

















• "... states who adopt the Common Core State Standards (CCSS) are expected to adopt them in their entirety. While states will not be considered to have adopted the common core if any individual standard is left out, states are allowed to *augment* the standards with an additional 15% of content that a state feels is imperative." (http://www.achieve.org/files/15PercentGuideline.pdf)





| | | l |
|----------------------|---------------------------------------------------|---|
| 35 states – no n | nodification | |
| 10 states – som | e modification | |
| K-8 | High School | |
| | night school | |
| | Alabama (65 stds added) | |
| izona (4 stds added) | Alabama (65 stds added) Arizona (4 stds added) | |

С Colorado (many word changes)

lowa (2 stds added) Kansas (Patterning, Prob&Stat statement) Maryland (Essential Skills added) Maryland (Essential Skills added) Massachusetts (13 stds added)

New York (2 stds added)

| High School |
|-----------------------------------------------|
| Alabama (65 stds added) |
| Arizona (4 stds added) |
| California (29 changes) |
| Colorado (word changes) |
| owa (8 stds added) |
| Kansas (Patterning, Prob & Stat statement) |
| |

Massachusetts (10 stds added) North Dakota (modified format) North Dakota (modified format)

Example of "augmentation" Maryland - "Essential Skills and Knowledge" statements added through the document to clarify standards

- o CCSS: 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. into
- MD Essential Skills and Knowledge (added below this

- standard): Knowledge of the relationship between the number of equal shares and the size of the share Knowledge of equal shares of circles and rectangles divided into or partitioned into halves, thirds, and fourths Knowledge that, for example, the fraction 14 is formed by 1 part of a whole which is divided into 4 equal parts Knowledge that, for example, the fraction 34 is the same as 14 14 + 1/4 (3 parts of the whole when divided into fourths)

Example of "augmentation" California - Added, moved or modified language of the standards

- Add Gr. K: Demonstrate an understanding of concepts time (e.g., morning, afternoon, evening, today, yesterday, tomorrow, week, year) and tools that measure time (e.g., clock, calendar).
- o Move: Gr. 7 6: Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.
- Modify: HS Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials, and divide polynomials by monomials. Solve problems in and out of context.

State Initiatives to Support Implementation of CCSSM

- Developed "crosswalk" summary, comparing state standards and CCSSM
- Developed "bridging" documents, including timeline for transition to CCSSM.
- · Collaborating on common assessments. · Disseminating information, organizing
- professional development activities.



Implementation 2011-2012 • Standards for Mathematical Content: Grade K: AZ, IN and FL Grades K-2: AR, NV, NH, NJ and OR Grades K-8: MS

- Grades 6 & 9: UT Grades K-12: KY • Standards for Mathematical Practices:
- Grades K-12: IN

How is the K-8 mathematics content as described by the state standards similar to or different from the learning expectations outlined in *CCSSM*?



































Computation with Fractions

- Developmental Trajectory:
- SS: Typically spanned a four grade-level band.
- CCSSM: Two year grade-level span

Mathematical Properties

 Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (-1)(-1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing realworld contexts. (Grade 7)

• Relationships between operations

• Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction. (Grade 3)

Algebra

Algebra primary sub-strands:

- Patterns
- Functions
- Expressions, equations and inequalities (EEI)
- Algebra secondary sub-strands:
- Mathematical Properties
- Relationships between operations



Patterns Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. (Grade 3) Functions

- Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. (Grade 8)
- Expressions, equations and inequalities (EEI)
 Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for. (Grade 6)



Algebra

- CCSSM has decreased the emphasis on Patterning standards across grade-bands
 - o Between 2-3 times fewer patterning standards in CCSSM
- CCSSM has increased the emphasis on Relationships with Operations and Mathematical Properties standards across the K-2 and 3-5 grade-bands.

 - Between 2.5-3.5 times more Relationships with Operations standards

Sample Level 3 GLEs from CCSSM Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes. (Grade 1) Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles. (Grade 5) Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so. (Grade 8)

Geometry

- Geometry GLEs analyzed in comparison to the van Hiele levels of geometric thinking:
 Level 1: student perceives a figure as a whole, recognizable by its visual form, but properties of a figure are not perceived.
 Level 2: student perceives properties of figures, but they are isolated and unrelated.
 Level 2: student understored edipilitant of figures.
 - Level 3: student understands definitions of figures, with relationships being perceived between properties and between figures. 0
 - Level 4: student can construct proofs, understand the role of axioms and definitions, and know the meaning of necessary and sufficient conditions. 0
 - Level 5: student understands the formal aspects of deduction. (Mayberry, 1983, p. 59)

Measurement GLEs analyzed in reference to an adapted framework for 1-, 2-, and 3 dimensional measurement: 1. The child shows awareness of the attribute and its descriptive language. The child compares, orders and matches objects by the attribute. The child chooses/uses non-standard units and tools for estimating and measuring. The child chooses/uses standard units and tools for estimating and measuring.

The child solves a range of problems involving important measurement concepts/skills. (Newton & Kasten, 2011, p. 16)



| Measureme | ent GLEs | |
|----------------------|-----------------|-------|
| Themes | State Standards | CCSSM |
| Attribute awareness | 12% | 27% |
| Compare by attribute | 8% | 5% |
| Non-standard units | 14% | 7% |
| Standard units | 20% | 25% |
| Problem solving | 50% | 66% |
| | | |

















Probability

- Core topics (e.g., identifying sample spaces; computing theoretical probabilities) have been moved to the middle grades (6-8) with the majority in 7th grade
- Some topics related to probability (e.g., using Permutations and Combinations; independence of events) have been moved to the high school (grades 9-12)



Statistics Statistics GLES - GAISE Framework (4 major components) • Formulate Questions • clarify the problem at hand • formulate one (or more) questions that can be answered with data • Collect Data • design a plan to collect appropriate data • employ the plan to collect the data • select appropriate graphical and numerical methods • use these methods to analyze the data • Interpret Results • interpret the analysis

o relate the interpretation to the original question

(Franklin, et al., 2007, p. 11)

Sample Type II GLEs from CCSSM

- Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages. (Grade 6, Formulate Question)
- Summarize numerical data sets in relation to their context, such as by: (d) relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered. (Grade 6, Collect Data, Analyze Data)

Discussion of Critical Differences between State Standards and *CCSSM*

- Mathematical content will shift to earlier or later grade levels
 - Earlier: Fraction computation
 - Later: Statistics and Probability
- Developmental trajectory of particular content will be altered.
 - Expanded number of grade levels: Whole number computation
 - Contracted Trajectory: Probability

Implications—What should teachers look for in Textbooks Not all states have adopted *CCSSM*Greater consensus across states should lead to strongly aligned curriculum materials. How was the textbook created? Developing conceptually-oriented textbook series requires piloting and revising which takes time. Do textbooks contain higher-order thinking problems?

Discussion of differences continued

- Within specific grade levels or grade bands content will be given an increased or decreased emphasis
 - Increased emphasis: Probability in grade 7
 Decreased emphasis: Patterns in K-5
- Increase in reasoning in CCSSM in certain content strands
 - Geometry
- Statistics

Questions?

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Implications--Teachers

- Shift in grade level content will require teachers to modify *how, what* and *when* they teach content.
- Teachers should prepare to teach mathematics with greater depth and understanding at their grade-level.
- New assessments may differ from previous examples of state-mandated assessments.