Common Core Math, PAUSD, and What Can You Do About it?

May 9, 2019

Ze'ev Wurman
Senior Fellow,
American Principles Project

Some History

- In 1997-8 California adopted new Standards in English, Mathematics, Science and History
- The Standards were benchmarked to what international high achievers were doing
- Our Standards were consistently rated the best in the nation, including in 2010 when compared to Common Core
- California put together the STAR test to assess students on the Standards

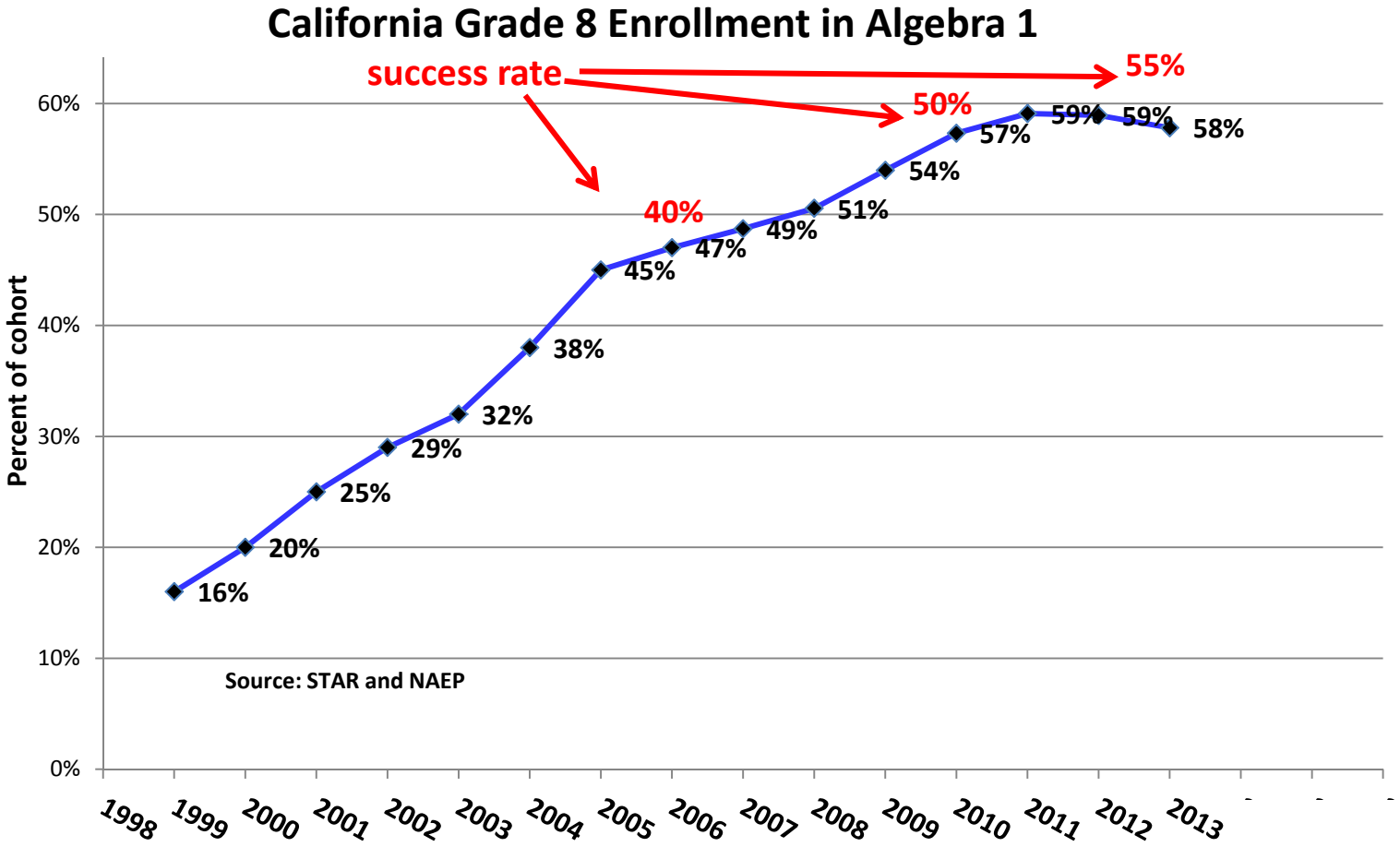
Some Math Results

During the Previous Calif. Standards

- All students increased achievement over time
- By 2013
  - More students successfully took demanding high school courses such as Geometry, Algebra 2, AP Calculus
  - Successful **White** students increased by factors of **1.5x - 2.5x**
  - Successful **Black** students increased by factors of **2.8x - 5.5x**
  - Successful **Latino** students increased by factors of **2.8x – 5.5x**
  - Successful **Low income** students increased by factors of **2x – 5x**

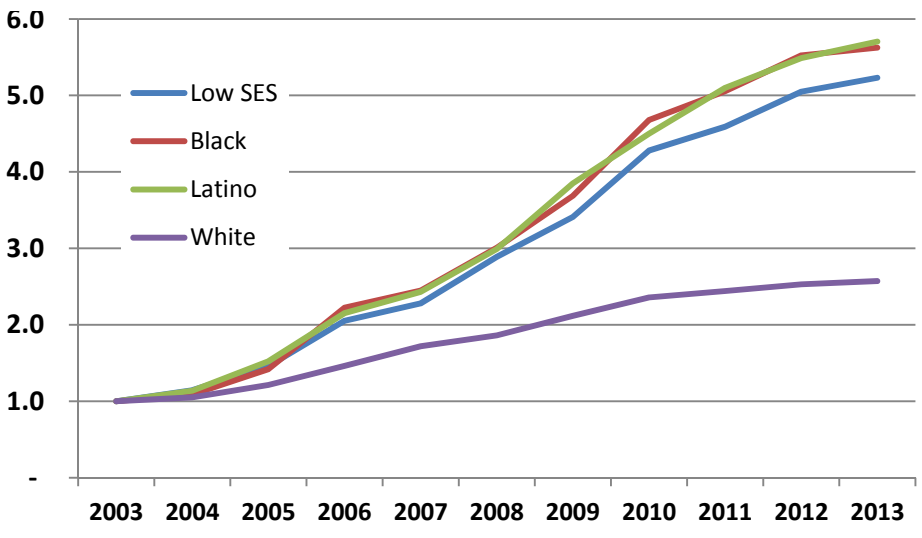
Everyone moved up, but disadvantaged students moved faster!

Enrollment Rapidly Increased, While Success Rate (Proficient & above) Increased Too!

