The Common Core State Standards for Mathematics (CCSSM)
CT Standards for Mathematics

Implications for Curriculum and Instruction

October 2011

Overview

- The Mathematics CCSS are CT Standards
- The Standards are rigorous, coherent and focused
- The Standards require a paradigm shift in instruction
- The Standards are not curriculum
- Revised curriculum should be implemented by 2013-14
- Effective implementation requires effective, focused PD

Common Core Standards and Connecticut's Education Reform Agenda

The CCSS, adopted by the State Board on July 7, 2010,

- are internationally benchmarked
- prepare all students to succeed in a global economy
- support the State Board's 5-Year Plan
- support Connecticut's Secondary School Reform (P.A.10-111)

The New CT Standards for Mathematics

- The Standards are rigorous, coherent and focused
  - Teach more of less
- The Standards require a paradigm shift in instruction
  - Teach more of less well enough for students to learn and be able to apply
- The Mathematics Standards are comprised of **content standards** and **standards for mathematical practice**

Standards for Mathematical Practice

- The K-12 Standards for Mathematical Practice (SMP) describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

  - Teachers' role
  - Students' role

- These practices are not new, they rest on important "processes and proficiencies" with longstanding importance in mathematics education.

- SMP will be assessed.

Standards for Mathematical Practice

- The SMP are located in the front of the mathematics standards and within the "nature of mathematics" section at each grade level.

- The SMP illustrate the connection between 21st century skills and mathematical content and instruction.

- The SMP should be considered when creating curricula, assessments, and professional development for teachers, and administrators.

Grouping the practice standards

1. Make sense of problems and persevere in solving them
6. Attend to precision

2. Reason abstractly and quantitatively

3. Construct viable arguments and critique the reasoning of others

Reasoning and explaining

4. Model with mathematics

5. Use appropriate tools strategically

Modeling and using tools

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.

Seeing structure and generalizing

Organization of the Standards

Practice Standards
- Based on NCTM Process Standards & and National Research Council.

⇦ Mathematics Standards ⇨

Content Standards
- Concepts and skills by grade level & **domain** or conceptual categories.

The variety of:
Processes, proficiencies and expertise students should develop

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Practice Standards- Present throughout Content Standards. The "flexible thinking work".

→

UNDERSTAND

←

Content Standards- Clear & specific. Cannot be met without the engagement of Practice Standards.

UNDERSTAND (~~know~~) **and be able to do**

- A balanced combination of procedures & understanding
- Students who lack deep understanding of concepts:
  - Rely too heavily on procedures
  - Lack the foundation to do the "flexible" thinking needed in the mathematical processes (Practice Standards)

Key Points about the Content Standards

- The standards stress not only procedural skill but also conceptual understanding, to make sure students are learning and absorbing the critical information they need to succeed at higher levels rather than the current practices by which many students learn enough to get by on the next test, but forget it shortly thereafter, only to review again the following year.

- The K-5 standards provide students with a *solid foundation in whole numbers, addition, subtraction, multiplication, division, fractions and decimals--which help young students build the foundation to successfully apply more demanding math concepts and procedures, and move into applications.*

Key Points about the Content Standards

- The middle school standards are robust and provide a coherent and rich *preparation for high school mathematics. Students who have completed 7th grade and mastered the content and skills through the 7th grade will be well-prepared for algebra in grade 8.*

www.corestandards.org

K-8 Content Standards by Domain

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

Key Points about the Content Standards

- The high school standards set a *rigorous definition of college and career readiness, by helping students develop a depth of understanding and ability to apply mathematics to novel situations, as college students and employees regularly do.*

- The high school standards *emphasize mathematical modeling, the use of mathematics and statistics to analyze empirical situations,*

