

# Mathematics Education and the Common Core – Vision and Progress

A Primer for Parents by Dev Sinha, University of Oregon

## Introduction

What are objectives of mathematics education? 3-5 minute think then share.

Answers typically organize in two threads

- a "canon" of material which serve science/ social science/ financial/ and thus citizenship needs
- providing opportunity for problem solving, sense-making, seeing structure, reasoning, and understanding the world.

Mathematics provides unique opportunities for developing reasoning, and is universal, like running and strength training are among physical activities. We have been falling well short of taking advantage of these opportunities (cf. 40% remediation rates in community college students, including students who have to start over with fractions).

Conclusion: one should teach the "canon" but creatively, fully engaging thought as you go along. That's the Common Core: content standards for the former; practice standards for the latter.

## Learning outcomes for this Primer

- become familiar with the best available understanding of what mathematics education should entail.
- become familiar with high-quality resources (Illustrative Mathematics, Dan Meyer, Mathalicious, EngageNY)
- start to learn some cultural/ instructional aspects as needed in roles as parents (tutor, mentor).
- begin discussion of shifts at the community level.

## Resources

How do we see this vision of teaching the mathematical canon in ways which engage fully doing mathematics?

**Illustrative Mathematics** - a site and community (my community) devoted to filling in this vision. All numbers below refer to IM task numbers, so for example 144 refers to

<http://www.illustrativemathematics.org/illustrations/144>

- 144 and 574 2.NBT and vs. "3 hundreds, 6 tens and 2 ones makes \_\_\_\_"
- 633 (8.F) vs. "graph  $x^2 - 3x + 2$ " (only),
- 590 (5.OA) vs. nothing we do now,
- 172 3.NF vs. "compare these two fractions" & note the related problems
- 1316 G-SRT vs. "fill in the missing length".

All Illustrative Mathematics tasks are vetted by at least one classroom expert and at least one college or university mathematician.

This deeper vision for mathematics education has been shared and elaborated by the mathematics education community for decades. “**Celebrity teachers**” include

Deborah Ball, who figured out as a third grade teacher how to teach fractions better than how they were developed in any curriculum, published that as a professor twenty years ago, but despite recognition as a best practice hasn't been in widespread use - until now.

<http://ncrtl.msu.edu/http/craftp/html/pdf/cp902.pdf>

Dan Meyer, who realized as a high-school teacher how much we actually discourage patient problem solving through our current curricula.

[http://www.ted.com/talks/dan\\_meyer\\_math\\_curriculum\\_makeover.html](http://www.ted.com/talks/dan_meyer_math_curriculum_makeover.html) (4:33 in)

He can now easily share his "three-act tasks" with other teachers, who can readily understand how they fit in their classrooms.

<https://docs.google.com/spreadsheets/pub?key=0AjIqyKM9d7ZYdEhtR3BJMmdBWnM2YWxWYVM1UWowTEE&output=html>

Ultimately, the Common Core allows us to be creative through better communication, as well as to work at scale, and to better serve students who move between schools.

I have taken to using the term "juicy math". Others discuss "math with sticks with you". Another way to say it is "math which is worth our children's' attention." Some have coined the term **Mathalicious**:

<http://www.mathalicious.com/lesson/pandemic/>

The Standards have some points of emphasis and others which are supporting. Those of emphasis should be developed fully from **Meaning to Method to Mastery** (as coined by Cody Patterson from U. Arizona, and I might write about with him).

For **Meaning**, consider the question: “what does it mean when you type in  $1/7$  in your calculator and get 0.14...?”

**Method** is what we’ve emphasized and will continue to incorporate since it is such an important part of the canon.

**Mastery** means being able to model with, to reason with, and to use in further mathematics. For example, mastery of place value is used/developed when understanding the algorithm for long division.

Well-constructed curricula integrate meaning, method and mastery into the mathematical work which students do. One such curriculum is **EngageNY**, commissioned by the State of New York, funded by Race to the Top monies, and being made openly and freely available (a main reason we share it!).

<http://www.engageny.org/mathematics>

Because the site can be clunky to navigate, I have been downloading and posting at

<http://pages.uoregon.edu/dps/engageny/>

We can even see some videos and other materials aimed at teachers but which can also help us understand as parents.

<http://www.engageny.org/resource/nti-november-2012-rigor-breakdown-shoe-box-place-value-chart>

At middle grades, here's another good resource for the vision of proficiency

[http://www.learner.org/courses/teachingmath/grades6\\_8/session\\_04/section\\_01\\_a.html](http://www.learner.org/courses/teachingmath/grades6_8/session_04/section_01_a.html)

The **Smarter Balanced Assessment Consortium**, with initial funding through Race to the Top and continued funding through states, is developing a suite of assessment tools. They will support our understanding of student achievement, including through formative tasks for teachers to use every day and the ability to give unit tests at any time. Sample tests are at

<https://sbacpt.tds.airast.org/student/>

Getting back to the mathematics, the primary resources to draw from if we have questions are the Common Core standards themselves as well as their narrative form in **Progressions Documents** published by the University of Arizona.

<http://ime.math.arizona.edu/progressions/>

## **Broader changes in culture and mindset**

If we are to change our expectations for student learning, we need to revisit our culture around education. Is education a process of consumption or one of engaging in training? What does success mean?

Here we can look to incorporate some (not necessarily all) elements of other cultures.

<http://www.npr.org/blogs/health/2012/11/12/164793058/struggle-for-smarts-how-eastern-and-western-cultures-tackle-learning>

The educational and psychology research in this country points to some simple shifts, for example in what we praise or otherwise reward, which could help us move in the right direction.

[http://www.youtube.com/watch?v=TTXrV0\\_3UjY](http://www.youtube.com/watch?v=TTXrV0_3UjY)

## **Final discussion**

What is our community vision?

How do we want to act on this as parents individually and collectively?

Do we want to try to address issues which arise from our short school year and large class sizes through collective action (after school, on furlough days, etc)?

Do we want to try to influence policy decisions to prioritize and fully support this work?