Transitioning to the New 2011 Massachusetts Curriculum Frameworks in Mathematics

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Presentation Overview

2011 Mathematics Curriculum Frameworks Incorporating the Common Core State Standards

- Development & Adoption
- Intent and Key Features
- Implementation Timeline
- Practices Activity



Purpose of the Standards

"These Standards are not intended to be new names for old ways of doing business. They are a call to take the next step. It is time for states to work together to build on lessons learned from two decades of standards based reforms."

> -2011Massachusetts Curriculum Framework for Mathematics (page 14) -Common Core State Standards for Mathematics (page 5)



Development and Adoption of the New Curriculum Frameworks Incorporating the Common Core Standards

Spring 2009	Summer 09-Spring 10	July 2010	Fall 2010	December 2010
 Governor and Commissioner sign MOU 	• ESE Staff & Local Educators Provide Feedback to Drafts	• ESE & MBAE Studies	• ESE/EEC Identify Additional Standards	BESE Adopts New Frameworks Incorporating CCSS
• Development Begins	• Final Version of CCSS completed June 2010	• BESE Adopts CCSS, with Option for Additions	• Public Comment Solicited on Additions	BEEC Adopts Pre-K Standards
Massachusetts E	Department of			

Evidence Base for the Standards

- Standards from high-performing countries, leading states, and nationally-regarded frameworks, such as the American Diploma Project and NCTM Math Focal Points
- National Assessment of Educational Progress (NAEP) Frameworks, international assessments (e.g., TIMSS and PISA) and longitudinal NAEP, SAT, and ACT scores
- Documents including National Mathematics Advisory Panel Report, National Academy's Adding It Up (see list in the framework)



International Comparison

In what ways do the curricula of the top-achieving countries exhibit coherence?

FIGURE 1

A+ Composite: Mathematics topics intended at each grade by at least two-thirds of A+ countries.

Note that topics are introduced and sustained in a coherent fashion, producing a clear upper-triangular structure.

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FIGURE 2

State Composite: Mathematics topics intended at each grade by at least two-thirds of 21 U.S. states.

Note that topics are introduced and sustained in a way that produces no visible structure.

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	to complete a typical curriculum at each gr	rade level	8	8	7	8	8	5	6	6

Key Features New Mathematics Framework

The new standards support improved curriculum and instruction due to increased:

- FOCUS, via critical areas at each grade level
- **COHERENCE**, through carefully developed connections within and across grades
- **CLARITY**, with precisely worded standards that cannot be treated as a checklist
- RIGOR, including a focus on College and Career Readiness and Standards for Mathematical Practice throughout Pre-K-12



Adding MA Standards to the K-12 Common Core State Standards

- MA added preKindergarten standards
- About 4% additional standards in K-12:
 - 13 K-8 additions
 - No additions in Kindergarten, grade 3 or grade 8
 - One addition in grade 4 and grade 5
 - Two additions in grade 1, grade 2, and grade 7
 - Five additions in grade 6
 - 9 high school additional standards
 - Included in conceptual categories: Number and Quantity, Algebra, Functions, and Geometry



Tour the 2011 Mathematics Curriculum Framework



2011 MA Curriculum Framework for Mathematics Organization

- Introduction (pg.7)
- Guiding Principles for Mathematics Programs (pg.9)
- Standards for Mathematical Practice (pg.15)
- Pre-K to 8 Grade-level standards (pg.18-65)
 - Grade-level Introduction highlighting critical areas
 - Grade-level Overview of the domains and clusters
- High School Standards: Conceptual Categories (pg.66-93)
- High School Model Pathways and Courses (pg.94-151)
- Appendices (pg.152-155)
- Sample of work consulted (pg.156-159)
- Glossary (pg.160-167)



(8) K-12 Standards for Mathematical Practice

"Expertise" for students at <u>all</u> grade levels:

- 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



Organized by Domains Rather than Strands

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

High School Standards

- Conceptual Categories
 - Cross course boundaries
 - Span high school years
- Standards
 - "Core" for common mathematics curriculum for <u>all</u> students to be <u>College and Career Ready</u>
 - "<u>College Ready</u>" for entry level credit bearing course
 - "<u>Career Ready</u>" to qualify for post-secondary training in one's chosen field
 - (+) Additional mathematics that students should learn in order to take courses such as calculus, discrete mathematics, or advanced statistics.



High School Organization: Conceptual Categories

- Number and Quantity (N)
- Algebra (A)
- Functions (F)
- Geometry (G)
- Modeling (★)
- Statistics and Probability (S)



Format

- Introduction
 - PK-8 outlines critical areas for each grade
 - Conceptual Category narrative of that category
 - Model course outlines the critical areas for each model course
- Overview
 - All Overviews include the domains and clusters for the grade, conceptual category or model course
- Standards
 - Presented by Domain and Cluster



Format of High School Standards Conceptual

Domain

Algebra

Seeing Structure in Expressions

Interpret the structure of expressions.

Interpret expressions that represent a quantity in terms of its context. 1.

Categor

a. Interpret parts of an expression, such as terms, factors, and coefficients.

b. Interpret complicated expressions by viewing one or more of their parts as a single the product of P and a factor not depending on P.

2. Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.

Cluster Heading

Write expressions in equivalent forms to solve problems.

- Choose and produce an equivalent form of an expression to reveal and explain properties of the quant 3. expression.
 - a. Factor a quadratic expression to reveal the zeros of the function it defines.
 - Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. b.

c. Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.

Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve 4. problems. For example, calculate mortgage payments.



Modeling Symbol



Code

Standard A-SSE.2

16

A-SSE

Model High School Pathways

- Two model course pathways
- Traditional:
 - ✓Algebra I, Geometry, Algebra II
- Integrated:
 - ✓ Mathematics I, Mathematics II, Mathematics III
- Additional courses:
 ✓Precalculus, Advanced Quantitative Reasoning



Standards for Mathematical Practice bring Rigor to the New Standards





Applying the Standards for Mathematical Practice

- Open the Massachusetts Curriculum Framework for Mathematics to the Standards for Mathematical Practice (page 15)
- Read Standard 7 and underline key words and phrases that help to explain the standard
- Turn and talk
- While you watch the video clip, use the transcript to note when you see evidence of standard 7 (www.insidemathematics.com: Quadratic Functions: Problem 1, Part D)

Turn and talk



Focus	Coherence	Clarity	Rigor
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General Discussion

- Do you see these Standards for Mathematical Practice as having an impact on your teaching?
- How can you see them being applied from preKindergarten through grade 12?



Focus	Coherence	Clarity	Rigor

Exploration Activities Posted

- Explore **FOCUS** by Examining the Critical Areas in Mathematics:
 - Participants organize standards by Critical Areas and discuss connections in order to understand how the new standards provide greater focus at each grade level. (PK-12)
- Explore **COHERENCE** by Tracing Domain and Cluster Progressions:
 - Participants explore domains and clusters to see how the new standards connect concepts within and across grades as the basis of a coherent curriculum. (PK-8)
- Explore **CLARITY** by Comparing the New and Former MA Mathematics Standards:
 - Participants use the crosswalk documents to compare the standards in the former and new Framework and consider how the increased clarity of the new standards may impact teaching and learning. (PK-12)
- Explore **RIGOR** by Connecting the Standards for Mathematical Practice to the Content Standards:
 - Participants examine content standards to see how they connect with the Standards for Mathematical Practice and how in tandem they form the basis of a rigorous curriculum. (PK-12)



Some National Projects Underway....

- PARCC Model Content Framework project
 - Scope and Sequence for each grade
 - Narratives to help unwrap the standards
- National Council for Supervisors of Mathematics
 - Illustrating the standards for mathematical practice PD materials
- Gates Foundation, (<u>http://illustrativemathematics.org/</u>) led by the original standards writers
 - Illustrative Mathematics Project will produce a complete set of sample problems and tasks illustrating the standards.
- CCSSO, Bill Bush



Transitioning Curriculum and Instruction to the New Frameworks



Timeline for Preschools, Districts, Colleges and Universities

2010-2011	2011-2012	2012-2013
Initial Planning	Partial Implementation	Near Full Implementation
Build awareness and identify what needs to change and how it will be changed	Continue planning and make changes in targeted grades, subjects, and courses	Implement balance of changes



ESE and Readiness Center Help

2010-2011 Initial Planning	2011-2012 Partial Implementation	2012-2013 Near Full Implementation
 Orientations Crosswalks Modules RTTT \$\$\$ Targeted support 	 Model Curriculum PD courses RTTT \$\$\$ Targeted support 	 Model Curriculum Formative Assessment System PD courses RTTT \$\$\$ Targeted support



Transitioning Grades 3-8* MCAS

Objectives: (1) Fairness (2) Maintain Trendline

2010-2011	2011-2012	2012-2013
Initial	Partial	Near Full
Planning	Implementation	Implementation
<mark>MCAS</mark> No changes - based on <i>former</i> Frameworks	MCAS Focus on standards <u>common</u> to <u>former</u> and <u>new</u> Frameworks Will also assess <u>selected</u> standards from the <u>former</u> Frameworks not included in the <u>new</u> Frameworks**	MCAS Focus on standards <u>common</u> to <u>former</u> and <u>new</u> Frameworks Will also assess <u>selected</u> standards from <u>new</u> Frameworks not included in <u>former</u> Frameworks**

* The transition plan for grade 10 is being determined. ** www.doe.mass.edu/MCAS/transition



Looking Ahead

- Preschools, districts and educator preparation programs should have curriculum and instruction *fully* aligned to the new frameworks by the beginning of the 2013-2014 school year
- MCAS in grades 3-8 will be based exclusively on the new frameworks in spring 2014
- Pending its successful development, Massachusetts will transition to PARCC for ELA and math in 2014-2015
- Similar standards development process for science and engineering, with standards expected in mid-2012 and a transition period to follow
- Standards for English Language Learners, Comprehensive Health, History and Social Science, the Arts, and Foreign Languages will be added to the revision cycle



Continuing Updates

- The 2011 Frameworks and crosswalks are available at <u>http://www.doe.mass.edu/candi/commoncore</u>
- Please check this site regularly for additional resources and updates on professional development.

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