Rigor: Illustrations of Conceptual Understanding, Fluency, and Application

Professional Development on the Instructional Shift of Rigor

Delaware Department of Education

Mathematical Shift 3:

What is Rigor?

- Identify the three components of rigor
- Describe the three components in your own words.

Delaware Department of Education

Group Discussion

- **Shift #3: Rigor: Expect fluency, deep understanding, and application**

- *In your groups, discuss ways to respond to one of the following comments: "These standards expect that we just teach rote memorization. Seems like a step backwards to me." Or "I'm not going to spend time on fluency—it should just be a natural outcome of conceptual understanding."*

Delaware Department of Education

Solid Conceptual Understanding

- Teach more than "how to get the answer" and instead support students' ability to access concepts from a number of perspectives
- Students are able to see math as more than a set of mnemonics or discrete procedures
- Conceptual understanding supports the other aspects of rigor (fluency and application)

Delaware Department of Education

Procedural Skill and Fluency

- The standards require speed and accuracy in calculation.
- Teachers structure class time and/or homework time for students to practice core functions such as single-digit multiplication so that they are more able to understand and manipulate more complex concepts

Delaware Department of Education

Required Fluencies in K-6

Grade	Standard	Required Fluency
K	K.OA.5	Add/subtract within 5
1	1.OA.6	Add/subtract within 10
2	2.OA.2 2.NBT.5	Add/subtract within 20 (know single-digit sums from memory) Add/subtract within 100
3	3.OA.7 3.NBT.2	Multiply/divide within 100 (know single-digit products from memory) Add/subtract within 1000
4	4.NBT.4	Add/subtract within 1,000,000
5	5.NBT.5	Multi-digit multiplication
6	6.NS.2,3	Multi-digit division Multi-digit decimal operations

Delaware Department of Education

Procedural VS. Conceptual

- “Procedural involves working out a procedure, but the students may not understand the reasoning behind procedure. Conceptual knowledge is understanding the concepts in order to solve problems (so students may use any procedure). A great example is with fractions. Many students can solve fraction problems for a test because they memorize a procedure only to forget two weeks later. Thus, the students have not mastered the conceptual understanding.”

Delaware Department of Education

Application

- Students can use appropriate concepts and procedures for application even when not prompted to do so.
- Teachers provide, and HS. opportunities at all grade levels for students to apply math concepts in “real world” situations, recognizing this means different things in K-5, 6-8
- Teachers in content areas outside of math, particularly science, ensure that students are using grade-level-appropriate math to make meaning of and access science content.

Delaware Department of Education

Rigor Card Sort
Sample Problems[1]

1. Sort problems into one of the three categories of Rigor. Be able to justify your reasoning.

2. Consider the following questions:

- What is something that you observed from one of the problems you've tried?
- How can assessing (through tests, HW problems, exit tickets) all 3 aspects of rigor affect student learning?
- What does it look like when we ask students to work on procedural skill and fluency, conceptual understanding or application?
- What standards do these problems align to?

Delaware Department of Education

Action Plan

- How does rigor apply to the Depths of Knowledge?
- Review Mathematical Practices
  - Determine which practices apply to which aspect of rigor: Conceptual, Procedural/Fluency, and application
  - What do those practices look like in your classroom?

Delaware Department of Education

Teacher Resources

- Rigor Deep Drive
- Revised Blooms Taxonomy Posters
- Standards of Mathematical Practices Progression

Delaware Department of Education