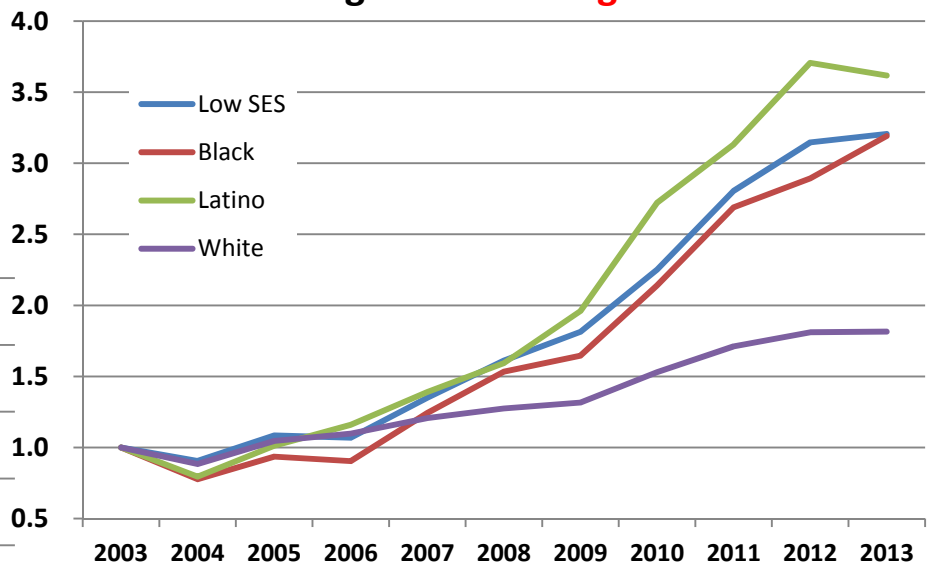


Change in number of successful (Proficient & above) students 2003-2013

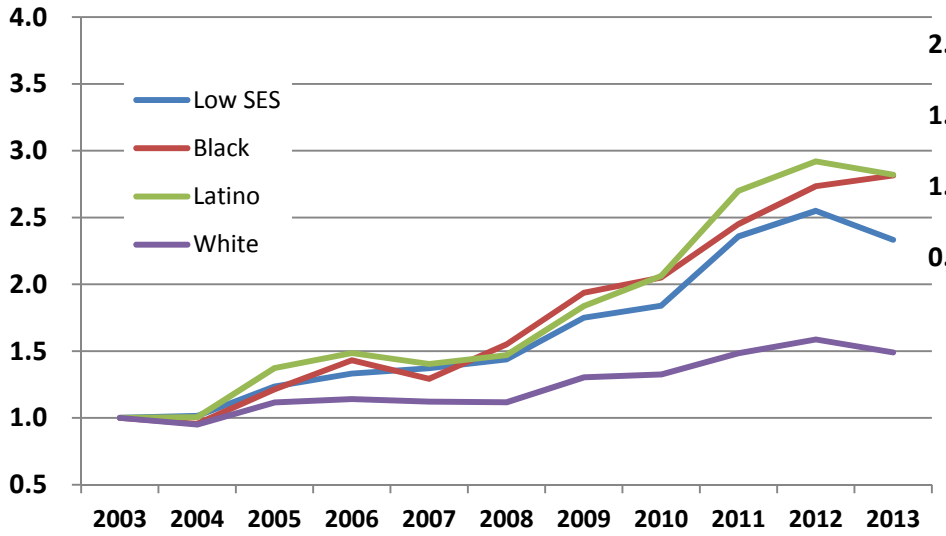
Middle School -- Algebra 1



High School -- Algebra 2



High School -- Geometry



What was the Key to this Success?

- Rigorous K-7 standards preparing everyone for Algebra 1 in grade 8
  - Not everyone was ready; but most were
  - Algebra-1/Integrated-1 taking by grade 8 more than quadrupled to 68% across the state since 1999
  - Despite that, success rates kept inching up
  - Biggest beneficiaries were **minority students**

Where Does the Common Core Stand?

- K-7 Common Core **does not** prepare students for Algebra 1 in grade 8
  - Expresses hope that some students will accelerate anyway
- Who will likely be those accelerated students?
  - **Not minority or disadvantaged students**
- Early Algebra 1 is a key to success
  - Major National Mathematics Advisory Panel finding
  - This is what high achieving countries do – **even Common Core acknowledges that**
  - Enables large fraction to reach calculus by grade 12
  - Essentially **all kids** are able to take it by grade 8 if taught properly
- **Early Algebra is the Gateway to STEM careers**

Common Core Genesis

More History

- Traditionally, education in America is left to the states under the 10th Amendment
- Elementary and Secondary Education Act (ESEA) passed under Johnson in 1965.
  - Official focus (Title I): Improving The Academic Achievement Of The Disadvantaged
  - NCLB was its 2002 incarnation under George W. Bush

The first time ever federal education affected ALL students, not just disadvantaged or disabled students!

- Efforts at national standards – curriculum, really – go a long way back.
  - New Math of the late 1950s, a reaction to the Sputnik
  - 1989 NCTM "Standards"
  - 1989 Governors' summit in Charlottesville, VA with G.H. W. Bush
  - National History Standards in 1994. US Senate disapproved 99:1

Common Core: Taking Shape

- By 2007 education experts were disappointed with NCLB
  - "race to the bottom" argument claimed that states lowered their standards
  - *The Proficiency Illusion* (Fordham, 2007) studied and rejected: '*trends do not indicate a helter-skelter "race to the bottom." They rather suggest more of a walk to the middle*.'
- Nevertheless, *Benchmarking for Success* published in late 2008
  - Written by Achieve Inc., NGA, CCSSO – three private DC organizations
  - Calling for "*rigorous, internationally-benchmarked*" National Standards
  - Asking the feds to "*underwrite costs*" and offer "*a range of incentives*"

- So in 2009 NGA and CCSSO established the CCSSI – *Common Core State Standards Initiative*, with Achieve as its main contractor
  - Paid for by Bill & Melinda Gates Foundation

Common Core: State Adoption

- The Standards were published on June 2, 2010
  - They were very significantly changed from the last reviewed version of March 2010
  - 37 states adopted them within three months
    - Four states adopted even before they were finished! ☺
  - 10 more states adopted them before the end of 2010 (incl. DC)
  - **Typical state adoption process of standards takes 1.5-2 years!**
- 2010 was the depth of the recessions
- **Race to the Top** offered **$4.3B** competitive grants
  - States got 40 extra points for adopting CCSS by Aug. 2, 2010
  - The difference between top awardee score and the bottom awardee score was 30 points

Common Core: Assessment

- Standards without Assessment are a dead letter on paper
- USED is prohibited from establishing "Federally Sponsored Test"
  - "*No funds provided under this Act to the Secretary or to the recipient of any award may be used to develop, pilot test, field test, implement, administer, or distribute any federally sponsored national test in reading, mathematics, or any other subject*" (NCLB, section 9525)
- USED "solution"?
  - $350M in Race to the Top Assessment (from "stimulus" money, not ESEA) to create 2 assessment consortia (PARCC and SBAC)
  - Another 10 points for Race to the Top competition to states that join one of the consortia
  - Out of the original 47 states (incl. DC) that participated in the testing, only 16 are left in 2019.

