Common Core State Standards Transition to Implementation
Core Challenge Event

Francis (Skip) Fennell
Professor of Education
McDaniel College, Westminster, MD
&
Project Director
Elementary Math Specialists & Teacher Leaders Project
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A Common Challenge:

Developing Understanding of Critical Content Areas

Wray approved title…

One year ago…

First...

appropriately

The Starting Point…

NCTM Processes	CCSS – Standards for Mathematical Practice	Adding it Up – Strands of Mathematical Proficiency
Problem Solving	Make sense of problems and persevere in solving them.	Strategic competence
Reasoning and Proof	Reason abstractly and quantitatively.	Adaptive reasoning
Reasoning and Proof	Construct viable arguments and critique the reasoning of others.	Adaptive reasoning
Connections	Model with mathematics.	Strategic competence
Representation	Use appropriate tools strategically.	Strategic competence
		Conceptual understanding
Communication	Attend to precision.	Procedural fluency.
Connections	Look for and make use of structure.	Strategic competence
Reasoning and Proof	Look for and express regularity in repeated reasoning.	Adaptive reasoning
		*Productive disposition

The Practices – What do we know

- Well accepted as a starting point…
- Observable…
- Planning and pedagogy related…
- Some more than others
  - Mathematics
  - Developmental levels
- See the next slides

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Look For's

Make sense of problems and persevere in solving them (e.g.):

1.Students: Are actively engaged in solving problems

2.Teacher: Provides time for and facilitates the discussion of problem solutions

Reason abstractly and quantitatively (e.g.):

1.Students: Use varied representations and approaches when solving problems

2.Teacher: Provides a range of representations of mathematical ideas and problem situations and encourages varied solution paths

Construct viable arguments and critique the reasoning of others (e.g.):

1.Students: Understand and use prior learning in constructing arguments

2.Teacher: Provides opportunities for students to listen to or read the conclusions and arguments of others

Model with mathematics (e.g.):

1.Students: Apply mathematics learned to problems they solve and reflect on results

2.Teacher: Provides a variety of contexts for students to apply the mathematics learned

Use appropriate tools strategically (e.g.):

1.   Students: Use technological tools to deepen understanding

2.   Teacher: Uses appropriate tools (e.g. manipulatives) instructionally to strengthen the development of mathematical understanding

Attend to Precision (e.g.):

1.Students: Based on a problem's expectation, students calculate with accuracy and efficiency.

2.Teacher: Emphasizes the importance of mathematical vocabulary and models precise communication.

Look for and make use of structure (e.g.):

1.Students: Look for, develop, and generalize arithmetic expressions

2.Teacher: Provides time for applying and discussing properties

Look for and express regularity in repeated reasoning (e.g.):

1.Students: Use repeated applications to generalize properties

2.Teacher: Models and encourages students to look for and discuss regularity in reasoning

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Another Look

2. Reason abstractly and quantitatively

3. Construct viable arguments and critique the reasoning of others

4. Model with mathematics

5. Use appropriate tools strategically

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.

1. Make sense of problems and persevere in solving them

6. Attend to precision

Reasoning and explaining

Modeling and using tools

Seeing structure and generalizing

Overarching habits of mind of a productive mathematical thinker.

Bill McCallum's blog!

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The Content

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Grades K-2

- **Counting and Cardinality (K only)**
- Operations and Algebraic Thinking
- Number and Operations in Base Ten
- Measurement and Data
- Geometry

Grades 3-5

- Operations and Algebraic Thinking
- Number and Operations in Base Ten
- **Number and Operations – Fractions**
- Measurement and Data
- Geometry

CCSSO, 2010

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and…

Grades 6, 7

- **Ratios and Proportional Relationships**
- The Number System
- Expressions and Equations
- Geometry
- Statistics and Probability

Grades 8

- The Number System
- Expressions and Equations
- **Functions**
- Geometry
- Statistics and Probability

CCSSO, 2010

High School Conceptual Categories

- Number and Quantity

- Algebra

- Functions

- Modeling

- Geometry

- Statistics and Probability

- **Note on courses and transitions**: course sequence, K-7 standards prepare students for Algebra I in grade 8, etc.

