

Increase Mathematical Proficiency Using Problem Solving



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Learning Intentions

~We are learning how to use problem solving in the classroom to promote student understanding.

~We are learning how the Mathematical Practices and the Modes of Mathematical Representations are related.

How we once taught Math (sadly):



How we teach math now (hopefully)

<https://www.teachingchannel.org/videos/math-practice-standard-perseverance>

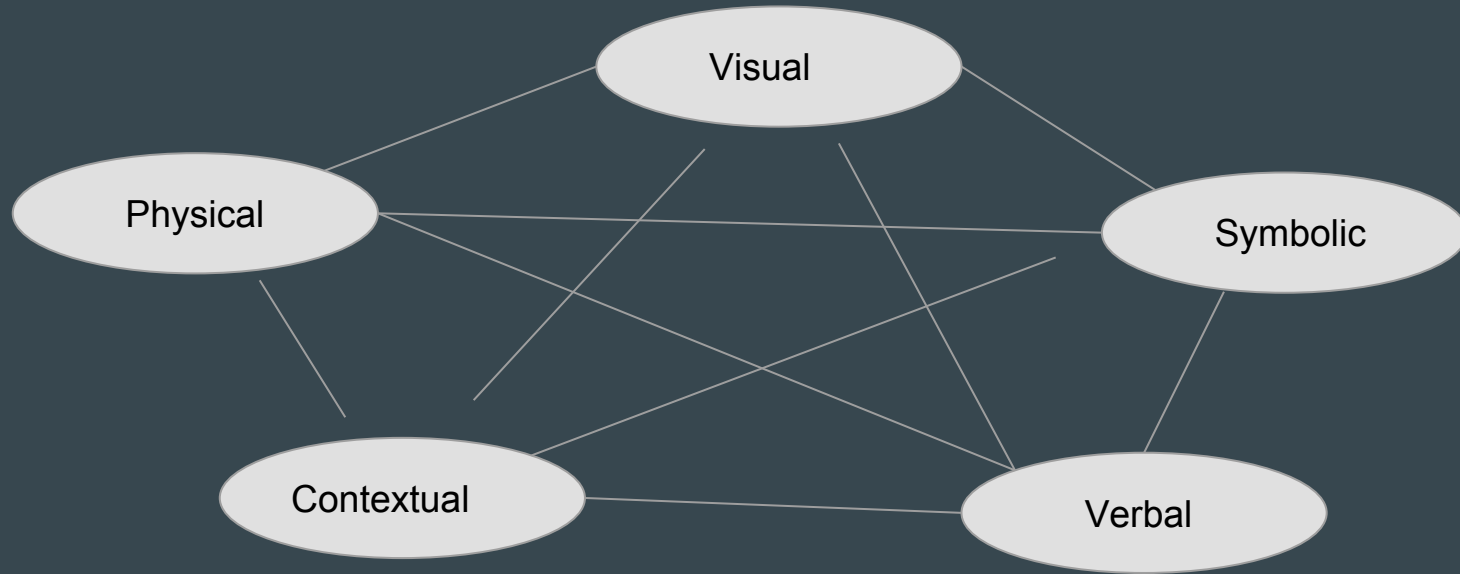
Common Core Mathematical Practices

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.

Mathematics Teaching Practices (From *Principles to Actions*)

- ~Establish mathematics goals to focus learning.
- ~Implement tasks that promote reasoning and problem solving.
- ~Use and connect mathematical representations.
- ~Facilitate meaningful mathematical discourse.
- ~Pose purposeful questions.
- ~Build procedural fluency from conceptual understandings.
- ~Support productive struggle in learning mathematics.
- ~Elicit and use evidence of student thinking.

Modes of Mathematical Representations (*Principles to Actions, pg. 25*)



Concrete → Representational → Abstract

Pizzas Made to Order - Grade 3

(Georgia Department of Education - Grade 3)

Standards for Mathematical Content:

3.NF.1 Understand a fraction $1/b$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size $1/b$.

3.NF.3 Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size...

Standards for Mathematical Practice?

Modes of Mathematical Representations?

Farmer Fred - Grade 4

(Teacher Created Tasks (<http://ccak52012.wikispaces.com/Fourth+Grade>))

Standards for Mathematical Content:

4.NF.2 Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as $\frac{1}{2}$...

4.NBT.6 Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value...

Standards for Mathematical Practice?

Modes of Mathematical Representations?

Collecting Basketball Cards - Grade 5

(Exemplars K-12)

Standards for Mathematical Content:

5.OA.3 Generate two numerical patterns using two given rules...

5.G.1 Use a pair of perpendicular number lines, called axes, to define a coordinate system...

5.G.2 Represent real world mathematical problems by graphing in the first quadrant...

Standards for Mathematical Practice?

Modes of Mathematical Representations?

Breakfast for All - Grade 5

(Georgia Department of Education)

Standards for Mathematical Content:

5.MD.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

5.MD.4 Measure volume by counting unit cubes...

5.MD.5 Relate volume to the operations of multiplication and addition and solve real world mathematical problems involving volume.

Standards for Mathematical Practice?

Modes of Mathematical Representations?

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Final thoughts?

Questions?

Thank you for being active participants today!

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