Common Core Quality

Common Core: Quality

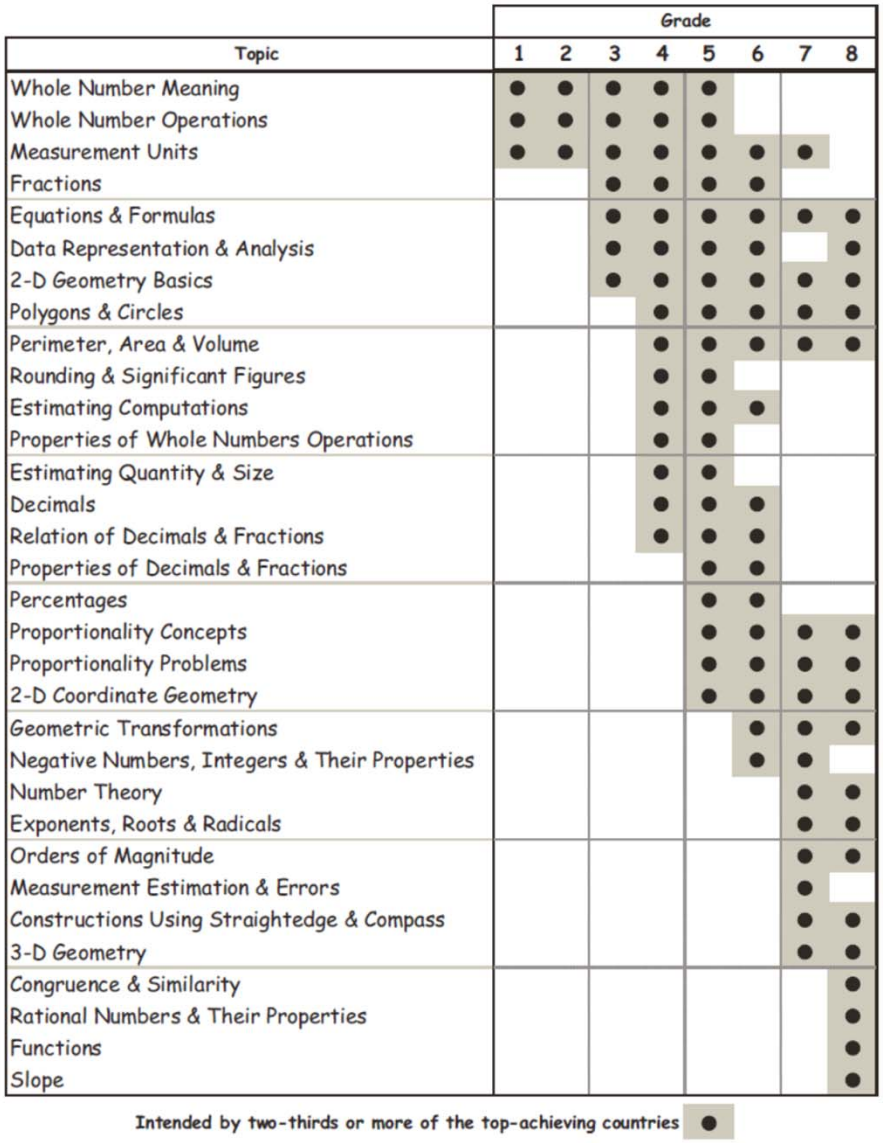
Forget about the politics … are they any good?

- Promised to be "rigorous, internationally-benchmarked"
- *Benchmarking for Success* in 2008 cited prof. William Schmidt as evidence of the necessary rigor of Common Core:
  - "***By the end of eighth grade, children in these [high achieving] countries have mostly completed mathematics equivalent to U.S. high school courses in algebra I and geometry***" (American Educator, Fall 2005)
- Yet prof. Schmidt signed off, as a Validation Committee member in 2010, on Common Core that
  - Places Algebra 1 in grade 9
  - Ends high school with weak Algebra 2, weak Geometry, and a few pre-calc modules

Common Core: Quality

- In fact, prof. Schmidt is the only scholar who found Common Core "similar" to international high achieving countries
- All other scholars that studied it found it lacking
  - Jonathan Goodman, Prof. of Mathematics, Courant Institute, NYU
  - Andrew Porter, Dean of Graduate School of Ed., U. of Pennsylvania
  - Jim Milgram, Prof. of Mathematics, Stanford University
- In 2012, more than two years after he already certified CC as comparable to standards of high-achieving countries, he published a study retroactively supporting his 2010 opinion.

W.H. Schmidt & R.T. Houang, *Curricular Coherence and the Common Core State Standards for Mathematics.* Educational Researcher, 2012.



Topic	Grade 1	2	3	4	5	6	7	8
Whole Number Meaning	●	●	●	●	●			
Whole Number Operations	●	●	●	●	●			
Measurement Units	●	●	●	●	●	●	●	
Fractions			●	●	●	●		
Equations & Formulas			●	●	●	●	●	●
Data Representation & Analysis			●	●	●	●		●
2-D Geometry Basics			●	●	●	●	●	●
Polygons & Circles				●	●	●	●	●
Perimeter, Area & Volume				●	●	●	●	●
Rounding & Significant Figures				●	●			
Estimating Computations				●	●	●		
Properties of Whole Numbers Operations				●	●			
Estimating Quantity & Size				●	●			
Decimals				●	●	●		
Relation of Decimals & Fractions				●	●	●		
Properties of Decimals & Fractions					●	●		
Percentages					●	●		
Proportionality Concepts					●	●	●	●
Proportionality Problems					●	●	●	●
2-D Coordinate Geometry					●	●	●	●
Geometric Transformations						●	●	●
Negative Numbers, Integers & Their Properties						●	●	
Number Theory							●	●
Exponents, Roots & Radicals							●	●
Orders of Magnitude							●	●
Measurement Estimation & Errors							●	
Constructions Using Straightedge & Compass							●	●
3-D Geometry							●	●
Congruence & Similarity								●
Rational Numbers & Their Properties								●
Functions								●
Slope								●

Intended by two-thirds or more of the top-achieving countries ●

Fig.1: Mathematics topics intended at each grade by at least two thirds of the TIMSS A+ countries

Here is what the TIMSS A+ curriculum looked like

"A+ countries" are six nations, Flemish Belgium, Czech Republic, Hong Kong, Japan, Korea, and Singapore, that scored at the top in the 1995 TIMSS.

Prof. Schmidt was the US TIMSS Coordinator at the time, but those findings were verified by many others at the time and since then.

- **Coherent Sequence: order of the rows**
- **Focus: limited # of grades per topic**
- **Depth: Limited # of topics per grade**

The SHAPE conveys much of it.

Topic	Grade 1	2	3	4	5	6	7	8
Whole Number Meaning	●	●	●	●	●			
Whole Number Operations	●	●	●	●	●			
Measurement Units	●	●	●	●	●	●	●	
Fractions			●	●	●	●		
Equations & Formulas			●	●	●	●	●	●
Data Representation & Analysis			●	●	●	●		●
2-D Geometry Basics			●	●	●	●	●	●
Polygons & Circles				●	●	●	●	●
Perimeter, Area & Volume				●	●	●	●	●
Rounding & Significant Figures				●	●			
Estimating Computations				●	●	●		
Properties of Whole Numbers Operations				●	●			
Estimating Quantity & Size				●	●			
Decimals				●	●	●		
Relation of Decimals & Fractions				●	●	●		
Properties of Decimals & Fractions					●	●		
Percentages					●	●		
Proportionality Concepts					●	●	●	●
Proportionality Problems					●	●	●	●
2-D Coordinate Geometry					●	●	●	●
Geometric Transformations						●	●	●
Negative Numbers, Integers & Their Properties						●	●	
Number Theory							●	●
Exponents, Roots & Radicals							●	●
Orders of Magnitude							●	●
Measurement Estimation & Errors							●	
Constructions Using Straightedge & Compass							●	●
3-D Geometry							●	●
Congruence & Similarity								●
Rational Numbers & Their Properties								●
Functions								●
Slope								●

Intended by two-thirds or more of the top-achieving countries ●

Fig.1: Mathematics topics intended at each grade by at least two thirds of the TIMSS A+ countries

Topic	Grade 1	2	3	4	5	6	7	8
Whole Number Meaning	●	●	●	●	●			
Whole Number Operations	●	●	●	●	●			
Properties of Whole Numbers Operations	●	●	●	●	●	●		
Fractions	●	●	●	●	●	●		
Measurement Units	●	●	●	●	●	●	●	●
Polygons & Circles	●	●	●	●	●	●	●	●
Data Representation & Analysis	●	●	●	●	●	●	●	●
3-D Geometry	●	●			●	●	●	●
Measurement Estimation & Errors		●	●					
Number Theory		●		●	●	●		
2-D Geometry Basics		●		●	●	●	●	●
Rounding & Significant Figures			●	●	●			
Relation of Decimals & Fractions			●	●	●	●		
Estimating Computations			●	●	●		●	●
Perimeter, Area & Volume			●	●	●	●	●	●
Equations & Formulas			●	●	●	●	●	●
Decimals				●	●	●		
Patterns, Relations & Functions				●	●	●	●	●
Geometric Transformations				●		●	●	●
Properties of Decimals & Fractions					●	●		
Orders of Magnitude					●			●
2-D Coordinate Geometry					●	●	●	●
Exponents, Roots & Radicals					●	●		●
Percentages						●	●	
Negative Numbers, Integers & Their Properties						●	●	
Proportionality Concepts						●	●	●
Proportionality Problems						●	●	●
Rational Numbers & Their Properties						●	●	●
Constructions Using Straightedge & Compass							●	
Systematic Counting							●	
Uncertainty & Probability							●	
Real Numbers & Their Properties								●
Congruence & Similarity								●
Slope								●
Validation & Justification								●

Fig.2: Mathematics topics intended in the Common Core State Standards

Schmidt & Houang argue the figures are similar. Quote:

"Are the Common Core State Standards Coherent and Focused?

