 x25 25 150 100 +600 875

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Common Content Knowledge

Solve:

$$\frac{4}{6} = \frac{6}{?}$$

Knowledge of Content and Students

27. Ms. Abdul is preparing a unit to introduce her students to proportional reasoning. She is considering three versions of a problem that are the same except for the numbers used. Which version of the Mr. Short and Mr. Tall problem below is likely to be the most challenging for students? (Circle ONE answer.)

a) A picture depicts Mr. Short's height as 4 paper clips and as 6 buttons. The height of Mr. Tall (not shown) is given as 6 paper clips. How many buttons in height is Mr. Tall?

b) A picture depicts Mr. Short's height as 4 paper clips and as 7 buttons. The height of Mr. Tall (not shown) is given as 5 paper clips. How many buttons in height is Mr. Tall?

c) A picture depicts Mr. Short's height as 2 paper clips and as 9 buttons. The height of Mr. Tall (not shown) is given as 5 paper clips. How many buttons in height is Mr. Tall?

d) All three of the problems are equally challenging.

Common Content Knowledge

- Solve:

Baker Joe is making apple tarts. If he uses $\frac{3}{4}$ of an apple for each tart, how many tarts can he make with 15 apples?

Specialized Content Knowledge

Ms. Williams plans to give the following problem to her class:

Baker Joe is making apple tarts. If he uses $\frac{3}{4}$ of an apple for each tart, how many tarts can he make with 15 apples?

Because it has been awhile since the class has worked with fractions, she decides to prepare her students by first giving them a simpler version of this same type of problem. Which of the following would be most useful for preparing the class to work on the is problem? (Circle ONE answer).

I. Baker Ted is making pumpkin pies. He has 8 pumpkins in his basket. If he uses ¼ of his pumpkins per pie, how many pumpkins does he use in each pie?

II. Baker Ted is making pumpkin pies. If he uses ¼ of a pumpkin for each pie, how many pies can he make with 9 pumpkins?

III. Baker Ted is making pumpkin pies. If he uses ¾ of a pumpkin for each pie, how many pies can he make with 10 pumpkins?

a) I only

a) II only

a) III only

a) II and III only

a) I, II, III

Back to Lesson-based guess at MKT: Scoring

- How would the teacher fare on our MKT assessment: low (1), mid (2), or high (3)?
  - **Low (1):** Teachers who score poorly typically have gaps in the knowledge required to teach mathematical material. These gaps come in two varieties
    - In "common" content knowledge; these teachers will simply get basic lesson material incorrect
    - In "specialized" knowledge. This is seen when the lesson requires teacher to use specialized knowledge (e.g., using chips to represent integer subtraction; responding to a student request to justify an algorithm; evaluating an unusual student method).
      - The teacher cannot successfully, correctly, and clearly accomplish these activities
  - Teachers who score low on the MKT would get most of the example items wrong.

Lesson-based guess at MKT: Scoring

- **Mid (2)**: Teachers who score in the middle…
  - Always have a grasp of the "common" mathematics they teach (facts and procedures)
  - But hold "specialized" knowledge for teaching inconsistently and/or tenuously
  - May not even attempt to provide explanations, use representations, evaluate solution methods, and so forth
  - Teachers with middling MKT would get some of the above items correct, others incorrect

Lesson-based guess at MKT: Scoring

- **High (3)**: Teachers who score high always have strong "common" and "specialized" knowledge….
  - Have strong and elaborated knowledge of the meaning of mathematical facts and procedures.
  - If asked, they can almost always say why something is true or why a procedure works.
  - They are knowledgeable about mathematical representations and different solution methods.
  - They also tend to have strong knowledge of typical student errors and development patterns.
- These teachers would get most of the example items correct.

Lesson-based guess at MKT: Scoring

- Make your best guess at teacher's performance on the written assessment
- To score this code:
  - You may "weight" instructional episodes differently, using your judgment
  - Look for "clues" even in short exchanges, e.g.:
    - Does the teacher provide strong, elaborated mathematical meaning when he/she can?
    - Is the teacher fluent in their use of representations or language?
    - Can the teacher make connections between mathematical topics?
    - Does the teacher seem to know what students are talking about, mathematically?

What's the difference between MKT and MQI?

- In most cases, a lesson receives the same score for MQI and MKT
- But in some cases, they may differ
- Here are some scenarios…

Scenarios

- Teacher Y teaches a review lesson that is mostly procedural in nature. However, there are moments when it becomes clear teacher knows the material in deep, connected ways.
  - MQI: 2
  - MKT: 3
- Teacher D reads the mathematical content from powerpoint slides. While reading, the lesson is of average quality. However, when she diverges from the materials, it becomes clear she is confused about the content.
  - MQI: 2
  - MKT:1

Scenarios

- Teacher B teaches a test prep lesson. Some of the lesson is average, but for three segments, he flounders while teaching test prep problems that are poorly worded.
  - MQI: 1
  - MKT: 2
- Teacher Z teaches a lesson that mostly has students cut and paste rather than do mathematics. During the times mathematics is present, she appears to know the content.
  - MQI: 1
  - MKT: 2

Overall notes on MQI and MKT

- Distribution of scores to date
  - Most lessons scored as mid
  - Over one-fourth scored as low
  - Smaller fraction scored as high
- Of course, this may differ in any new study conducted with larger samples of schools and teachers

Final Steps in MQI Training

- Complete the post-training questionnaire
- Prepare for certification
  - You are free to complete/retake practice modules as you see fit
  - Study the MQI document
- Take certification
  - Download Excel scoring spreadsheet
  - Watch videos online, fill in scores
  - Upload completed scoring spreadsheet to dropbox.
- ETS/MET coders: After passing initial certification and receiving your initial assignment, you will need to complete 3 webinars
  - After successful completion of webinars, you join the scoring pool