- The high school standards call on students to *practice applying mathematical ways of thinking to real world issues and challenges; they prepare students to think and reason mathematically.*

www.corestandards.org

Common Core State Standards
K-12 Mathematics Learning Progressions

Kindergarten	1	2	3	4	5	6	7	8	HS
Counting and Cardinality									Number and Quantity
Number and Operations in Base Ten						The Number System			
			Number and Operations: Fractions			Ratios and Proportional Relationships (6 and 7)			
Operations and Algebraic Thinking						Expressions and Equations			Algebra
								Functions	Functions
Geometry						Geometry			Geometry
Measurement and Data						Statistics and Probability			Statistics And Probability

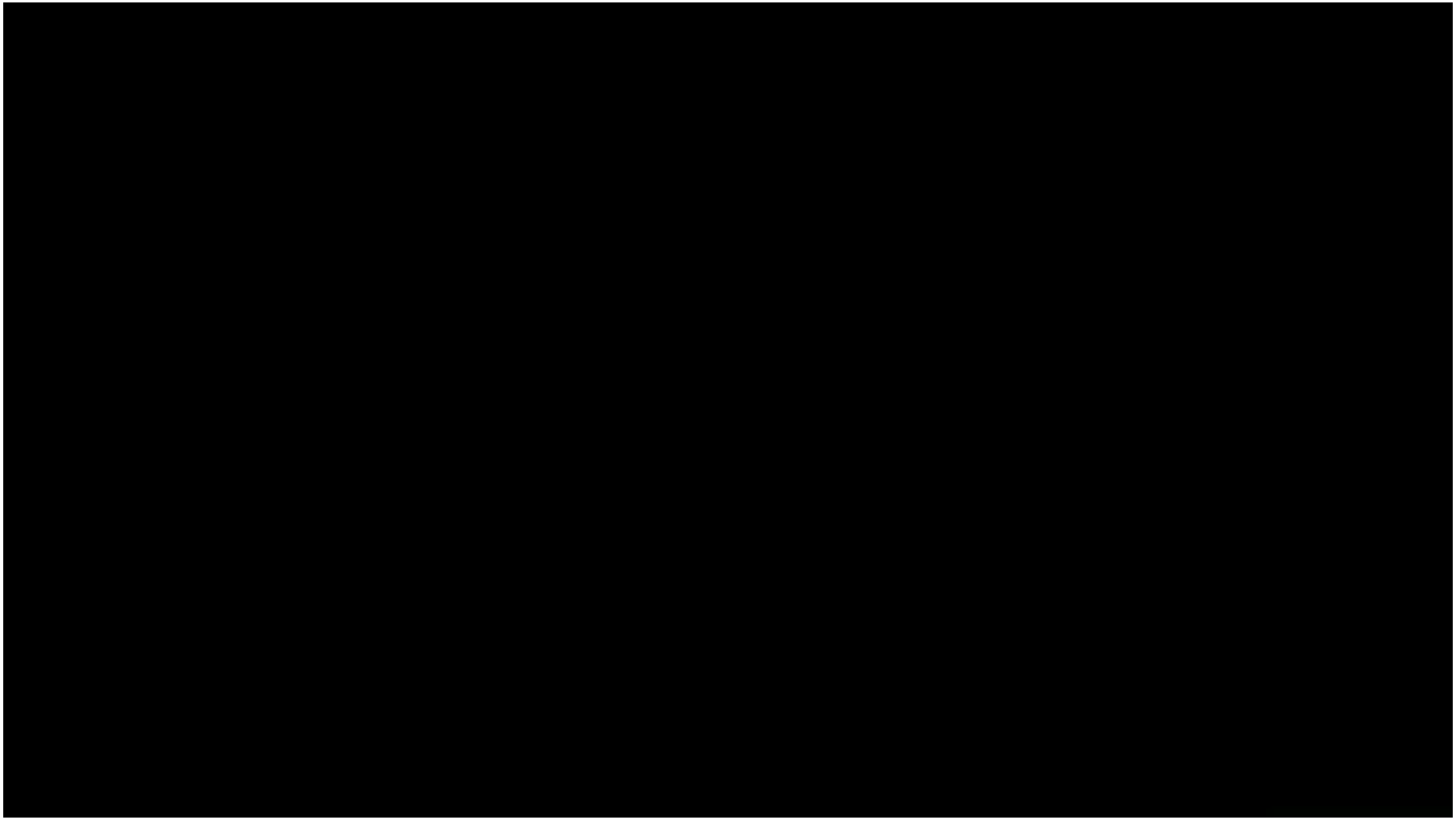
http://education.ohio.gov/GD/Templates/Pages/ODE/ODEDetail.aspx?page=3&TopicRelationID=1704&ContentID=83475&Content=102764

