What’s So Difficult About Task Difficulty?
How to maintain the cognitive demand and accessibility of math tasks!

Erica N. Mason
Outcomes

- Identify the features of **worthwhile math tasks**
- Understand how to make worthwhile tasks **accessible** while maintaining the **cognitive demand** of the task
Worthwhile Tasks
Why?

- Promote and reveal students’ mathematical thinking
- Increases access
- Establishes a high level of rigor
Why?

- When students are presented with meaningful and challenging work
  - Increased engagement
  - Increased academic understanding
easy successes are not helpful; experience with success in challenging tasks that require perseverance and even involve setbacks along the way lead to stronger efficacy beliefs.

Gurganus (2017)
Feedback

- Encourage students to do the bulk of the intellectual work (aka: thinking)
- Prompt students’ mathematical thinking
- Help students make sense of things
Feedback

**DO**
- listen
- prioritize kids’ thinking
- ask “why?”

**AVOID**
- taking over
- leading questions
- asking “how?”

Ginsburg (1997)
What?

- Complex
- Non-algorithmic
- Require understanding concepts and making connections
- Require considerable cognitive effort ... may involve some anxiety

Smith & Stein (1998)
Give the fraction and percent for each decimal:

- 0.20 = _____ = _____
- 0.25 = _____ = _____
- 0.33 = _____ = _____
- 0.50 = _____ = _____
- 0.75 = _____ = _____

Smith & Stein (1998)
Create a real-world situation for the following problem:

\[
\frac{2}{3} \times \frac{3}{4}
\]

Solve the problem you have created without using the rule, and explain your solution.

Smith & Stein (1998)
Feedback: Model

**DO**
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**AVOID**
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Ginsburg (1997)
When?

- Regularly

- Students should consider worthwhile tasks as part of what it means to ”do math”
Who?

- Everyone
From Meh to Meaningful
How?

- Reversibility
- Flexibility
- Generalizability

Dougherty et al. (2015)
Reversibility

- Give students an answer or solution and have them create a problem that would result in that answer or solution.
Simplify.
4(3 + 5y)
12 + 20y

Find two expressions that simplify to:
12 + 20y
Flexibility

- Asks the student to solve a problem in **multiple ways**.
-3 + (-8)
Feedback: Model

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Ginsburg (1997)
Generalizability

- Transform problems that have a single answer to provide opportunities for *pattern-building, conjecturing, and generalizing* mathematical facts and relationships.
<table>
<thead>
<tr>
<th>Fun Tees: Version 1</th>
<th>Fun Tees: Version 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fun Tees is offering a 30% discount on all merchandise. Find the amount of discount on a T-shirt that was originally priced at $16.</td>
<td>Fun Tees is offering a 30% discount on all merchandise.</td>
</tr>
<tr>
<td><img src="image" alt="T-shirts" /></td>
<td>• Find the amount of discount on a T-shirt that was originally priced at $16.</td>
</tr>
<tr>
<td></td>
<td>• Suppose the T-shirt was originally priced at $17, $18, $19, $20, or $50. Describe the amount of discount on T-shirts at each price.</td>
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<tr>
<td></td>
<td>• Write a number sentence that describes the amount of discount you will receive on any T-shirt that is offered at a 30% discount. Explain why this works.</td>
</tr>
</tbody>
</table>

Smith & Stein (2018)
Discussion

- What are the potential challenges you see with making these types of curricular adjustments?
Discussion

- What instructional supports and routines could you put in place prior to introducing these more rigorous math tasks?

- Psst. How can you anticipate challenging behavior and address things proactively?
Discussion

- How might you collaborate with other professionals in your building or district to enact these adjustments?
Thanks!

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