CCSSO, 2010

A glimpse…probably not fair

Cluster Expectations

K	24
1	23
2	27
3	30
4	34
5	34
6	43
7	44
8	33

- Don't let the number of understandings and skills be the whole story…

Less is more!?

Common Core State Standards Adoptions

45 states

State adopted standards in only one subject

FEBRUARY
10 Kentucky

MAY
12 West Virginia
20 Hawaii
25 Maryland

JUNE
2 Wisconsin
3 North Carolina
4 Utah
7 Ohio
15 Michigan
15 Missouri
16 New Jersey
16 Wyoming
18 Nevada
24 Illinois
14 Oklahoma

JULY
1 Louisiana
1 Pennsylvania
1 Rhode Island
7 Connecticut
8 Georgia
8 New Hampshire
12 Arkansas
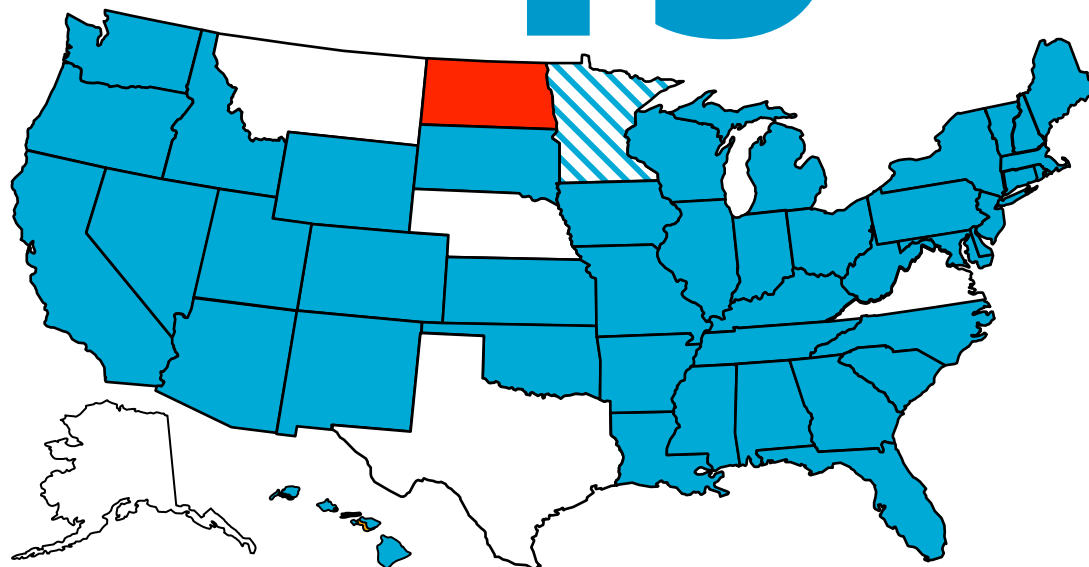14 South Carolina
19 New York
19 Washington
21 Massachusetts
21 Washington, D.C.
27 Florida
29 Iowa
30 Tennessee

