A Framework for Recognizing Teachable Moments in Mathematics Classrooms

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Describe an instance, either from your own mathematics classroom or from one you have observed, when a mathematics-related “teachable moment” occurred.

Discussion

What is it about these instances that make them teachable moments?

From the literature…

- "critical moments in the classroom when students created a moment of choice or opportunity" (Jaworski, 1994, p. 527)
- "novel student idea[s] that prompt teachers to reflect on and rethink their instruction" (Schifter, 1996, p. 130)
- "potentially powerful learning opportunities" (Davis, 1997, p. 360)
- "significant mathematical instances" (Davies and Walker, 2005, p. 275)
- "[student's] comment provides the fodder for a content-related conversation" (Schoenfeld, 2008, p. 57)
- "crucial mathematic hinge moment[s]" (Thames and Ball, in press, p. 26)

3 Characteristics

- Students
- Mathematics
- Pedagogy

3 Characteristics

- Students—Student Thinking
- Mathematics
- Pedagogy

3 Characteristics

- Students—Student Thinking
- Mathematics—Mathematically Significant
- Pedagogy

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- Students—Student Thinking
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- Pedagogy—Pedagogical Opening

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MOSTs

Mathematically significant
pedagogical **O**penings
to build on **S**tudent
Thinking

3 Characteristics

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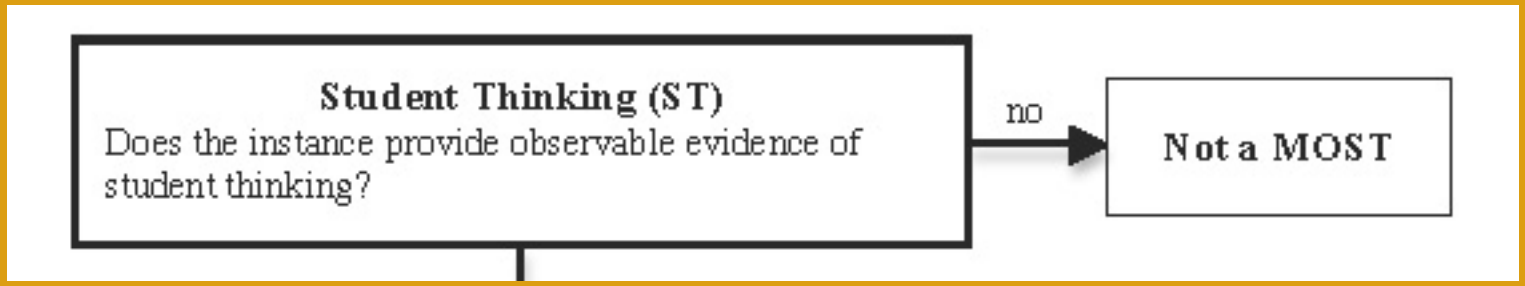
Student Thinking

- *Observable evidence of student thinking*, defined as any instance where a student's actions provide sufficient evidence to make reasonable inferences about their thinking.
- In a classroom setting, evidence is most commonly visible in verbal utterances, gestures or written work (including on the board).

Student Thinking: Key Distinctions

- **Observable** vs. observed
  - *Observable* refers to thinking that could be observed by someone (e.g., the teacher, other students, a researcher) who witnessed the instance, either by being present or by engaging with a record of the interactions
- Evidence *that* students are thinking vs. **evidence of *what* students might be thinking**


Student Thinking (ST)
Does the instance provide observable evidence of student thinking?
no
Not a MOST