… Looking first at a visual representation, we note that Figure 2 representing the CCSSM bears a strong resemblance to Figure 1 (A+ model), at least in terms of its general shape. From that point of view, together with the vetting done by mathematicians (several of whom were the same ones that did the original vetting of the A+), it can be suggested that the CCSSM are coherent and focused."

But note that in figure 2, the rows were reordered to create the *illusion* of a triangular "coherent" shape!

		TIMSS								COMMON CORE									
	Topic	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8		Topic
1	Whole Number: Meaning	●	●	●	●	●				●	●	●	●	●				1	Whole Number: Meaning
2	Whole Number: Operations	●	●	●	●	●				●	●	●	●	●				2	Whole Number: Operations
3	Measurement Units	●	●	●	●	●	●	●		●	●	●	●	●	●			12	Whole Numbers: Properties of Operations
4	Common Fractions			●	●	●	●			●	●	●	●	●	●			4	Common Fractions
5	Equations & Formulas			●	●	●	●	●	●	●	●	●	●	●	●	●	●	3	Measurement Units
6	Data Representation & Analysis			●	●	●	●		●	●	●	●	●	●	●	●	●	8	2-D Geometry: Polygons & Circles
7	2-D Geometry: Basics			●	●	●	●	●	●	●	●	●	●	●	●	●	●	6	Data Representation & Analysis
8	2-D Geometry: Polygons & Circles				●	●	●	●	●	●	●			●	●	●	●	28	3-D Geometry
9	Measurement: Perimeter, Area & Volume				●	●	●	●	●		●	●						26	Measurement: Estimation & Errors
10	Rounding & Significant Figures				●	●					●		●	●	●			23	Number Theory
11	Estimating Computations				●	●	●				●		●	●	●	●	●	7	2-D Geometry: Basics
12	Whole Numbers: Properties of Operations				●	●						●	●	●				10	Rounding & Significant Figures
13	Estimating Quantity & Size				●	●						●	●	●	●			15	Relation of Common & Decimal Fractions
14	Decimal Fractions				●	●	●					●	●	●		●	●	11	Estimating Computations
15	Relation of Common & Decimal Fractions				●	●	●					●	●	●	●	●	●	9	Measurement: Perimeter, Area & Volume
16	Properties of Common & Decimal Fractions					●	●					●	●	●	●	●	●	5	Equations & Formulas
17	Percentages					●	●						●	●	●			14	Decimal Fractions
18	Proportionality Concepts					●	●	●	●				●	●	●	●	●	31	Patterns, Relations & Functions
19	Proportionality Problems					●	●	●	●				●		●	●	●	21	Geometry: Transformations
20	2-D Geometry: Coordinate Geometry					●	●	●	●					●	●			16	Properties of Common & Decimal Fractions
21	Geometry: Transformations						●	●	●					●			●	25	Exponents & Orders of Magnitude
22	Negative Numbers, Integers, & Their Properties						●	●						●	●	●	●	20	2-D Geometry: Coordinate Geometry
23	Number Theory							●	●					●	●		●	24	Exponents, Roots & Radicals
24	Exponents, Roots & Radicals							●	●						●	●		17	Percentages
25	Exponents & Orders of Magnitude							●	●						●	●		22	Negative Numbers, Integers, & Their Properties
26	Measurement: Estimation & Errors							●							●	●	●	18	Proportionality Concepts
27	Constructions Using Straightedge & Compass							●	●						●	●	●	19	Proportionality Problems
28	3-D Geometry							●	●						●	●	●	30	Rational Numbers & Their Properties
29	Geometry: Congruence & Similarity								●							●		27	Constructions Using Straightedge & Compass
30	Rational Numbers & Their Properties								●							●		33	Systematic Counting
31	Patterns, Relations & Functions								●							●		34	Uncertainty & Probability
32	Proportionality: Slope & Trigonometry								●								●	35	Real Numbers & Their Properties
33	Systematic Counting																●	29	Geometry: Congruence & Similarity
34	Uncertainty & Probability																●	32	Proportionality: Slope & Trigonometry
35	Real Numbers & Their Properties																●	36	Validation & Justification
36	Validation & Justification																	13	Estimating Quantity & Size

Common Core: Quality II

- *"It's not what we aspire to for our children. It's not what we as a nation want to set as a final deliverable. I completely agree with that, and we should go beyond that."*
  William McCallum, Joint AMS/AMA meeting, Jan. 2010, San Francisco
- *The standards are "for the colleges most kids go to, but not for the colleges most parents aspire to … [they are] not for STEM … [and] not for selective colleges."*
  Jason Zimba, March 2010 testifying in front of Mass. BESE
- *Yet the most astounding statement I have read is the claim that Common Core standards are "internationally benchmarked." They are not. The Common Core fails any comparison with the standards of high-achieving countries, just as they fail compared to the old California standards. They are lower in the total scope of learned material, in the depth and rigor of the treatment of mathematical subjects, and in the delayed and often inconsistent and incoherent introductions of mathematical concepts and skills*.
  Marina Ratner, UC Berkley professor emerita of mathematics, member Nat'l Academy of Sciences, writing in the WSJ , Aug. 5, 2014

Is a weak Algebra 2 sufficient for "college readiness"?

Table 5. Bachelor's degree attainment rate by highest level of mathematics reached in high school by 1982 and 1992 12th-graders

	Class of 1982		Class of 1992	
Level of math	Percentage reaching this level of math	Earned bachelor's	Percentage reaching this level of math	Earned bachelor's
Calculus	5.2 (0.36)	82.1 (2.45)	9.7 (0.54)	83.3 (2.72)
Precalculus	4.8 (0.37)	75.9 (2.43)	10.8 (0.65)	74.6 (2.04)
Trigonometry	9.3 (0.51)	64.7 (2.32)	12.1 (0.81)	60.0 (3.32)
Algebra 2	24.6 (0.75)	46.4 (1.54)	30.0 (1.08)	39.3 (2.31)
Geometry	16.3 (0.65)	31.0 (1.92)	14.2 (0.87)	16.7 (1.87)
Algebra 1	21.8 (0.69)	13.4 (1.33)	16.5 (0.92)	7.0 (1.24)
Pre-algebra	18.0 (0.66)	5.4 (1.19)	6.7 (0.53)	3.9 (1.34)

Clifford Adelman, The Toolbox Revisited, U.S. Department of Education, 2006.