AUGUST
2 Colorado
2 California
3 Indiana
17 Vermont
19 Delaware

SEPTEMBER
27 Minnesota

OCTOBER
12 Kansas
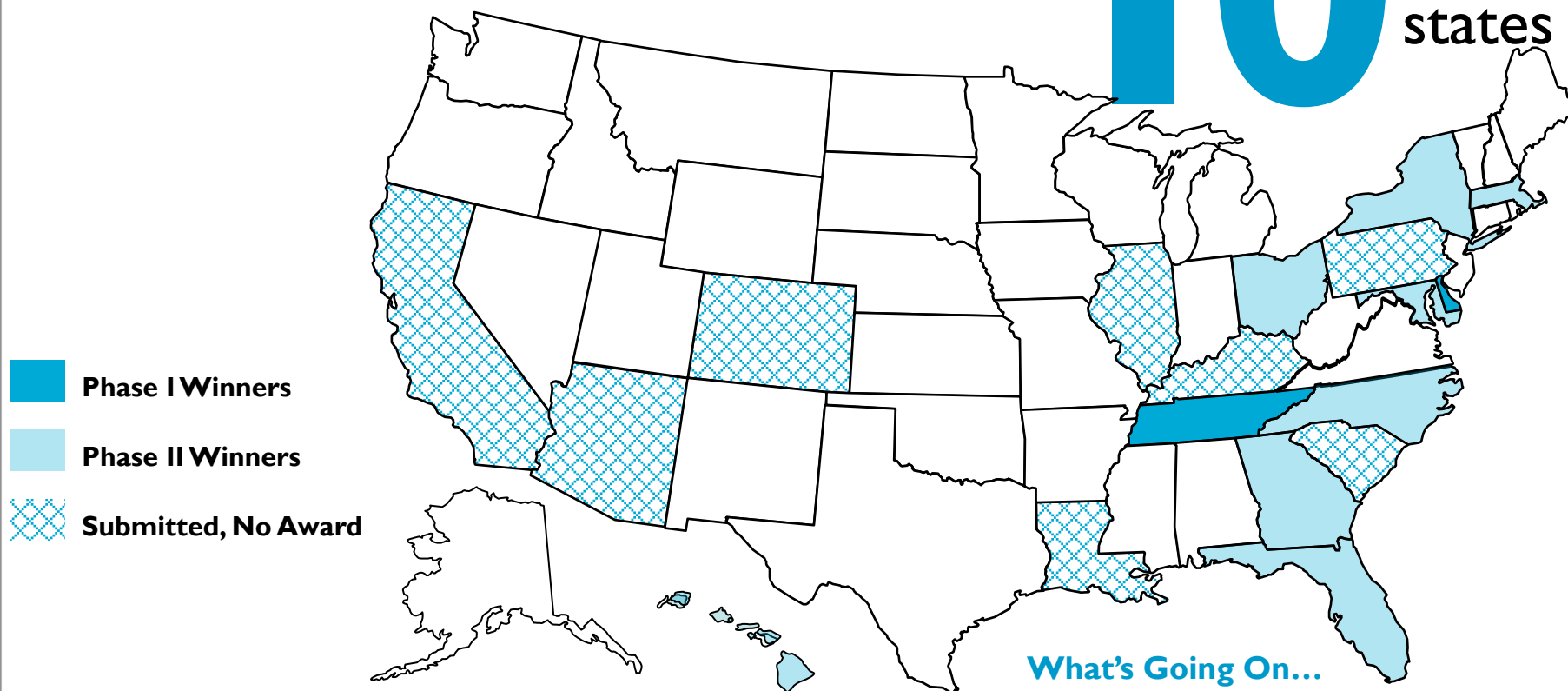19 New Mexico
28 Oregon

NOVEMBER
17 Idaho
18 Alabama
29 South Dakota

APRIL 2011
1 Maine

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Source: Education Week

Race to the Top Competition Results

10 states

Phase I Winners

Phase II Winners

Submitted, No Award

What's Going On…

New Race to the Top:
$500M for Early Education
$200M for Round 2 Runners-Up

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Math Groups Support Common Standards

TO THE EDITOR:

The final set of common academic standards released June 2 by the Common Core State Standards initiative are a welcome milestone in the standards movement that began more than 20 years ago when the National Council of Teachers of Mathematics published its "Curriculum and Evaluation Standards for School Mathematics." The new common standards provide the foundation for more-focused and coherent instructional materials and assessments that measure students' understanding of mathematical concepts and acquisition of fundamental reasoning habits, in addition to fluency with math skills. …

