



Parent Education Night Common Core Math

Implementation of Common Core Math:
Traditional and Integrated Courses for Secondary
Mathematics

January 7, 2015

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A Shift from the CA State Standards to the Common Core Content and Practice Standards

- With the implementation of the CCSS, over the course of the next several years, teachers will shift their teaching practices and curriculum.
- Students will focus on fewer math concepts and principles, and will be expected to develop greater mastery and conceptual understanding of each.
- There will be greater emphasis on understanding the connections among different math concepts, within and between grade levels.

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A Shift in Focus

- **Greater focus on fewer topics**
- The Common Core calls for greater focus in mathematics.
- Rather than racing to cover many topics in a mile-wide, inch-deep curriculum, the standards ask math teachers to significantly narrow and deepen the way time and energy are spent in the classroom.
- This focus will help students gain strong foundations, including a solid understanding of concepts, a high degree of procedural skill and fluency, and the ability to apply the math they know to solve problems inside and outside the classroom.

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A Shift in Coherence

- **Coherence: Linking topics and thinking across grades**
- Mathematics is not a list of disconnected topics, tricks, or mnemonics; it is a coherent body of knowledge made up of interconnected concepts. Therefore, the standards are designed around coherent progressions from grade to grade.
- Learning is carefully connected across grades so that students can build new understanding onto foundations built in previous years. Each standard is not a new event, but an extension of previous learning.

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A Shift in Rigor

- **Rigor: Pursue conceptual understanding, procedural skills and fluency, and application with equal intensity**
- Rigor refers to deep, authentic command of mathematical concepts, not making math harder or introducing topics at earlier grades.
 - *Conceptual understanding:* Students must be able to access concepts from a number of perspectives in order to see math as more than a set of mnemonics or discrete procedures.
 - *Procedural skills and fluency:* The standards call for speed and accuracy in calculation.
 - *Application:* The standards call for students to use math in situations that require mathematical knowledge.

+ New Courses for 2014-15

- In the spring of 2014, the PUSD Board of Education adopted three new courses:
 - Common Core 6 Math
 - Common Core 7 Math
 - Common Core 8 Math

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- PUSD developed the Math Task Force (parents, students, teachers, and administrators).
- We are charged by the PUSD Board of Education to research, review, and recommend PUSD Math Pathways to the Superintendent and the Board of Education for consideration and implementation in 2015-16.
 - Compression opportunity at PMS
 - Compression opportunity at PHS/MHS
 - Pathway to AP Calculus AB & BC
 - Multiple entry compression entry points

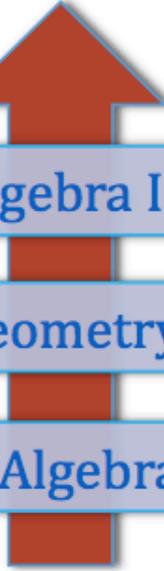
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- Although the CCSS have been adopted by the State of California, and each school district in the State is working toward implementation, individual school districts have discretion over certain aspects of implementation.
- For example, each district has discretion to follow either a “traditional” or “integrated” model for teaching algebra and geometry.

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- The **traditional approach** reflects a higher mathematics model typically seen in the U.S. This model consists of two algebra courses and a model geometry course. All three courses include statistics and probability standards.
- The **integrated approach** is typically seen internationally and consists of a sequence of three model courses, each of which includes algebra, geometry and statistics standards.
- Students enrolled in either pathway should arrive at **the same point** by the end of their third year of higher mathematics instruction.

Courses in higher level mathematics:
Pre-calculus, AP Calculus, AP Statistics, or courses designed for
career technical programs of study.



Algebra II

Geometry

HS Algebra I

TRADITIONAL Naming Pathway
(Typical *in* U.S.)

2 Algebra courses, 1 Geometry
course, with Probability and
Statistics interwoven



Mathematics III

Mathematics II

Mathematics I

INTEGRATED Naming Pathway
(Typical *outside* of U.S.)

3 courses that attend to Algebra,
Geometry, and Probability and
Statistics each year

+ Why are there two approaches?

- The Common Core Mathematics Standards are grouped by conceptual category – not by course – to allow for two approaches.
- The Standards were written with this flexibility in mind so states and districts could implement the approach best suited to their goals for mathematics education. California allows districts to choose which approach to implement.

+ What is an Integrated Approach?

- It's a sequence of three model courses, each of which includes algebra, geometry and statistics standards.
- In the real world, problems do not come in a box labeled "Algebra" or "Geometry." By using an "integrated" approach, students can decide what skills to call upon to solve a particular problem--no matter what the content area.
- Students can use their skills in algebra, geometry and statistics, depending on their analysis and approach to solving a problem.