To Illustrate how weak this is

National Center for Education Statistics

Table 7.
HIGHEST MATH COURSE IN FIRST YEAR: Percentage distribution of the highest level of mathematics in which 2003–04 beginning bachelor's and associate's degree students earned credits, by STEM entrance and persistence through 2009

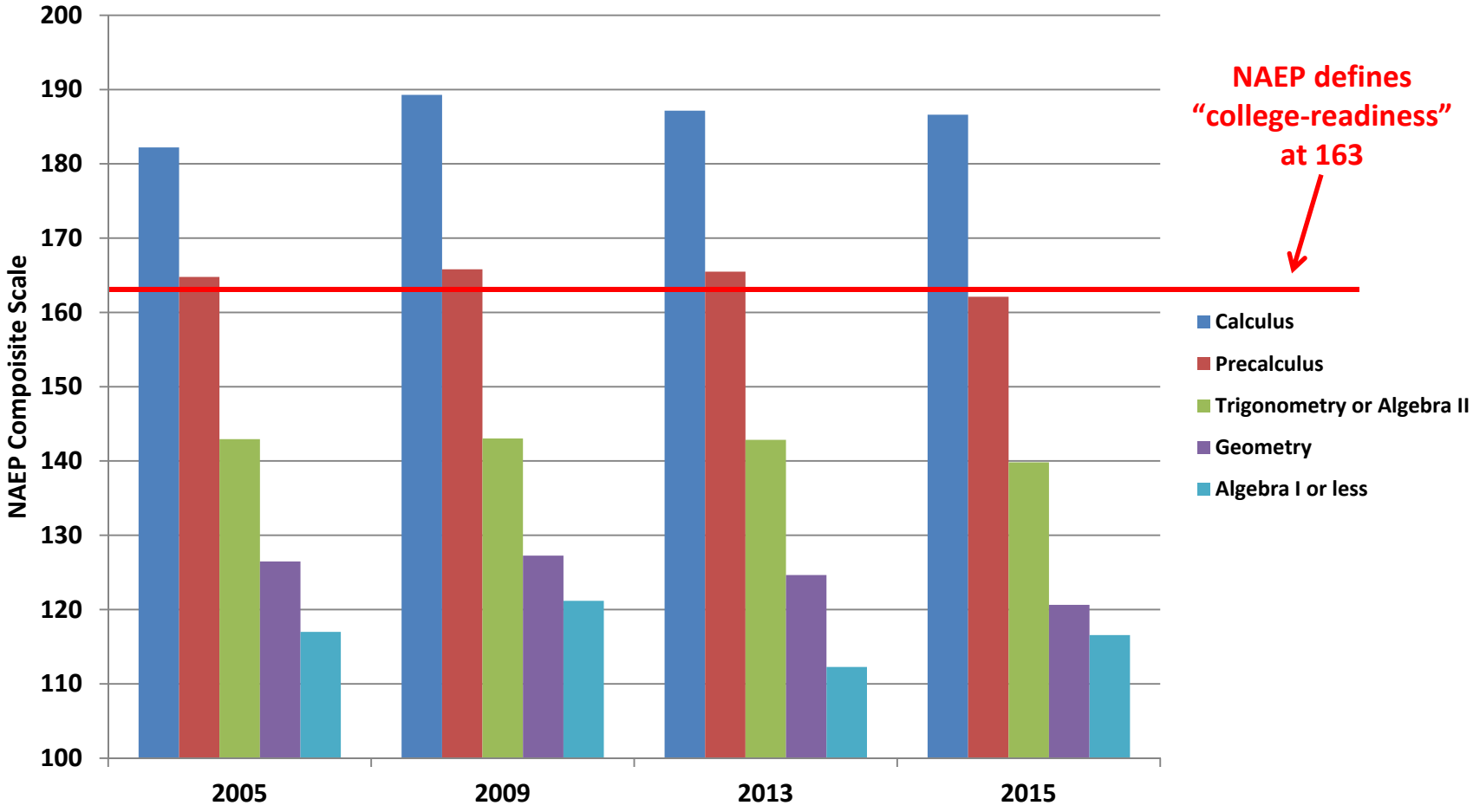
	Beginning bachelor's degree students				Beginning associate's degree students			
STEM entrance and persistence through 2009	No math	Precollege-level math only[1]	Introductory college-level math[2]	Calculus and advanced math	No math	Precollege-level math only[1]	Introductory college-level math[2]	Calculus and advanced math
Total	**40.1**	**8.7**	**30.1**	**21.2**	**49.2**	**24.5**	**22.9**	**3.4**
Students who entered STEM fields in first year								
STEM leavers[3]	34.3	9.3	24.0	32.4	44.2	21.2	28.4	6.2
Students who left PSE without a degree/certificate	39.9	12.1	20.2	27.8	50.5	16.2	28.0	5.3 !
Students who switched major to a non-STEM field	29.7	7.0	27.1	36.2	36.8	27.1	28.9	7.2 !
STEM persisters/completers	14.3	3.1 !	19.3	63.3	25.1	13.9	33.4	27.6
Students who completed a STEM degree/certificate	13.7	2.1 !	15.0	69.2	16.8 !	12.2 !	44.0	27.1
Students who entered STEM fields after first year								
STEM leavers[3]	36.4	10.7	30.1	22.8	43.5	22.5	30.6	3.3 !
Students who left PSE without a degree/certificate	34.6	11.4 !	36.1	18.0	48.9	27.9	19.7	‡
Students who switched major to a non-STEM field	37.6	10.3 !	26.4	25.7	35.8	14.9 !	46.3	‡
STEM persisters/completers	27.1	5.4	20.0	47.6	37.5	17.8	27.4	17.3
Students who completed a STEM degree/certificate	24.2	4.3 !	17.4	54.1	18.5 !	12.6 !	37.0	31.9 !

See notes at end of table.

Students with only the Common Core preparation wishing to major in a STEM area, their odds of obtaining a degree in STEM are 2.1%!

Another Issue: Course Dilution

NAEP Math Scores of 12th Graders as a Function of the Highest Math Course Taken



From 2015 even pre-calculus doesn't guarantee college readiness for any degree. Today the difference is likely bigger

Common Core: Significant Changes

English Language Arts (ELA)

- 50-50 Allocation to literary and informational reading
  - Going to 30-70 in high school
  - Driven by misreading of NAEP item specifications
  - Harmful to the development of critical thinking

- "Close Reading" of text as a dominant mode of reading
  - Applicable – sometimes – to analyzing poetry, not to the Gettysburg Address!

Common Core: Significant Changes

Mathematics K-8

- Unnecessarily rigorous and formal in K-1
  - Expectation for written number sentences in K
    *Decompose numbers less than or equal to 10 into pairs in more than one way … and record each decomposition by a drawing or **equation** (e.g., 5 = 2 + 3 and 5 = 4 + 1*)
  - Transitivity (if A>B and B>C then A>C) in grade 1
    compare the lengths of two objects indirectly by using a third object
- Large slowdown in 2-8
  - Multiple standards repeatedly dealing with "strategies based on place value, properties of operations" but standards algorithms only in grade 4 (add/sub), 5 (mult) and 6 (divide).
  - Delayed geometry (area of triangles in grade 6, circles in grade 7, sum of angles in triangles in grade 8)
  - Intense focus on base-10 and on explanations, de-emphasis of procedures

Common Core: Significant Changes

High School math – ends at Algebra 2

- "Functional" approach to algebra
  - Emphasis on observing behavior rather than on analytical solutions
  - De-emphasis of technical fluency with algebraic expressions & polynomials – **bound to impact quantitative science**!
- Rigid-transformations-based congruency and similarity proofs
  - Tried by Kolmogorov in late 1970s and 1980s in Moscow. Failed and abandoned.
  - Experimental, never successfully tried at scale, yet imposed nationwide
- Partial and deficient higher content
  - Trigonometry: no half-angle formulae, no polar functions, no phase
  - Algebra 2 & bits of pre-calc: partial conic sections, no sums of geometric and arithmetic series, no mathematical induction
  - No serious statistics content, no calculus

Common Core is Full of Pedagogy

It is not about the WHAT but about the HOW

Common Core, Geometry

- Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.