Letter co-signed by NCTM, NCSM, AMTE, ASSM; June 14, 2010
Additional efforts forthcoming by NCTM and NCSM – stay tuned

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Domains/ Grades	K	1	2	3	4	5	Totals
Counting and Cardinality	9						5%
Operations and Algebraic Thinking	5	8	4	9	5	3	20%
Number and Operations in Base Ten	1	8	10	3	6	8	21% (K-5); 17% (3-5)
Number and Operations - Fractions				7	12	11	31% (3-5)
Measurement and Data	3	4	10	12	8	8	26%
Geometry	6	3	3	2	3	4	12%
Totals	24	23	27	30	34	34	172

Grades K-5

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Take a Chance…

NOTE: Please consider this table as a 'for discussion ONLY' example of the impact of the CCSS. The totals above are <u>only</u> a count of the standards (or sub-standards) within a cluster, there is NO attempt here to consider weight/emphasis/time needed for particular standards, which is another AND VERY IMPORTANT consideration.

BUT, Think about:

- Number and Operations in Base Ten and Fractions – 48% of grades 3-5.

- Number related domain emphasis (operations and algebraic thinking, number and operations in base ten, and number and operations – fractions):
  - 63% in grade 3
  - 68% in grade 4
  - 65% in grade 5

- What do YOU see? What do YOU wonder about?

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Domains Grades	6	7	8	Totals
Ratios and Proportional Relationships	7	6		15% (grades 6, 7)
The Number System	13	9	2	20%
Expressions and Equations	11	5	11	23%
Functions			5	15% (grade 8)
Geometry	4	6	11	18%
Statistics and Probability	8	11	4	19%
Totals*	44	43	33	120

Grades 6-8

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Take a Chance…

NOTE: Same qualification as with grades K-5.

BUT, Think about:

- Ratio and proportional relationships, the number system, expressions and equations – 72% of grade 6.

- Algebra related domain emphasis (ratio and proportional relationships; number system, expressions and equations, functions):
  - 72% in grade 6
  - 45% in grade 7
  - 55% in grade 8

- Statistics and probability emphasis:
  - 19% in grade 6
  - 25% in grade 7
  - 12% in grade 8

- What do *YOU* see? What do *YOU* wonder about?

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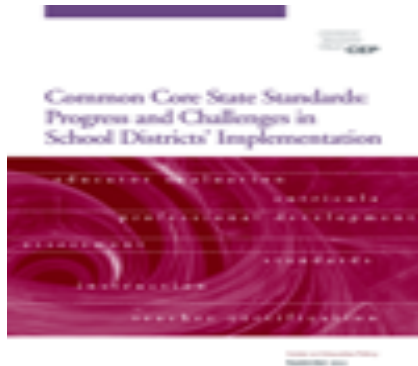
CCSS Progress and Challenges

- Almost three-fifths of the districts in states that have adopted the CCSS viewed the standards as more rigorous and expected the CCSS to improve student learning.
- Two-thirds of the districts have begun to develop an implementation plan or intend to do so in 2011-2012; Sixty-one percent of the districts are developing and/or purchasing curriculum materials.
- Adequate funding is a major challenge.
- About two-thirds of the adopting districts cited inadequate or unclear guidance from the state.
- Districts appear to face little resistance from parents, community members, or educators.
- Districts or school-level staff have participated in a variety of state, regional, or district activities in 2010-2011 to become informed about the CCSS

Center on Ed Policy

What's important?

Four (or more) considerations…

Moving Beyond Transitioning

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FIRST

1. Developing understanding of and applying proportional relationships;

2. Developing understanding of operations with rational numbers and working with expressions and linear equations;

3. Solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume;

4. Drawing inferences about populations based on samples.

Curriculum Focal Points and Connections for Grade 7

The set of three curriculum focal points and related connections for mathematics in grade 7 follow. These topics are the recommended content emphases for this grade level. It is essential that these focal points be addressed in contexts that promote problem solving, reasoning, communication, making connections, and designing and analyzing representations.