+ What is the **same** between the two approaches?

- All three courses in both approaches include the same content standards.
- Across the three courses, students in the traditional pathway will study the same content as students in the integrated pathway.
- In other words, they have the same entry and exit point. Additionally, there is attention to the Standards for Mathematical Practice and an emphasis on mathematical modeling in both approaches.

+ What is **different** about the two approaches?

- The difference in the two pathways is how the standards are organized into the three courses.
- For example, in the traditional pathway, the geometry conceptual category is its own course.
- In the integrated pathway, there are geometry standards present in all three courses. The integrated pathway intends for connections across all conceptual categories to be made, as standards from all conceptual categories are present in each of the three courses. By doing so, the coherence of studying mathematics across the various domains in K-8 is preserved.



Traditional Approach K-12:

K	1	2	3	4	5	6	7	8	Algebra I	Geometry	Algebra II
Counting & Cardinality											
Number and Operations in Base Ten						Ratios and Proportional Relationships			Number and Quantity		Number and Quantity
			Number and Operations in Fractions			The Number System					
Operations and Algebraic Thinking						Expressions and Equations			Algebra		Algebra
									Functions		Functions
Geometry										Geometry	*
Measurement and Data						Statistics and Probability			Statistics and Probability		Statistics and Probability

+ Traditional Approach: Secondary Levels

Traditional Pathway

Course	Algebra I	Geometry	Algebra II
Conceptual Category	Number and Quantity		Number and Quantity
	Algebra		Algebra
	Functions		Functions
		Geometry	*
	Statistics and Probability		Statistics and Probability

*G-GPE.A.2 is in Algebra II.

+ Integrated Approach

K	1	2	3	4	5	6	7	8	Core Math I	Core Math II	Core Math III
Counting & Cardinality											
Number and Operations in Base Ten						Ratios and Proportional Relationships			Number and Quantity	Number and Quantity	Number and Quantity
			Number and Operations in Fractions			The Number System					
Operations and Algebraic Thinking						Expressions and Equations			Algebra	Algebra	Algebra
									Functions		Functions
Geometry									Geometry	Geometry	Geometry
Measurement and Data						Statistics and Probability			Statistics and Probability	Statistics and Probability	Statistics and Probability

+ Integrated Approach: Secondary Levels

Integrated Pathway

Core Math I	Core Math II	Core Math III
Number and Quantity	Number and Quantity	Number and Quantity
Algebra	Algebra	Algebra
Functions	Functions	Functions
Geometry	Geometry	Geometry
Statistics and Probability	Statistics and Probability	Statistics and Probability

+ Decisions, Decisions ...

- Some districts are taking an approach of minimal change, keeping the traditional approach and moving a few topics in and out of their current course offerings.
- Some districts have not yet realized that successful CCSS implementation will require **major instructional changes** inside each of their mathematics courses, regardless of the approach.
- Many of these districts also do not realize that the status quo is not working for significant populations of students.

+ Decisions, Decisions ...

- Among the districts that understand the scope and magnitude of required changes to curriculum and instruction, two possible approaches toward instructional change seem likely:
 - Some districts believe that they are most likely to promote instructional improvement from within the framework of familiar course names.
 - Other districts believe, in contrast, that explicitly new courses will be useful catalysts for instructional change.

+ Decisions, Decisions ...

- Primary advantages of the **traditional** approach:
 - familiar to teachers (it is the way most math teachers were prepared in college to teach math) and parents (it is the way math courses have been sequenced in the United States).
 - has served many PUSD students well; however, there are questions about how well it serves all learners.
- Primary advantages of the integrated approach:
 - allows for introducing the increasingly complex concepts in Algebra and Geometry over a period of several years, as students are more developmentally ready.
 - lends itself to compression (acceleration for advanced learners) more so than some traditional courses.

+ Why is PUSD even investigating the Integrated Approach?

- Why consider a change from Traditional if the end point is the same?
 - For several years, data has shown that the percentage of Piedmont students meeting or exceeding state standards on the CST's is strong for our accelerated cohort and in need of improvement for students taking grade level courses.
 - While this is an accomplishment for our accelerated cohort of students, our faculty and administration aim to increase the percentage of students mastering mathematics at a deeper level with a stronger understanding.

+ Benefits and Challenges

- Each approach has both benefits and challenges.
- Both approaches, if they are to be successful, will require serious work, new materials, and new habits of collaboration among teachers.
- Our PUSD Mathematics Teachers see implementation of the CCSS as an opportunity to re-vision (redesign and reframe) the mathematics programs fundamentally, in order to embrace the ambitious goal of reaching all students, regardless of the chosen approach.
- Furthermore, they believe that such changes will enhance the already high quality of the courses for high achieving and advanced students.

