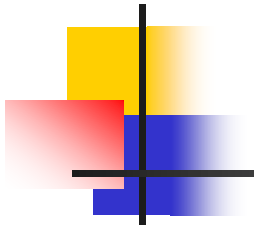


How Does Mathematics Pedagogy Influence Student Understanding?

History

- 2008 – National Math Advisory Panel Report
  - K-8 mathematics education should strive for **proficiency with fractions** (including decimals, percents, and negative fractions) as a major goal.
- 2010 – Common Core State Standards
- May 4, 2016 – adopted **New Jersey Student Learning Standards (NJSLS)**

Standards Implementation/ Assessment Transition

2010-2011 Plan for curriculum changes

2011-2012 Grades K-2

2012-2013 Grades 3-5 and HS

2013-2014 Grades 6-8

2014-2015 First Assessment on CCSS from PARCC (**P**artnership for **A**ssessment of **R**eadiness for **C**ollege and **C**areers)

2017-2018 **NJSLS** mandated

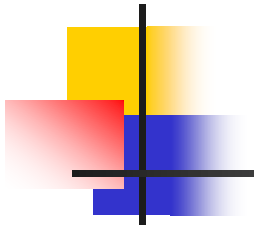
Two Parts to the Standards

Standards for Mathematical Content

- are organized into Domains and Clusters within the Domains
- state "The Math" objectives students need to know/understand
- are different at every grade level

Standards for Mathematical Practice

- are characteristics of an excellent math student
- are the same at every grade level, K-12



Standards for Mathematical Content

K-2 Mathematics Content

- It is imperative that students in K-2 have a foundation in numeracy skills.
- Emphasize a conceptual understanding of number.
- Analyze, compare, create, compose, and reason with 2- and 3-dimensional shapes.
- Encompass addition, subtraction, data, time, money, length, and fractions in the measurement domain.

3-5 Mathematics Content

- Emphasize developing understanding of fractions and their applications
- Reason with geometric shapes and their attributes
- Solve problems involving measurement, work with geometric measurement, represent and interpret data

6-8 Mathematics Content

- Grade 6: Ratios and proportional relationships, and early algebraic expressions and equations
- Grade 7: Ratios and proportional relationships, and arithmetic of rational numbers
- Grade 8: Linear algebra and linear functions

K-8 Mathematics Domains

K	1	2	3	4	5	6	7	8
Geometry								
Measurement and Data						Statistics and Probability		
Number and Operations in Base Ten						The Number System		
Operations and Algebraic Thinking						Expressions and Equations		
Counting and Cardinality		Number and Operations---Fractions				Ratios and Proportional Relationships		Functions

Standards for Mathematical Practice

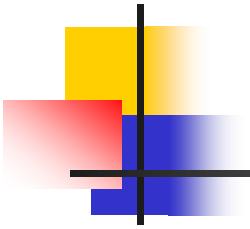
1. Make sense of problems and **persevere in solving them**.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically.
6. **Attend to precision**.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Impact on Curriculum and Teaching

- Must align curriculum to meet the NJSLS.
- Professional development must be provided for teachers to learn content that is new to the grade level or to deepen understanding of what is currently required.

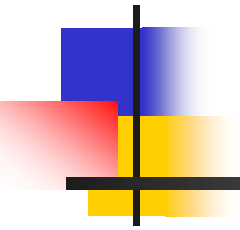
Pedagogy

- The way that we teach mathematics has a significant impact on the understanding of concepts.
- We must strive to reach all students through conceptual development of topics, not rote memorization.



Natural Learning Process

- "Flash card" approach?
- Slow, spiral approach?



Stage 1

Concrete

Stage 3

Symbolic;
Abstract

2 + 3 = 5

Stage 2

Iconic

aka Pictorial;

Representational

Three Stages of Learning Mathematics

1. Concrete
   touch, feel, manipulate
2. Iconic; Pictorial; Representational
   picture in mind
3. Symbolic; Abstract
   symbols, equations, rules, abstract

For all grades, be accepting of changes in your child's mathematics education. These changes will mean that your child will be a better problem solver and critical thinker.

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