Grade 7 Curriculum Focal Points	Connections to the Focal Points
Number and Operations and **Algebra** and **Geometry:** Developing an understanding of and applying proportionality, including similarity Students extend their work with ratios to develop an understanding of proportionality that they apply to solve single and multistep problems in numerous contexts. They use ratio and proportionality to solve a wide variety of percent problems, including problems involving discounts, interest, taxes, tips, and percent increase or decrease. They also solve problems about similar objects (including figures) by using scale factors that relate corresponding lengths of the objects or by using the fact that relationships of lengths within an object are preserved in similar objects. Students graph proportional relationships and identify the unit rate as the slope of the related line. They distinguish proportional relationships ($y/x = k$, or $y = kx$) from other relationships, including inverse proportionality ($xy = k$, or $y = k/x$).	**Measurement** and **Geometry:** Students connect their work on proportionality with their work on area and volume by investigating similar objects. They understand that if a scale factor describes how corresponding lengths in two similar objects are related, then the square of the scale
Measurement and **Geometry** and **Algebra:** Developing an understanding of and using formulas to determine surface areas and volumes of three-dimensional shapes By decomposing two- and three-dimensional shapes into smaller, component shapes, students find surface areas and develop and justify formulas for the surface areas and volumes of prisms and cylinders. As students decompose prisms and cylinders by slicing them, they develop and understand formulas for their volumes (*Volume = Area of base × Height*). They apply these formulas in problem solving to determine volumes of prisms and cylinders. Students see that the formula for the area of a circle is plausible by decomposing a circle into a number of wedges and rearranging them into a shape that approximates a parallelogram. They select appropriate two- and three-dimensional shapes to model real-world situations and solve a variety of problems (including multistep problems) involving surface areas, areas and circumferences of circles, and volumes of prisms and cylinders.	and b a... dents continue to develop their unders... ultiplication and division and the struc... bers by determining if a counting number grea... 1 is a prime, and if it is not, by factoring it into a p... of primes. *Data Analysis:* Students use proportions to make estimates relating to a population on the basis of a sample. They apply percentages to make and interpret histograms and circle graphs. *Probability:* Students understand that when all outcomes of an experiment are equally likely, the theoretical probability of an event is the fraction of outcomes in which the event occurs. Students use theoretical probability and proportions to make approximate predictions.
Number and Operations and **Algebra:** Developing an understanding of operations on all rational numbers and solving linear equations Students extend understandings of addition, subtraction, multiplication, and division, together with their properties, to all rational numbers, including negative integers. By applying properties of arithmetic and considering negative numbers in everyday contexts (e.g., situations of owing money or measuring elevations above and below sea level), students explain why the rules for adding, subtracting, multiplying, and dividing with negative numbers make sense. They use the arithmetic of rational numbers as they formulate and solve linear equations in one variable and use these equations to solve problems. Students make strategic choices of procedures to solve linear equations in one variable and implement them efficiently, understanding that when they use the properties of equality to express an equation in a new way, solutions that they obtain for the new equation also solve the original equation.	

Data Analysis: Students use proportions to make estimates relating to a population on the basis of a sample. They apply percentages to make and interpret histograms and circle graphs.

What to do here?

- Make sure teachers "get" the critical areas
- Grade band and cross grade groups

- How much time?
- When? Spaced – chunked?
- Assessments?

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TWO

Understanding

4.NBT

- Generalize place value ***understanding*** for multi-digit whole numbers.

- Use place value ***understanding*** and properties of operations to perform multi-digit arithmetic.

4.NF

- Extend ***understanding*** of fraction equivalence and ordering.