Implications for Instruction

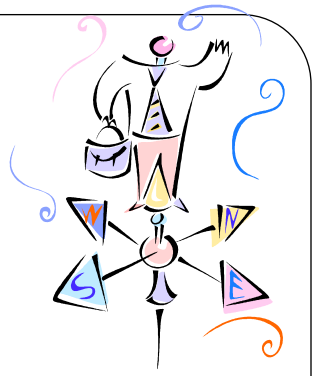
Changes in Practice

Changes in Focus

Changes in Emphasis



Paradigm Shift



"If you try to introduce people to a paradigm shift, **they will hear what you have to say and then interpret your words** in terms of their old paradigm. What does not fit, they will not hear.

Therefore, **a change in paradigm cannot be brought about by talking**. **People have to experience the change, or at a minimum see other people experiencing it,** before they will begin to understand what you are saying."

(Myron Tribus - 2001)

Shifting Mathematics Standards

Probability: Not mentioned until 7th grade, previously began in K. It appears briefly in grade 6, but the focus on actual probability is not until grade 7 because it is important to understand fractions and percents prior to teaching probability.

Money: Not mentioned until 2nd grade, previously began in K. The focus is instead on building number concepts and skills (such as skip counting) in K and 1st grade as a foundation for money in 2nd.

Fractions: Concentrated in a three grades: 3rd – 5th. Relies on a solid foundation in whole numbers rather than teaching the two in tandem as we have done in the past.

Patterns: De-emphasized in favor of a stronger foundation in place value & number.

Concepts are focused and do not recur unless in a new context. The goal is to commit more time to mastering a concept and less time to re-teaching.

Critical Areas of Focus

Each grade level section of the Common Core contains **Critical Areas of Focus**

A description of the key areas where instruction & learning time should be focused.

Mathematics | Kindergarten

In Kindergarten, instructional time should focus on two critical areas: (1) representing, relating, and operating on whole numbers, initially with sets of objects; (2) describing shapes and space. More learning time in Kindergarten should be devoted to number than to other topics.

(1) Students use numbers, including written numerals, to represent quantities and to solve quantitative problems, such as counting objects in a set; counting out a given number of objects; comparing sets or numerals; and modeling simple joining and separating situations with sets of objects, or eventually with equations such as 5 + 2 = 7 and 7 – 2 = 5. (Kindergarten students should see addition and subtraction equations, and student writing of equations in kindergarten is encouraged, but it is not required.) Students choose, combine, and apply effective strategies for answering quantitative questions, including quickly recognizing the cardinalities of small sets of objects, counting and producing sets of given sizes, counting the number of objects in combined sets, or counting the number of objects that remain in a set after some are taken away.

(2) Students describe their physical world using geometric ideas (e.g., shape, orientation, spatial relations) and vocabulary. They identify, name, and describe basic two-dimensional shapes, such as squares, triangles, circles, rectangles, and hexagons, presented in a variety of ways (e.g., with different sizes and orientations), as well as three-dimensional shapes such as cubes, cones, cylinders, and spheres. They use basic shapes and spatial reasoning to model objects in their environment and to construct more complex shapes.

