

Opening Up and Repacking Tasks to Include the Practice Standards
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Introduce yourself to your neighbor and share what comes to mind when you read this quote?

“Part of learning mathematics is learning to speak like a mathematician ...”

Speaking Mathematically, David Pimm, 1987

+ **CCSM Standards for Mathematical Practice**

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics

+ **CCSM Standards for Mathematical Practice**

5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

+ Texas Process Standards

- A. apply mathematics to problems ...
- B. use a problem-solving model ...
- C. select tools
- D. communicate mathematical ideas, reasoning, and their implications ...
- E. create and use representations ...
- F. analyze mathematical relationships ...
- G. ...use precise mathematical language in written or oral communication.

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“The mind develops in response to challenge or disequilibrium...and cognitive development is a social process promoted by high-quality dialogue among peers supported by teachers.”

“Learning is collaborative and requires dialogue...”

John Hattie – Visible Learning for Teachers

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Dialogue is seen as an essential tool for learning, student involvement is what happens during and not ‘at an end’ of an exchange.

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+ Dialogic rather than Monologic Classroom

Essential features:

- Collective
- Reciprocal
- Supportive
- Cumulative
- Purposeful

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Students learn mathematics through the experiences that teachers provide.

NCTM, Principles and Standards for School Mathematics, 2000

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Let's do some math!!

A **B**

The cells of a particular organism increase exponentially. If g represents cell growth and h represents time, in hours, which graph best represents the growth pattern of the cells of this organism?

What could this graph represent?

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Powerful Task Features

- Engaging
- High cognitive demand
- Multiple perspectives and/or representations
- Requires communication

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Mathematical Engagement

Exploration Sense Making

Productive Struggle

Teacher Decisions Student Understanding

Productive Struggle

Exploration Sense Making

Mathematical Communication

+ Describe a scenario represented by the following information?

Time	Steps	Activity %	Distance
8:27 am - 11:28 am	6,436	58%	3.2 mi

Time	Steps	Pace	Total burn
10:20 am - 11:28 am	5,991	23.5 min/mi	355 cal

+ Context

+ Describe a scenario represented by the following information?

Time	Steps	Activity %	Distance
8:27 am - 11:28 am	6,436	58%	3.2 mi

Time	Steps	Pace	Total burn
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+ Which Belongs to Blue?


A B

Time	Steps	Pace	Total burn
8:18 am - 9:26 am	5,057	28.5 min/mi	126 cal

Time	Steps	Pace	Total burn
8:19 am - 9:26 am	5,810	23.1 min/mi	366 cal

+ What could be happening at the following locations: A to B? C? D to E?
 What evidence supports your thinking?

+ Which of the following segments could be represented by the following video?
 A to B? B to C? D to E? E to F?
 What evidence supports your thinking?

+ 

+ Which of the following segments could be represented by the following video?
 A to B? B to C? D to E? E to F?
 What evidence supports your thinking?

+ What were the teacher decisions/ actions that facilitated your understanding?

What aspects of the task promoted student communication?

How did communication facilitate your understanding?

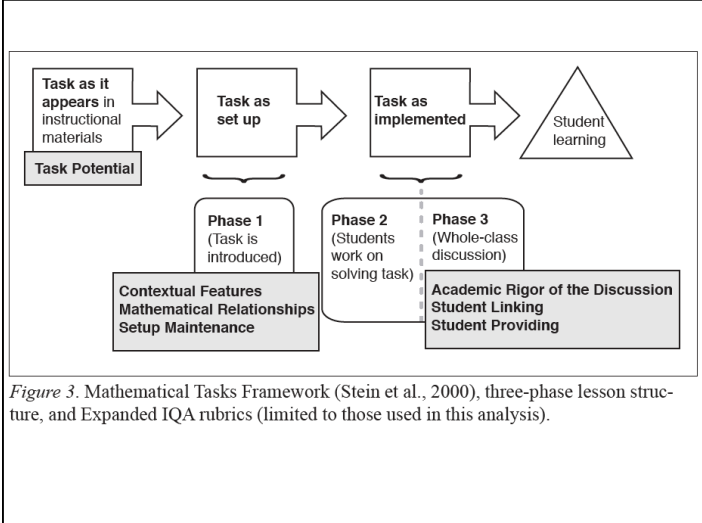


Figure 3. Mathematical Tasks Framework (Stein et al., 2000), three-phase lesson structure, and Expanded IQA rubrics (limited to those used in this analysis).

+ Opening Up and Repacking Tasks

How can tasks be opened up and repacked to create opportunities for student learning?

+ Number Lines

The image shows two horizontal number lines. The top number line has arrows at both ends and is labeled with integers from -5 to 5. The bottom number line also has arrows at both ends and is labeled with integers from -7 to 3.

+ Open Number Lines

+ Expressions on a Number Line

■ Place each expression on the number line when $x = 5$.

$3x$ $x/2$ x^2

■ Place each of expression on the number line.

$3x$ $x/2$ x^3

+ Mathematics Practices

1. Make sense and persevere.
2. Reason
3. Argue and critique
4. Model
5. Use tools
6. Are precise
7. Make use of structure
8. Look for patterns

+ Recap

- Learning takes place when the brain makes new connections.
- Challenge and/or disequilibrium needs to be present.
- Collaboration and dialogue are essential.
- Teachers need to begin with the task selection.