Old California Standards

- Students prove that triangles are congruent or similar

Another Example

Common Core, Grade 2

- Add and subtract within 1000

Old California Standards, Grade 2

- Find the sum or difference of two whole numbers up to three digits long.

Another Example

Common Core, Grade 2

- Add and subtract within 1000, using concrete models or drawings and strategies based on place value

Old California Standards, Grade 2

- Find the sum or difference of two whole numbers up to three digits long.

Another Example

Common Core, Grade 2

- Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations

Old California Standards, Grade 2

- Find the sum or difference of two whole numbers up to three digits long.

Another Example

Common Core, Grade 2

- Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction;

Old California Standards, Grade 2

- Find the sum or difference of two whole numbers up to three digits long.

Another Example

Common Core, Grade 2

- Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method.

Old California Standards, Grade 2

- Find the sum or difference of two whole numbers up to three digits long.

Another Example

Common Core, Grade 2

- Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones;

Old California Standards, Grade 2

- Find the sum or difference of two whole numbers up to three digits long.

Another Example

Common Core, Grade 2

- Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.

Old California Standards, Grade 2

- Find the sum or difference of two whole numbers up to three digits long.

Common Core Shows Up in Calif.

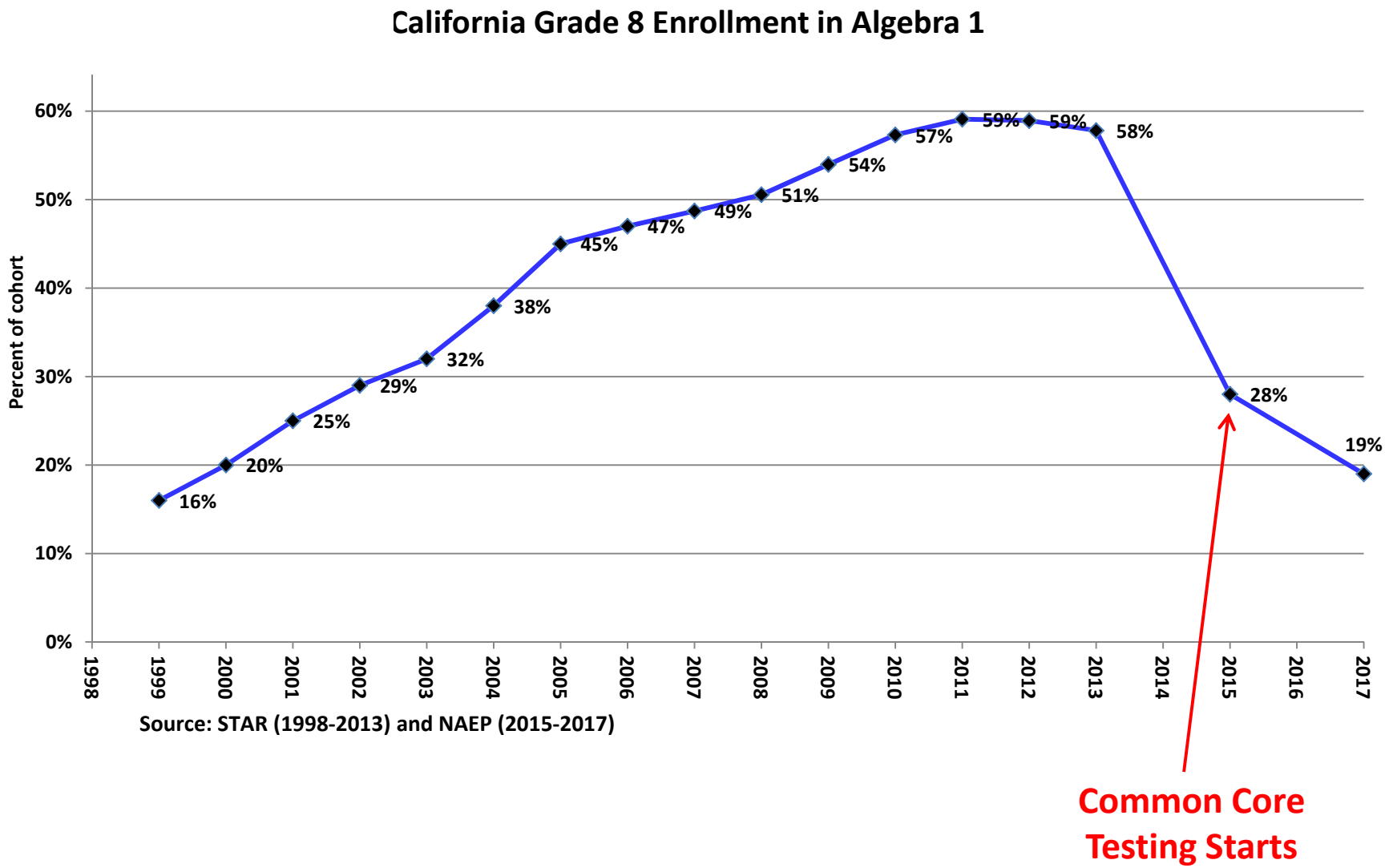
- **In August 2010 California adopted the mediocre and incoherent Common Core standards**
  - **Fixed some of the high school deficiencies.**
    - **Most other states did not change anything significant.**
  - **Made few corrections and enhancements to K-8 standards**
    - **The K-8 enhancements were removed by the State Board in 2012**
  - **Promised to prepare everyone for "Career and College"**

- **By 2014 STAR Test ceased to exist; replaced by Smarter Balanced (SBAC) Test in 2015.**
- **In California SBAC was renamed CAASPP, for California Assessment of Student Performance and Progress**

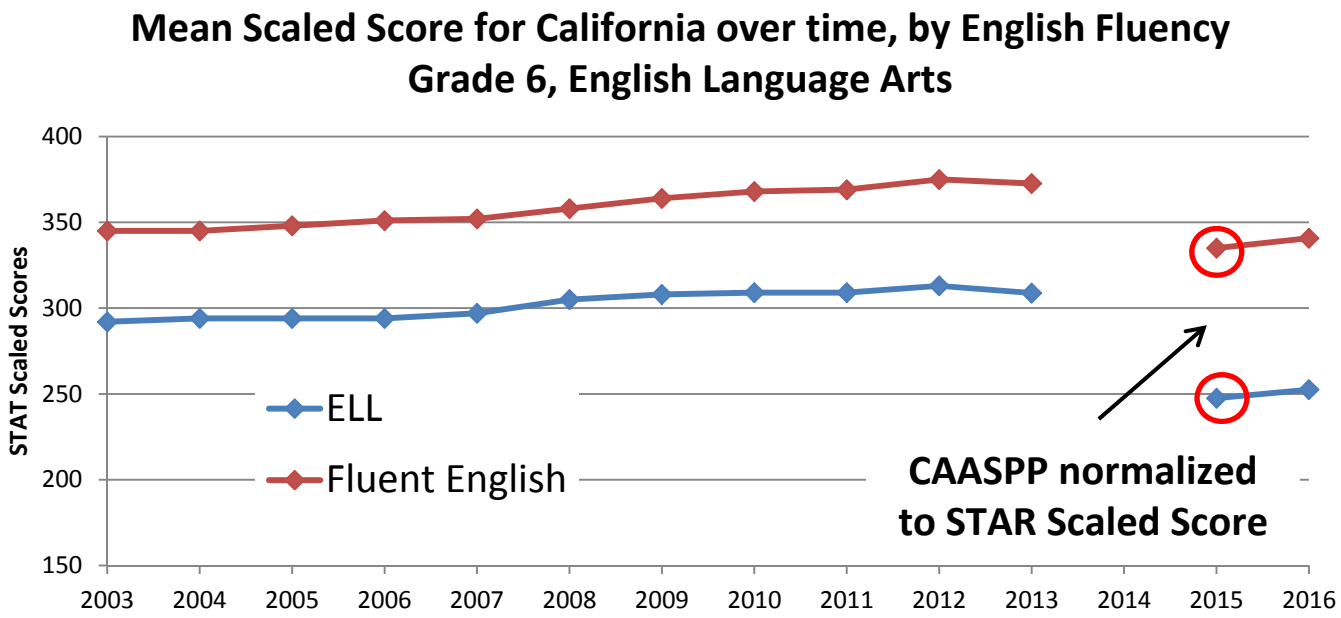
So What Happened to Math Achievement in California since Common Core?

