MATHEMATICAL QUALITY OF INSTRUCTION (MQI)
-EXCERPT-

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Mathematical Quality of Instruction (MQI) - EXCERPT

This excerpt contains two MQI codes. The first, Mathematical Sense-Making, is part of the Richness of the Mathematics and therefore refers to *mathematical meaning* being made in the segment, regardless of whether that sense-making comes from the teacher or from the students. The second, Students Communicate about the Mathematics of the Segment, is part of the Common Core-Aligned Student Practices Domain, and refers to the *students contributions themselves*. A brief overview of the four domains of the MQI is below.

Mathematical Quality of Instruction (MQI)

An observational rubric that provides a framework for analyzing mathematics instruction in several domains, described by the instructional triangle below. Within each domain, individual codes contain score points that categorize instruction into different levels of quality.

Richness of the Mathematics

To what extent are teachers and students making sense of the mathematics of the lesson? Are there elements of "why" and not just how? Do the teacher and students attend to precision in their use of mathematical language?

Working With Students and Mathematics

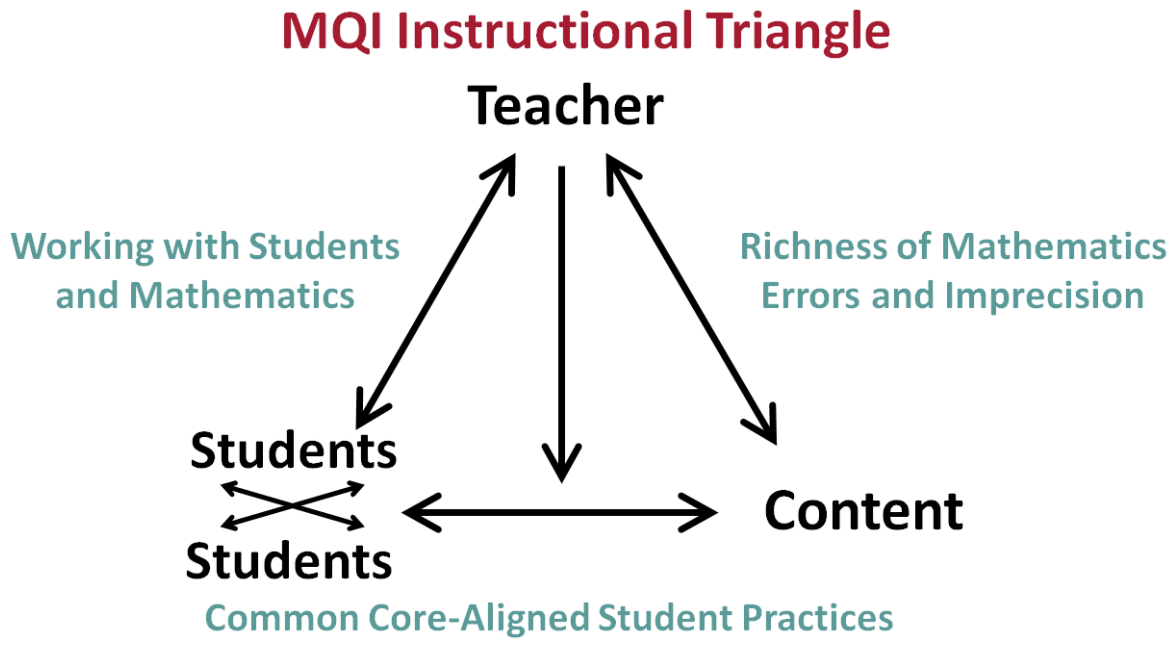
To what extent does the teacher use student mathematical ideas or misconceptions to move the lesson forward?

Common Core-Aligned Student Practices

To what extent are the students, as opposed to the teacher, doing the mathematics of the lesson—engaging in mathematical thinking and reasoning, communicating about mathematics, and solving high-cognitive demand tasks and contextualized problems?

Errors and Imprecision

Is the mathematics of the lesson clear and correct?