3 Characteristics

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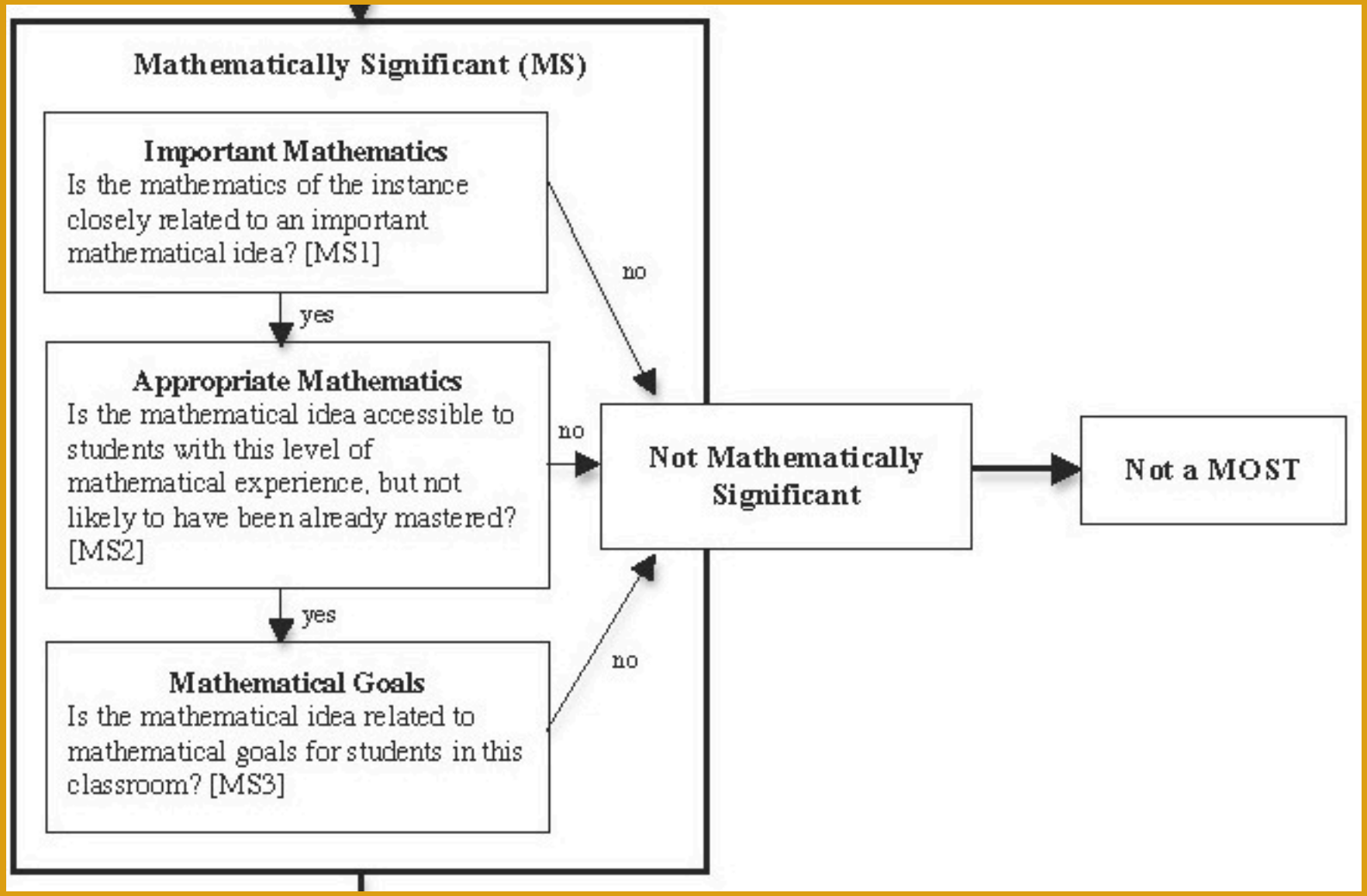
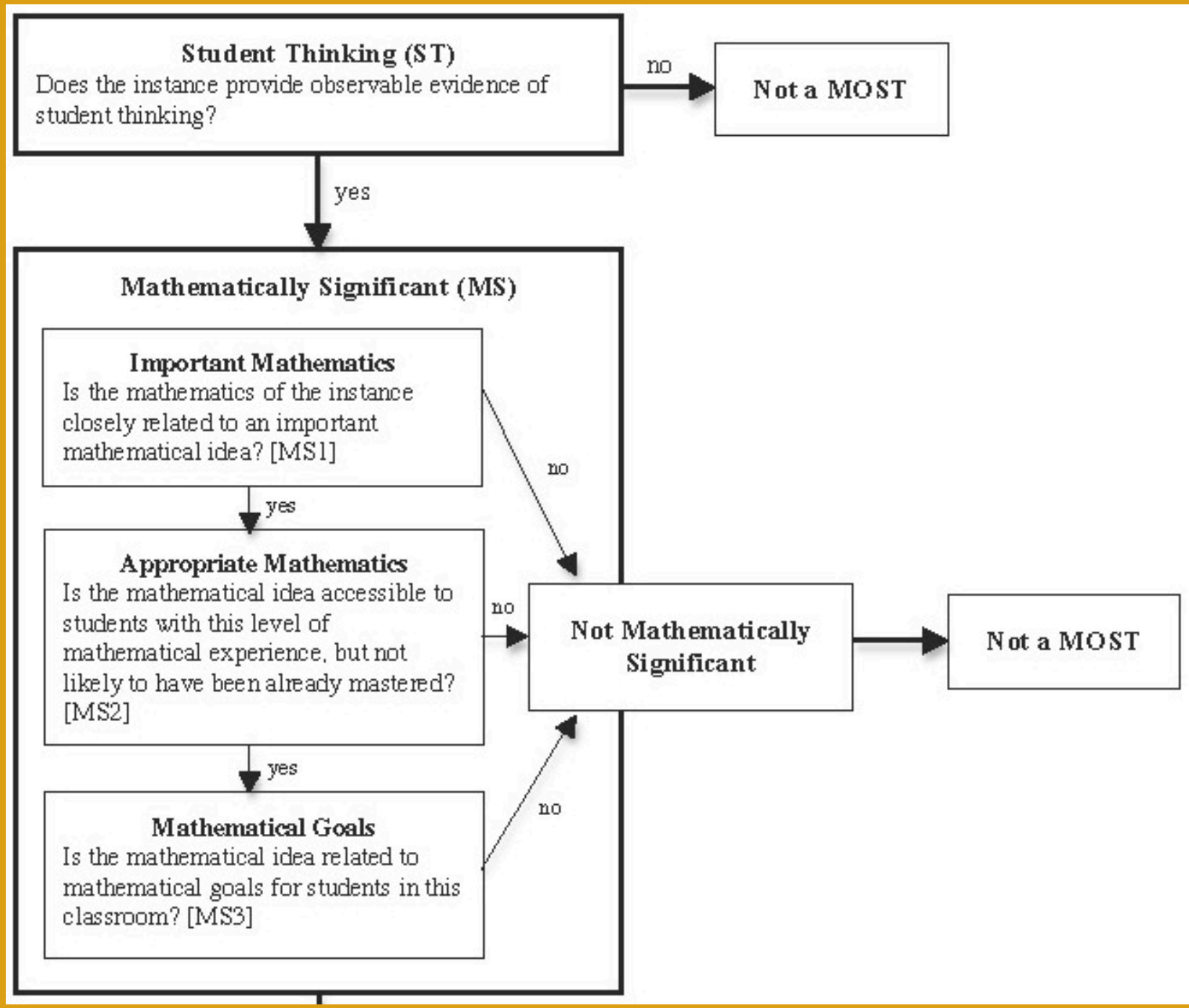
Mathematically Significant