- We don't really know
  - Grades 3-8 math trend data from before 2015 cannot be easily extended
  - Grades 3-8 seem mostly stagnant
  - No more End-of-Course tests in Algebra 1, Algebra 2, or Geometry
  - Only Grade 11 summative test to verify students are "college ready"

- **However …**

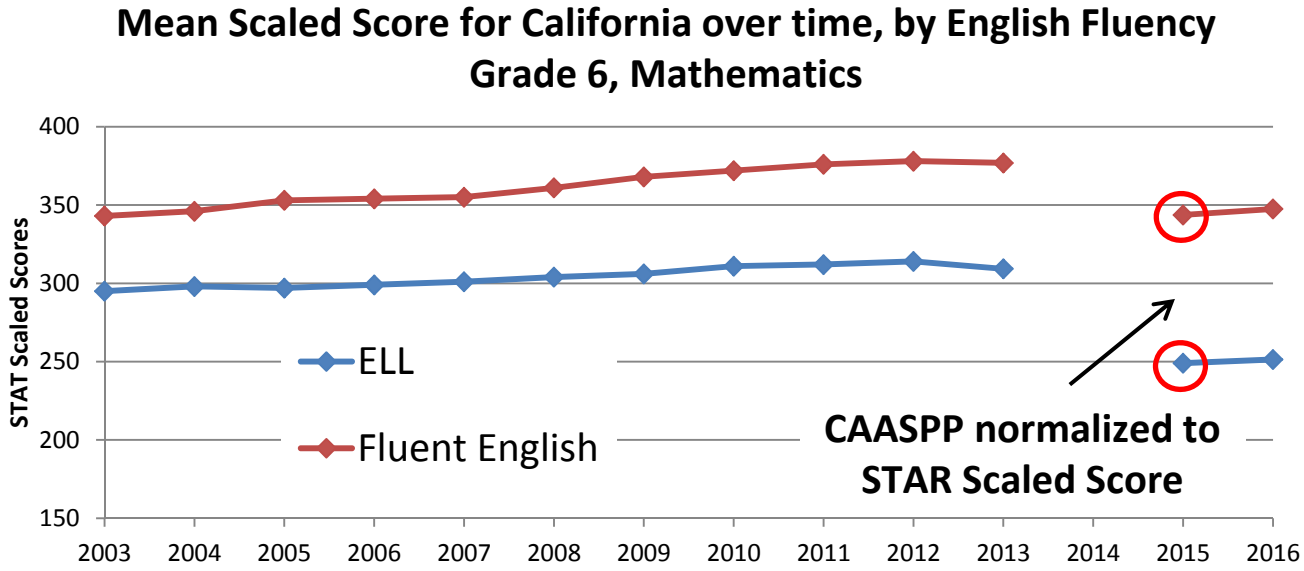

California Grade 8 Enrollment in Algebra 1
Percent of cohort
60%
50%
40%
30%
20%
10%
0%
16%
20%
25%
29%
32%
38%
45%
47%
49%
51%
54%
57%
59%
59%
58%
28%
19%
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
Source: STAR (1998-2013) and NAEP (2015-2017)
Common Core
Testing Starts

Change from STAR to SBAC Did Not Affect Everyone Equally - I



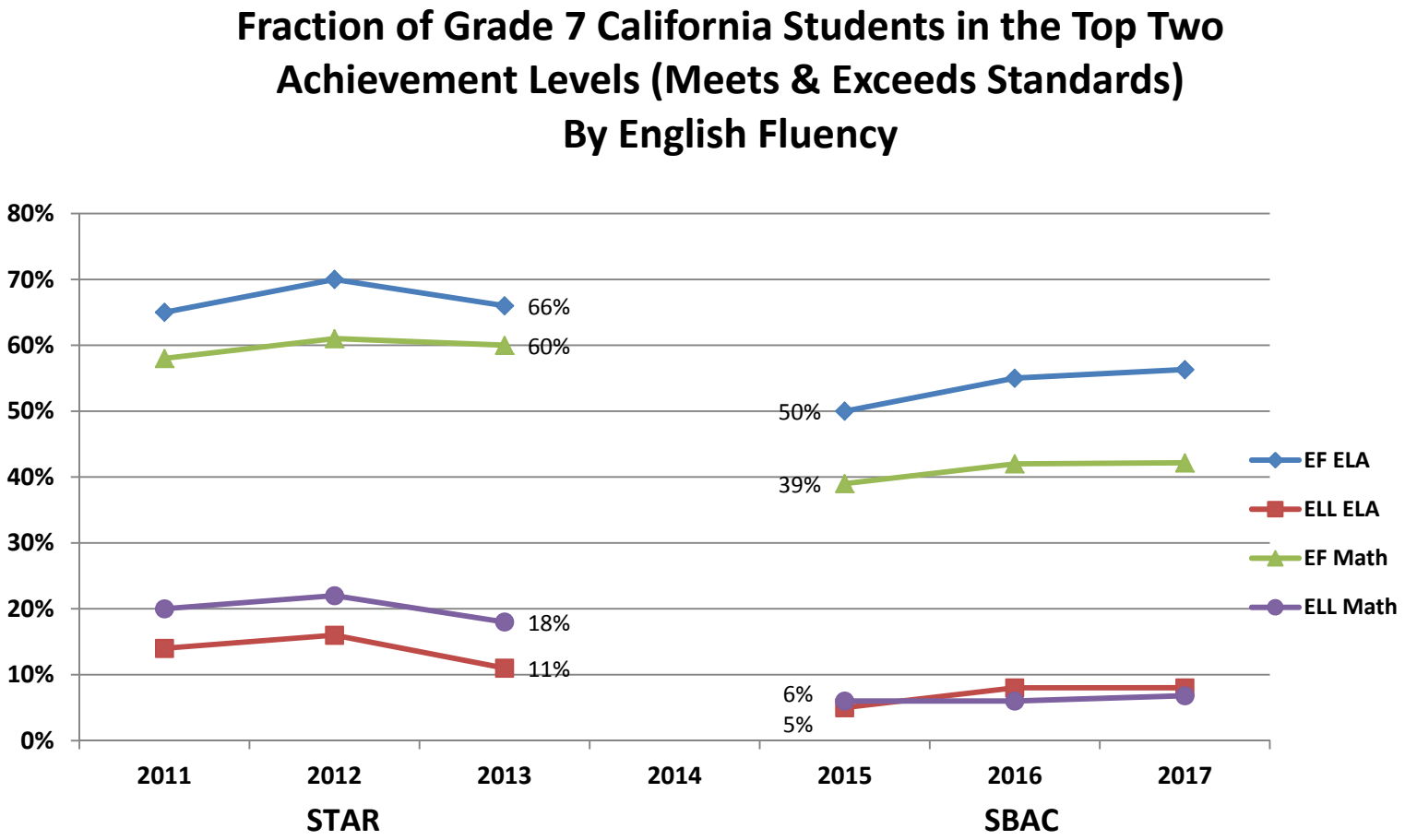
CAASPP 2015 Changes
English Proficient: 38 points drop
English Learners: 61 points drop