Mathematics

- FOCUS
- FOCUS
- FOCUS
- Coherence
- Fluency
- Deep Understanding
- Application

Priorities in Mathematics

Grade	Priorities in Support of Rich Instruction and Expectations of Fluency and Conceptual Understanding
K–2	Addition and subtraction, measurement using whole number quantities
3–5	Multiplication and division of whole numbers and fractions
6	Ratios and proportional reasoning; early expressions and equations
7	Ratios and proportional reasoning; arithmetic of rational numbers
8	Linear algebra

http://commoncoretools.wordpress.com/

Key Fluencies

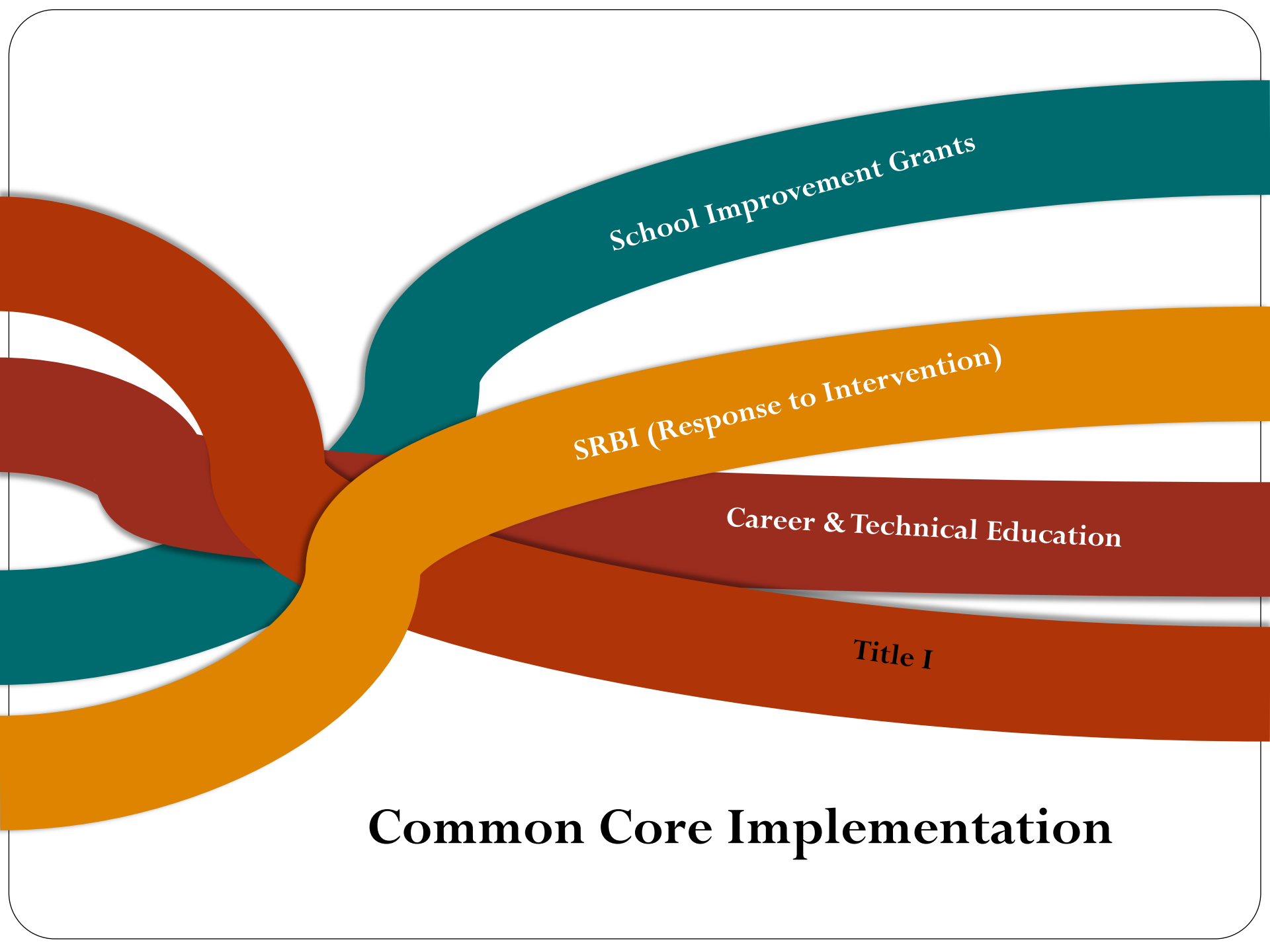
Grade	Required Fluency
K	Add/subtract within 5
1	Add/subtract within 10
2	Add/subtract within 20 Add/subtract within 100 (pencil and paper)
3	Multiply/divide within 100 Add/subtract within 1000
4	Add/subtract within 1,000,000
5	Multi-digit multiplication
6	Multi-digit division Multi-digit decimal operations
7	Solve $px + q = r$, $p(x + q) = r$
8	Solve simple 2×2 systems by inspection