- Must warrant use of limited instructional time
- Used in the context of teachers engaging a particular group of students in the learning of mathematics
- Subset of important mathematics
- Three criteria that must be met

Criteria for Mathematically Significant

1. Important Mathematics
   - Mathematics of the instance
   - Important mathematical idea related to it
2. Appropriate Mathematics
   - Accessible to students given their prior mathematical experiences
   - Not yet mastered
3. Mathematical Goals
   - Viable mathematical connection between the instance and the mathematical goals for student learning in the classroom
   - Math content and process goals; determined by teacher, curriculum documents, broader mathematical community


Mathematically Significant (MS)
Important Mathematics
Is the mathematics of the instance closely related to an important mathematical idea? [MS1]
no
yes
Appropriate Mathematics
Is the mathematical idea accessible to students with this level of mathematical experience, but not likely to have been already mastered? [MS2]
no
yes
Mathematical Goals
Is the mathematical idea related to mathematical goals for students in this classroom? [MS3]
no
Not Mathematically Significant
Not a MOST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3 Characteristics

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Pedagogical Openings

- "Openings in the [enacted] curriculum" as instances prompted by learners "questions, observations, [and] challenges." (Remillard and Geist, 2002, p. 13)
- Two components
  - Positioning
  - Timing

Pedagogical Opening - Positioning

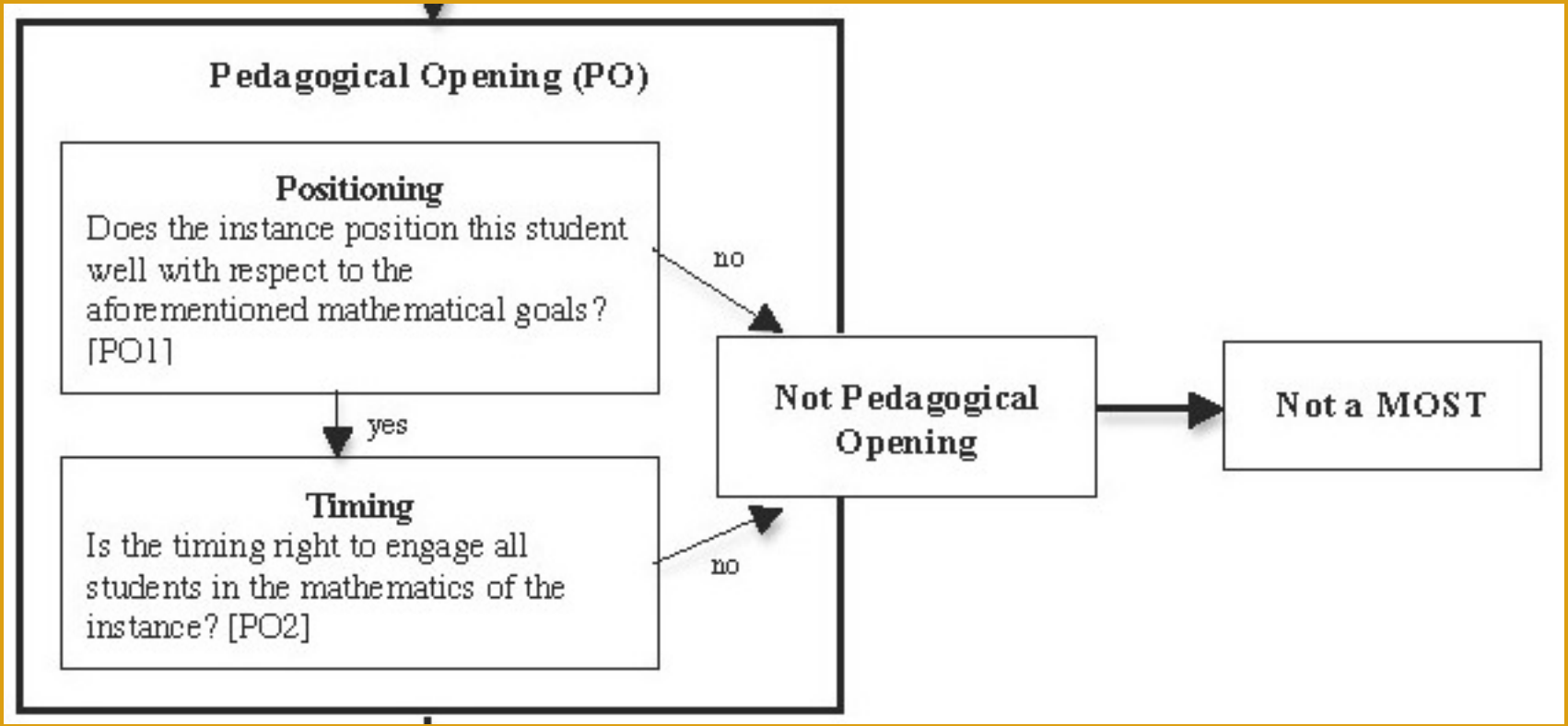
- The way student actions situate them with respect to instructional goals
- *How* students are engaged with ideas
  - Students engaged "deeply" with the content of a goal
  - Evidence of sense-making activity