- Build fractions from unit fractions by applying and extending previous ***understandings*** of operations on whole numbers.

- ***Understand*** decimal notation for fractions and compare decimal fractions.

4.MD

- Geometric measurement: ***understand*** concepts of angle and measure angles.

Understanding

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6.RP

- *__Understand__* ratio concepts and use ratio reasoning to solve problems.

6.NS

- Apply and extend previous *__understandings__* of multiplication and division to divide fractions by fractions.

- Apply and extend previous *__understandings__* of numbers to the system of rational numbers.

6.EE

- Apply and extend previous *__understandings__* of arithmetic to algebraic expressions.

6.SP

- Develop *__understanding__* of statistical variability.

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Representation

- 3.NF.2 – Understand a fraction as a number on the number line; *represent fractions on a number line diagram.*

- 4.NBT.5 – Multiply a whole number…Illustrate and explain…by *using equations, rectangular arrays, and/or area models.*

- 5.MD.4 – Measure volumes by counting unit cubes, *using cubic cm, cubic in, cubic ft, and improvised units.*

- 6.RP.3 – Use ratio and rate reasoning…by reasoning about *tables of equivalent ratios, tape diagrams, double line diagrams or equations.*

- 8.FF.2 – Compare properties of two *functions…represented in a different way (algebraically graphically, numerically in tables or by verbal descriptions).*

Try this…

- Pick a grade level you are familiar with (within K-8) – locate and <u>highlight</u> the following words within standards – ***understand, explain, interpret.***

- Pick a conceptual category you are familiar with (high school mathematics) – locate and <u>highlight</u> the following words within standards – ***understand, prove, rewrite, create, construct***

Now, Try this…

- With the grade level (K-8) you have been working with <u>highlight</u> any reference to the use of representations (e.g. use area models to…)

- With the conceptual category (high school) you have been working with <u>highlight</u> any reference to the use of representations (e.g. graphs, constructions)

Here's the point...

- Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?* (4.NF.4c)

- **Understanding + Representations = Time; Stuff; Depth**

**Conceptual understanding is NOT an option,
*it's an expectation!***

THREE

Try this

- Consider (with your grade or conceptual category)
  - What's familiar?
  - What's new?
  - What's challenging?
- Let's hear from you

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FOUR

Unpacking and Emphasis?

A few examples…

- 4.NF.1 Explain why a fraction a/b is equivalent to a fraction (n x a)/(n x b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

- *When?*
- *How much time?*
- *Assessment(s)?*

A few examples…

- 4.NF.3.d Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g. by using visual fraction models and equations to represent the problem.
- *When?*
- *How much time?*
- *Assessment(s)?*

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A few examples…

- 4.G.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

- *When?*

- *How much time?*

- *Assessment(s)?*

A few examples…

- 4.NBT.3 Use place value understanding to round multi-digit whole numbers to any place (builds off grade 3 to the nearest 10 or 100).

- *When?*

- *How much time?*

- *Assessment(s)?*

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I said four, BUT this is FIVE

Grade 1

- Students should apply the principle of *transitivity of measurement* to make indirect comparisons, but they need not use this technical term.

- *Right rectangular prisms*
- *Right circular cones*
- *Right circular cylinders*

- 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.

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Language…

Grade 5

- Make a <u>line</u> plot to display…

Grade 6

- Display numerical data in plots on a number line, including <u>dot</u> plots, histograms, and box plots

Other Issues

Continuing teacher needs?

- Do they know this is going on? Awareness? Awareness+?

- Professional Development
  - Where will you start?
  - When?
  - Who will be involved? Stages?