http://commoncoretools.wordpress.com/

Implications for Implementation

Connections to other initiatives and practice

Transition timeline



Common Core Implementation

Professional Learning

Common Core State Standards

Curriculum and Instruction Materials

Data Systems

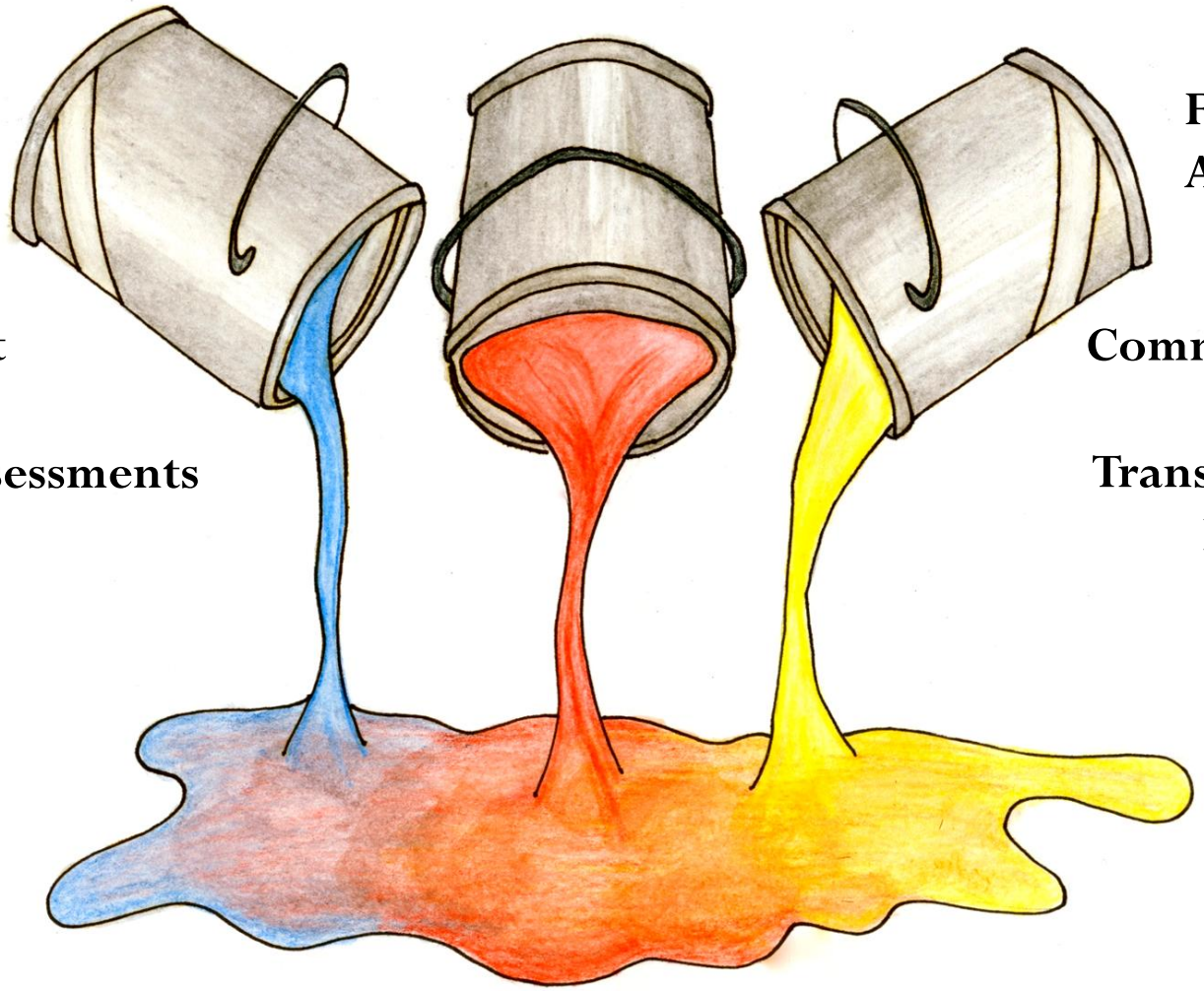
Formative Assessment

School Improvement

Communication

Assessments

Transition Plans



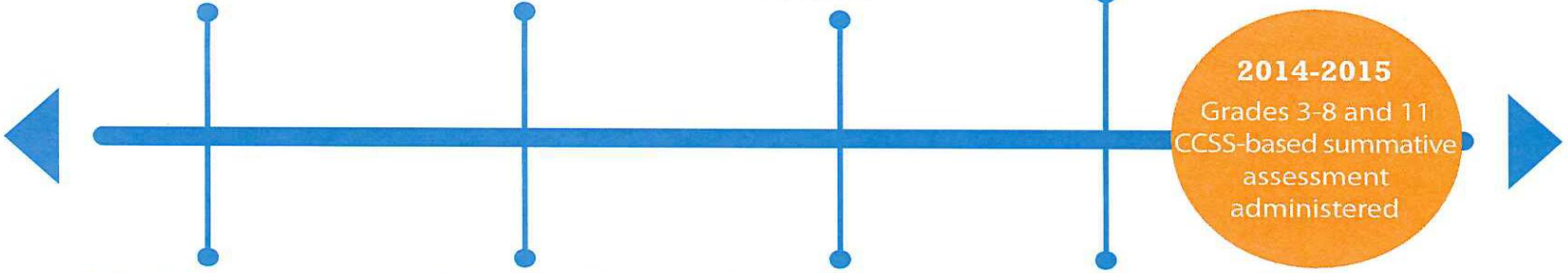
Graphics by Stacy Goodman,
Provided by Dean Fixsen and West Wind Education Policy Inc.

DISTRICT IMPLEMENTATION GUIDE

(Use blue arrows to navigate timeline)

ASSESSMENT

- Created governance structure and established Technical Advisory Committee and 10 Work Groups
- Develop formative tools to support states in implementation of CCSS and specifcations for summative and interim assessments
- Develop items for summative and interim assessments and make pool of interim items available to states
- Complete pilot-testing of summative items



Fall 2010

- Crosswalks illustrate correlation among Connecticut standards, CCSS, CMT and CAPT

Winter & Spring 2011

- Curriculum frames provide districts a foundation to design K-12 Mathematics and English Language Arts curriculum based on *Rigorous Curriculum Design* model

Summer 2011

- K-12 district curriculum revisions begin and continue throughout school year

School year 2011-2012

- Districts begin to implement CCSS-based curriculum for selected levels and courses

- K-12 district curriculum revisions continue throughout school year
- Districts continue CCSS-based curriculum implementation for selected levels and courses

- K-12 district curricula based on CCSS fully implemented

CURRICULUM

Considerations for Districts

- 2011-12- eighth graders will take 2014 CAPT and 2015 CCSS assessment
- 2011-12 kindergarteners will never take the CMT
- 2013-14- K-12 district curriculum should be fully implemented
- 2014-15- CCSS- based assessments administered in grades 3-8 and 11

Considerations for Districts

- Districts need to compare current curriculum to CCSS.
- Much will stay the same.
- Some CCSS concepts/skills will need to be added, and some current standards moved to a different grade.
- Current instructional materials will need to be supplemented, enhanced or moved to a different grade.