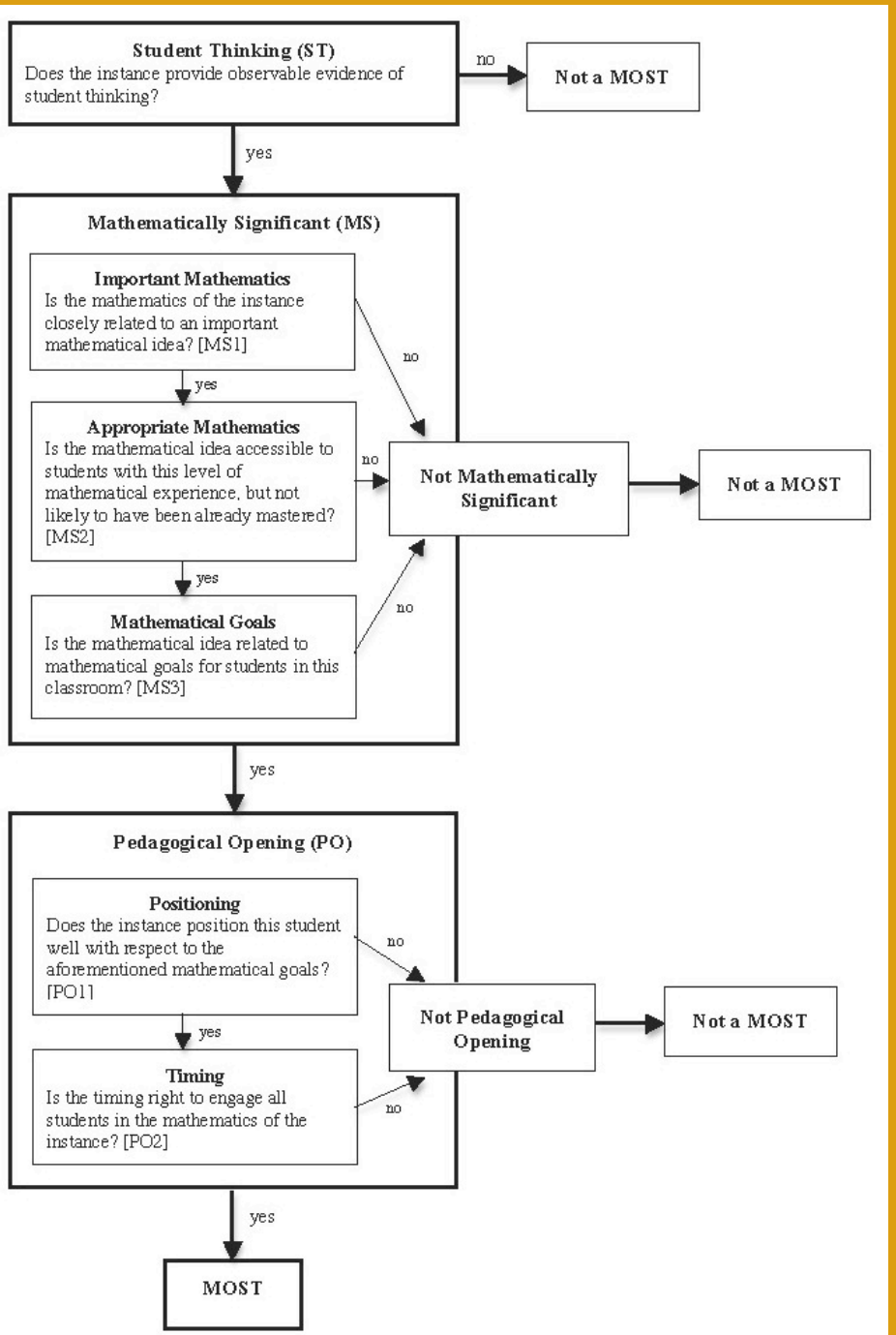
Pedagogical Opening- Timing

- “times of opportunity … right times of tactical action” (Erickson, 2003, p. x)
- Determined by *when* the instance takes place with respect to overall instructional goals
- Determined by the preparation of the class as a whole to engage with the mathematics of the instance.

Pedagogical Opening

1. Involves an observable student action that positions at least one student well with respect to the content of an instructional goal.
2. The timing of that action is such that the class as a whole can meaningfully engage with that content in ways that support, rather than supplant, overall instructional goals.


Pedagogical Opening (PO)
Positioning
Does the instance position this student well with respect to the aforementioned mathematical goals? [PO1]
no
yes
Timing
Is the timing right to engage all students in the mathematics of the instance? [PO2]
no
Not Pedagogical Opening
Not a MOST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MOST

MOST example

During a 9th grade Algebra 1 lesson, a teacher is explaining to his students how the "m" and "b" in the equation y = mx + b can be found from the graph of a linear function. In the midst of his explanation, a student raises his hand and asks, "Can there be two dots on the y-axis?"

Discuss

How might the MOST construct be useful to you as a mathematics teacher educator to help teachers

- focus on mathematics?
- engage in pedagogy that is responsive to the instructional dynamic in their classrooms?
- move beyond *eliciting* student mathematical thinking to *using* it productively?

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Leveraging MOSTs: Developing a Theory of Productive Use of Student Mathematical Thinking

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