- **Implementation Calendar – both directions**

- **Curriculum Materials**

- Assessments

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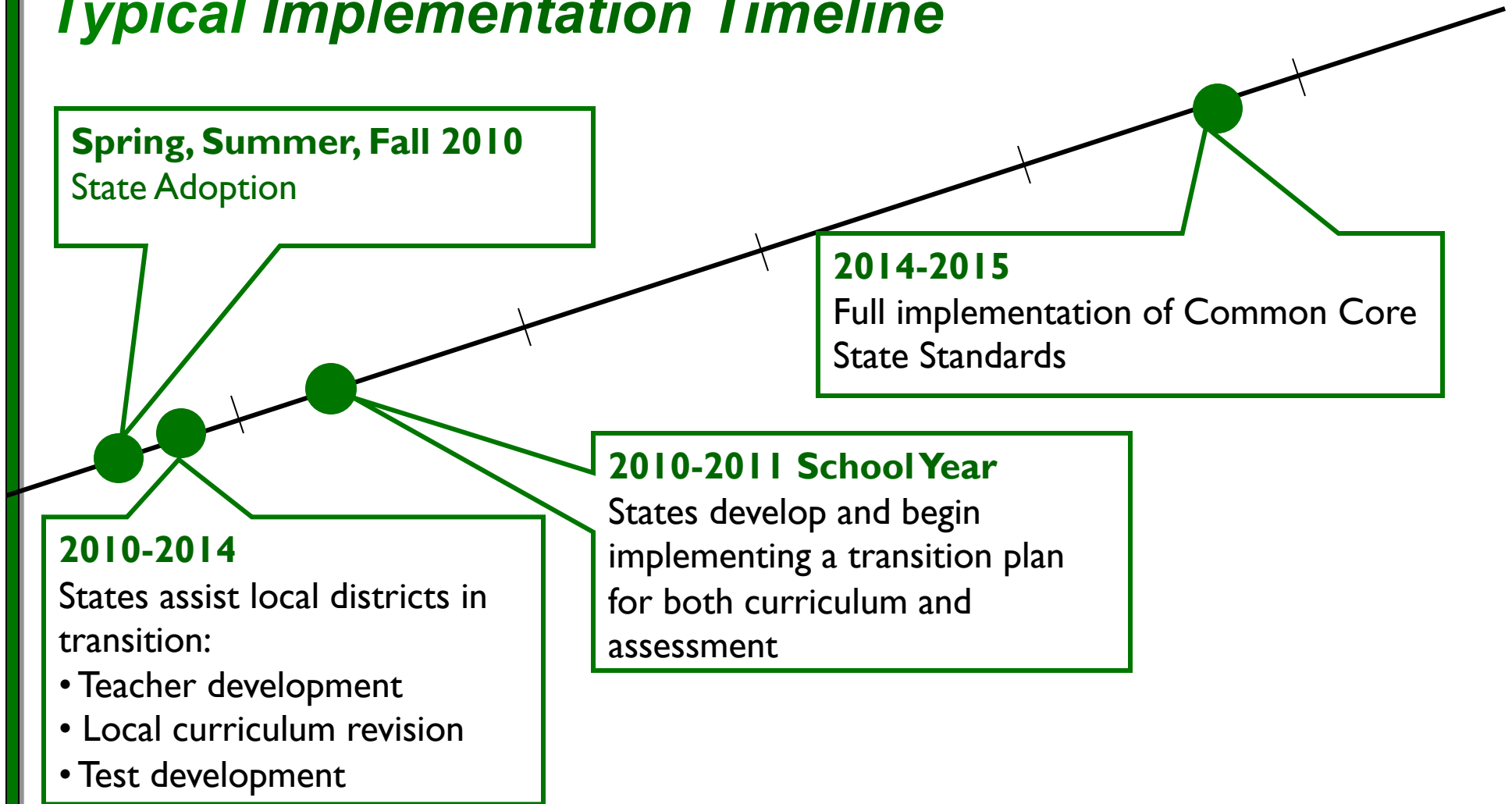& Teacher Leaders Project

Don't Forget

- Pre-requisites. What's the plan – for two years, forever?

- RtI – defining tier needs with a CCSS curriculum

- Advanced students? Acceleration – particularly between elementary and middle school.