Mathematical Sense-Making

This code captures the extent to which the teacher or students attend to one or more of the following:

- The meaning of numbers
- Understanding relationships between numbers
- The relationships between contexts and the numbers or operations that represent them
- Connections between mathematical ideas or between ideas and representations
- Giving meaning to mathematical ideas
- Whether the modeling of and answers to problems make sense

Examples include:

- Focusing on value of quantities (e.g., "7/8 is close to 1")
- The meaning of quantities (e.g., "the six represents the number of groups")
- Discussing reasonableness of an expression, solution method, or answer
- Using estimation or number sense
- Giving meaning to procedures (e.g., "1/4 x 2/3 means taking 1/4 *of* 2/3 *of* a whole")
- Giving meaning to expressions or equations

For word problems, score for activities like explaining why an operation is called for by a problem, why certain numbers are used in the operation, reasonableness of answer, reasonableness of solution method, etc.

In geometry, include making sense of definitions (what counts as a polygon, what does not count as a polygon), formulas, by elaborating them, applying them, finding counter-examples, etc. rather than just stating/executing them. Do not count "Give me examples of a circle" – instead, count cases where the definition or formula has meaning made around it.

If sense-making is partially correct and partially incorrect, only score the portion that is correct (e.g., would be a High, but vague for parts, thus receives a Mid).

Not Present	Low	Mid	High
Not present or incorrect.	Teacher and/or students focus briefly on meaning. For instance, a student may remark that 7/8 is "almost 1" or attends to reasonableness of the solution method.	Teacher and/or students focus on meaning more than briefly (e.g., several instances within the segment or one somewhat long instance), but this work is not sustained or substantial.	Teacher and/or students focus on meaning in sustained way during segment. Need not be the entire segment, but must be substantial.

Guiding Questions: Mathematical Sense-Making (from the MQI Domain: Richness of the Mathematics)

- Is there any Sense-Making from mathematical explanations or linking between representations?
- Is there correct sense-making from
  - Attending to the meaning of numbers OR
  - Relationships between numbers OR
  - Relationships between contexts and numbers/operations
  - Giving meaning to mathematical ideas
  - Making sense of modeling or answers to problems
- Is the focus on meaning-making brief, more than brief (but not sustained nor substantial), or is it sustained and substantial?

Students Communicate about the Mathematics of the Segment

This item captures the extent to which students communicate their mathematical ideas during the course of the segment, either in whole-group or small group settings. Examples of *substantive* student contributions include, but are not limited to, students presenting solution methods publicly (with or without words), asking mathematical questions, describing the meaning of a term, offering an explanation, discussing solution methods, commenting on the reasoning of others, etc.

In cases in which students are working in pairs or small groups, code substantive student contributions when you can a) hear them (e.g., a student and teacher are talking as teacher circulates, or you can overhear pairs of students) or b) the teacher's directions are very clear, and we can reasonably expect students to be having a substantive exchange for the duration of the small group work (e.g., a turn and talk). However, if it is not clear what students are talking about in small groups/pair work, score as Not Present.

Not Present	Low	Mid	High
Not present or minimally present. Students may contribute a word or phrase infrequently during whole-group instruction, but the segment primarily features teacher talk.	Student contributions are very brief. For example, students offer one- or two-word answers to questions or a partial description of steps, and they occur regularly during the segment.	There are some substantive student contributions, but these do not characterize the segment.	Substantive student contributions characterize the segment.

Scoring Help - Students Communicate About The Mathematics Of The Segment

Note that the difference between Not Present and Low is the prevalence of brief, one- or two-word answers, and the difference between Mid and High is the prevalence of *substantive* student contributions. The difference between Not Present/Low and Mid/High is whether there exist *any* substantive student contributions (i.e. a segment with a single substantive student contribution must be scored at least a Mid, and a segment with no substantive student contributions may not score above a Low). For instance, a student may provide one step of a procedure, followed by the teacher giving the next step. This would count as a Low. If the student narrates a complete set of steps for a problem, it would be counted as a Mid.

Student explanations and SMQR-type responses count here. In addition, this code encompasses additional types of substantive student contributions under Mid and High, including descriptions of choices students made while solving word problems, definitions, and so forth.

Guiding Questions: Students Communicate about the Mathematics of the Segment (from the MQI domain: Common Core-Aligned Student Practices)

- Are the students communicating?
- Are their contributions mathematical?
- Are their contributions brief?
- Are any of the contributions substantive?
    - What does the MQI mean by substantive?
    - Do they characterize the segment?
- Are there explanations (answers to *why*, not *how*), SMQR (student mathematical questioning and reasoning), or procedural contributions?