+ Why is PUSD even investigating the Integrated Approach?

- What does the research say?
 - The majority of other countries, including the countries with the highest-performing math students, such as Singapore, Japan, Hong Kong, Chinese Taipei, and South Korea, follow the integrated model.
 - The District commissioned Cheryl Holzmeyer, Ph.D. to prepare an analysis of the research and available data comparing the traditional and international models.

+ Why is PUSD even investigating the Integrated Approach?

- What does the research say?
 - In summary, Holzmeyer found that studies comparing the effectiveness of traditional and integrated math courses tend to overstate the differences between the two approaches.
 - More to the point, she cautions against inflating “the role of curricula alone in students’ overall learning experiences, attributing too much causality to curricula apart from the wider array of variables emphasized in the research literature from teacher professional development to school and community resources.”

+ Why is PUSD even investigating the Integrated Approach?

- What does the research say?
 - Holzmeyer states that “some research suggests that an integrated math curriculum has the potential to facilitate students’ mathematical thinking more effectively than a traditional math curriculum especially in certain areas, such as conceptual understanding.” At the same time, she notes that both approaches have potential strengths and weaknesses, and that several studies and articles emphasize the importance of other factors such as instructional practice, teacher professional development, and class size.

+ Are Textbooks Available for Both Approaches?

- Regardless of whether the District chooses traditional or integrated courses, there is published curriculum for Common Core math taught through either approach.
 - With this said, Common Core Aligned Materials are new and must be carefully evaluated to ensure they meet the needs of all students.
- Districts are piloting curriculum from multiple sources as well as developing curriculum of their own. The Silicon Valley Math Initiative supports over 100 districts in California by developing transitional units to teach course materials.

+ What does the UC System Prefer?

- **Does the University have a recommended course sequence for mathematics? Will UC approve an integrated math sequence to satisfy the "c" subject requirement?**
- UC does not have a preferred math course sequence. Individual schools or districts may determine the best sequence that will enrich their students' learning whether they choose the traditional single-subject sequence or an integrated math sequence.
 - <http://www.ucop.edu/agguide/a-g-requirements/c-mathematics/faq/index.html>

+ Will PUSD Teachers Be Prepared to Teach Either Traditional or Integrated Courses?

- Yes. Regardless of the pathway selected--traditional or integrated--math instructional practices need to shift. To support teachers in the transition to teaching the Common Core Standards for Math and the Standards for Mathematical Practice, the District is committed to providing professional development for all math teachers.
- This year, secondary math teachers have received training on instructional strategies that support Common Core math instruction from math experts from the Alameda County Office of Education and the Silicon Valley Math Initiative. In addition, the District sends teachers to local and national math trainings to learn about best practices in teaching CC math.

+ Criteria for Determining Integrated or Traditional Pathway

- The MTF developed criteria for evaluating the traditional and integrated/international approaches and making a recommendation to the Board.
- Which approach would better support:
 - Focus, Coherence, Rigor (as defined by the CCSS)?
 - the Needs of All Students?
 - the Math Practice Standards?
 - compression and expansion opportunities that best meet the needs of all students?
 - opportunities for differentiation and depth of knowledge levels for students?
- What does the research say?

+ Key to a Successful Implementation? TEACHERS!

- While David Foster, the Executive Director of SVMII, recommends the international approach for a variety of reasons, he downplays the difference between the traditional and international course sequences -- the content is the same, the only difference is the order in which the content is taught.
- Foster emphasizes that what matters most is the classroom implementation, not the course sequences. “Nobody has ever said standards change education or teaching,” he said. “Class size does not matter; what curriculum you use does not matter. All that ever matters is teaching.”

+ Key to a Successful Implementation? TEACHERS!

- Consultant Cheryl Holzmeyer, Ph.D. made a similar point in her analysis of the traditional and integrated models.
- Holzmeyer found that research comparing traditional and international math courses tend to overstate the differences, and she cautioned against underestimating key variables such as teacher professional development, instructional practice, and school and community resources.



Questions?

- Parent Engagement Calendar
- Jan. 13th – 7pm PMS Family Math Night – PMS MPR
- Jan. 14th – 7pm PUSD School Board Meeting – CC Math Update
- Jan. 22nd – 7pm PUSD Parent Education Night – CC Math Update
- Jan. 27th – 7:30pm Education Speaker Series
 - Dan Meyer discusses Common Core Math and the importance and method of teaching students to formulate and solve problems rather than memorize and apply formulas.
- Feb. 11th – 7pm PUSD School Board Meeting – Math Task Force Presentation on Math Pathway Recommendations
- Mar. 11th – 7pm PUSD School Board Meeting – Math Task Force Presentation on Math Pathway Recommendations (2nd Reading)