Next Steps for Districts

- Use the Crosswalks! www.sde.ct.gov
  - Become familiar w/standards content
  - Examine district curriculum
  - Make decisions about test correlation
- Balance of literature and literary non-fiction (K-5)
- Literacy as part of science and social studies/history; informational text as part of ELA (6-12)
- Work on intentional inclusion of the CCSS Standards for Mathematical Practice at **every** grade **level**.

CT Mathematics Crosswalk

CCSS	CT Standard Match	CT Assessment	Notes
GRADE 1			
OPERATIONS and ALGEBRAIC THINKING			
Represent and solve problems involving addition and subtraction.			
CC.1.OA.1 Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.	**CT.1.1.2.5** Model real-life situations that represent the result of counting, combining and separation of sets of objects (addition and subtraction of whole numbers) with objects, pictures, symbols and open sentences. **CT.1.1.3.6** Demonstrate understanding of equivalence or balance with objects, models, diagrams, operations or numbers, e.g., using a balance scale, or an arm balance showing the same amount on both sides. **CT.1.2.2.13** Create problems and write one- and two-digit number sentences that reflect contextual situations and real world experiences. Solve the problems using a variety of methods including models, pictures, pencil and paper, estimation and mental computation, and describe the reasoning or strategies used. For example: Tell a story or draw a picture for a problem that. **CT.1.2.2.14** Solve contextual problems using all addition sums to 18 and subtraction differences from 10 with flexibility and fluency.	**CMT Strand 5: Models for Operations** **CMT3.5C** Write story problems from addition or subtraction number sentences. **CMT Strand 6: Basic Facts** **CMT3.6A** Add and subtract facts to 18. **CMT Strand 9: Solve Word Problems** **CMT 3.9A** Solve simple story problems involving addition (with/without regrouping) or subtraction (without regrouping). **CMT 3.9B** Solve simple story problems involving addition (with/without regrouping) or subtraction (without regrouping) with extraneous information.	CT standards and CCSS address open number sentences involving addition and subtraction of whole numbers. CCSS emphasize understanding the operations of addition and subtraction within 20, including unknowns in all positions. CT standards support the flexible and fluent use of addition to 18 and subtraction from 10, in addition to representing the operations in contextual situations.

	Grade 8 Domains	Grade 8 Units
2011-2012	•Expressions and Equations	Unit 1: Real Numbers Unit 3: Linear Relationships Unit 4: Systems of Linear Relationships
2012-2013	•Expressions and Equations •Functions •The Number System	Unit 1: Real Numbers Unit 3: Linear Relationships Unit 4: Systems of Linear Relationships
2013-2014	•Expressions and Equations •Functions •The Number System •Geometry	Unit 1: Real Numbers Unit 2: Pythagorean Theorem Unit 3: Linear Relationships Unit 4: Systems of Linear Relationships Unit 5: Congruence and Similarity Unit 6: Volume

Displaced Grade-Level Concepts (Former CT Grade 8 content that is no longer in Grade 8 under the CCSS)

•Recursive and explicit formulas
•Equivalent forms of fractions, mixed numbers, decimals and percent
•Computation with numbers and operations (Should be done in the context of Expressions and Equations in Grade 8)
•Percent
•Exponential growth and decay
•Surface area
•Data representations (limited to scatterplots in Grade 8 CCSS)
•Sampling for statistical analyses
•Permutations and combinations

Mathematics Unit Templates

- Standards for Mathematical Practice
  - Highlighted to indicate opportunities for emphasis
- Prioritized and Supporting Standards
  - Organized by units with pacing guidance
  - Includes explanations and examples of the meaning
- Concepts and Skills
  - Unwrapped from the standards and aligned with Bloom's Taxonomy
- Sample assessments

http://www.sde.ct.gov/sde/cwp/view.asp?a=2710&Q=333538

Pictures of the Learning : Assessment Connection

http://www.sde.ct.gov/sde/cwp/view.asp?a=2618&q=322592

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