Back to the Mathematical Practices

Really important: "A lack of **_understanding_** effectively prevents a student from engaging in the mathematical practices." (p. 8)

Common Core State Standards

Typical Implementation Timeline

Spring, Summer, Fall 2010
State Adoption

2014-2015
Full implementation of Common Core State Standards

2010-2014
States assist local districts in transition:
• Teacher development
• Local curriculum revision
• Test development

2010-2011 School Year
States develop and begin implementing a transition plan for both curriculum and assessment

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Status

- Most states transitioning K-2…

- Promise of the *Mathematical Practices…*

- ***2011-2012 – Grades K, 1, 2 (or portions)***
- ***2012-2013 – Grades 3-5***
- ***2013-2014 – Grades 6-8***; Interim PARCC and Smarter Assessments
- 2014-2015 – PARCC and Smarter Assessments…

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Race to the Top Assessment Program Competition

- $350 million of Race to the Top Fund set aside for awards to consortia of states to design and develop common K-12 assessment systems aligned to common, college- and career-ready standards

- The competition asked consortia to design assessment systems that meet the dual needs of *accountability* and *instructional improvement*

- In September 2010, the U.S. Department of Education awarded grants to:

  - ***Partnership for Assessment of Readiness for College and Careers (PARCC)***

  - ***Smarter Balanced Assessment Consortium (SBAC)***

- The winning consortia have four years to develop assessments systems, and states participating in either consortium will administer new assessments statewide by 2014-2015

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PARCC Assessments

- A mix of item types – short answer, longer open response and performance-based – in addition to richer multiple choice items that:

  - Better reflect the sophisticated knowledge and skills found in the English and math Common Core State Standards and

  - Will encourage teachers to focus on helping each student develop a deep understanding of the subject matter, rather than just narrowing their instruction in order to "teach to the test"

- Testing at key points throughout the year to give teachers, parents and students better information about whether students are "on track" or need some additional support in particular areas

- **Recent design revisions, based on feedback from the PARCC states, rather than 4 "through-course" assessments; will create 2 summative assessments that could be used for accountability purposes as well as 2 optional assessment components – more formative.   Draft materials available for review.**

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Taking your CCSS Pulse

- District level awareness AND plan
- Building level awareness and PLAN
- Teachers
  - Standards
  - Content; related language
- Materials
- Professional Development
- PARCC - awareness of plan

Pulse rate?

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Implementation Resources…

- Progressions

- Illustrative Mathematics Project

- *Institute for Mathematics and Education – University of Arizona; Bill McCallum*

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Resources - Coming

- Articulating Research Ideas that Support the Implementation of the Professional Development Needed for Making the CCSS Reality – Karen Marrongelle, Peg Smith, Paola Sztajn – forthcoming report.

- COMAP – Curriculum and Assessment and the CCSS – on COMAP site.

- Development of a Research Agenda for Understanding the Influence of the Common Core State Standards in Mathematics – Horizon Research forthcoming, check Horizon site.

- Mathematics Curricular Analysis Tool – Bill Bush, University of Louisville, posted on McCallum's site and the CCSS site.

- Math Forum – October 2-4, 2011 – CCSS and Teacher Education and Professional Development – Reston, VA

- MANY NCTM publications and opportunities – stay tuned and visit this very robust website regularly (existing "stuff" Curriculum Focal Points Grade and Grade Band Books, Essentials, and lots more).

- *NCTM, NCSM, AMTE, ASSM, CCSSO, PARC, SBAC – CCSS Coalition – look for*

What are your steps toward transition and implementation?

Reminder

- No set of standards has much meaning without equitable resources to ensure that teachers are trained well enough to reach kids who live in widely different circumstances.

- …it is important to remember that neither these standards nor any other single effort will be the silver bullet some mistakenly believe is out there…

Valerie Strauss, June 7, 2010