Basic to Proficient:
50 scaled points

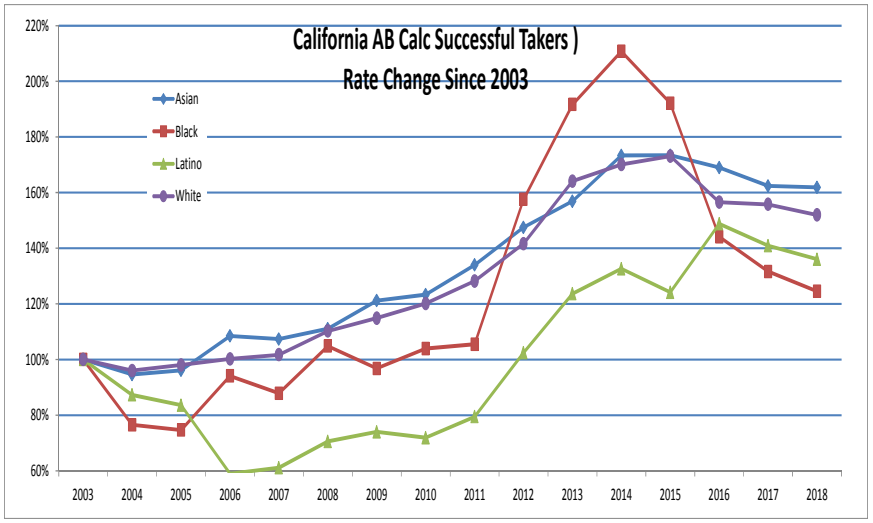


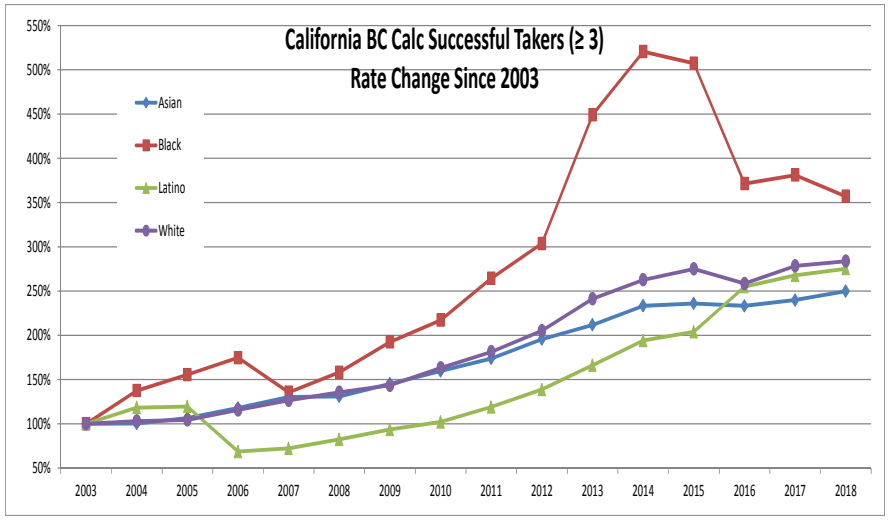
English Proficient: 33 points drop
English Learners: 60 points drop

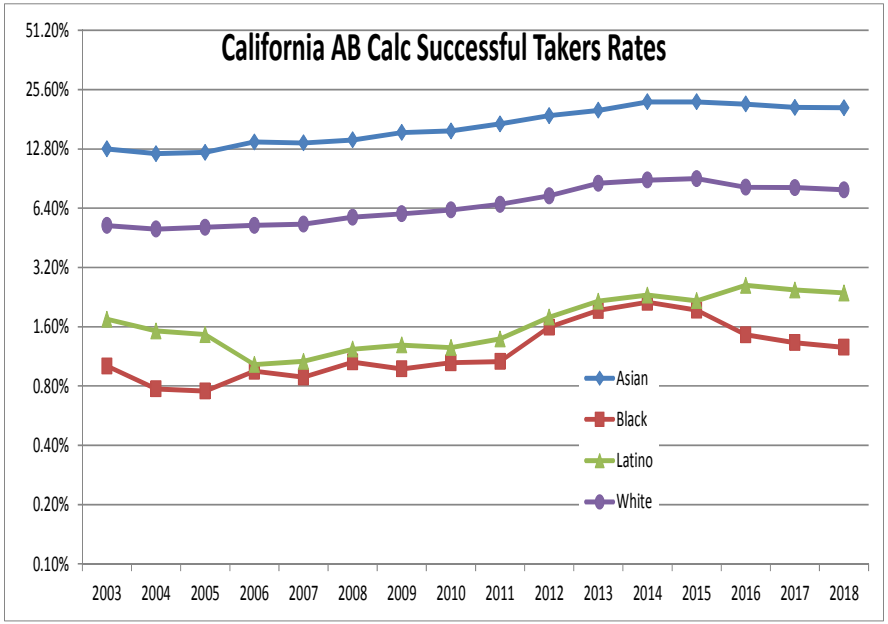
Change from STAR to SBAC Did Not Affect Everyone Equally - II

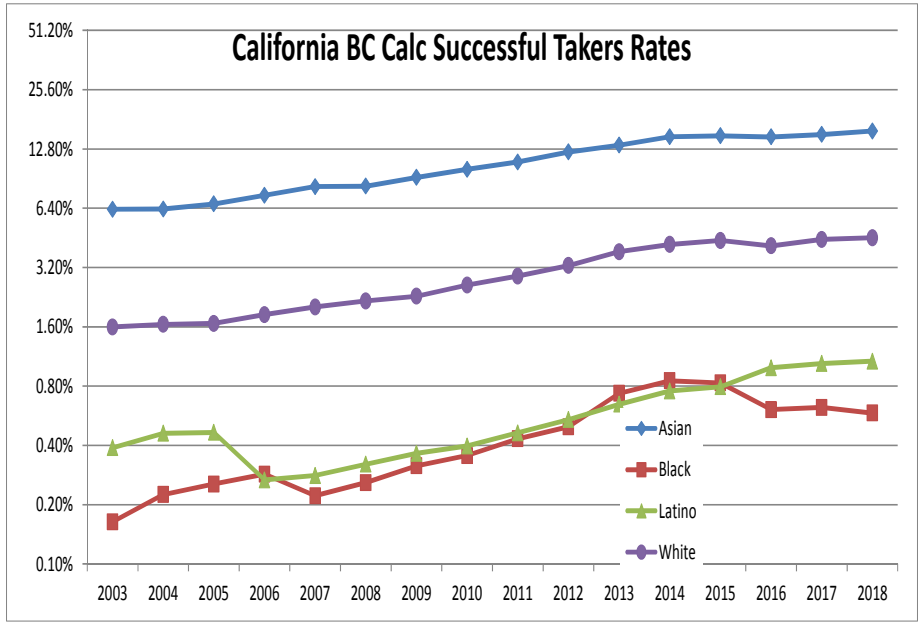


Note how during the STAR days, about 1 in 4 ELL students did as well as English speakers. After Common Core only 1 in 6 or 7 does.





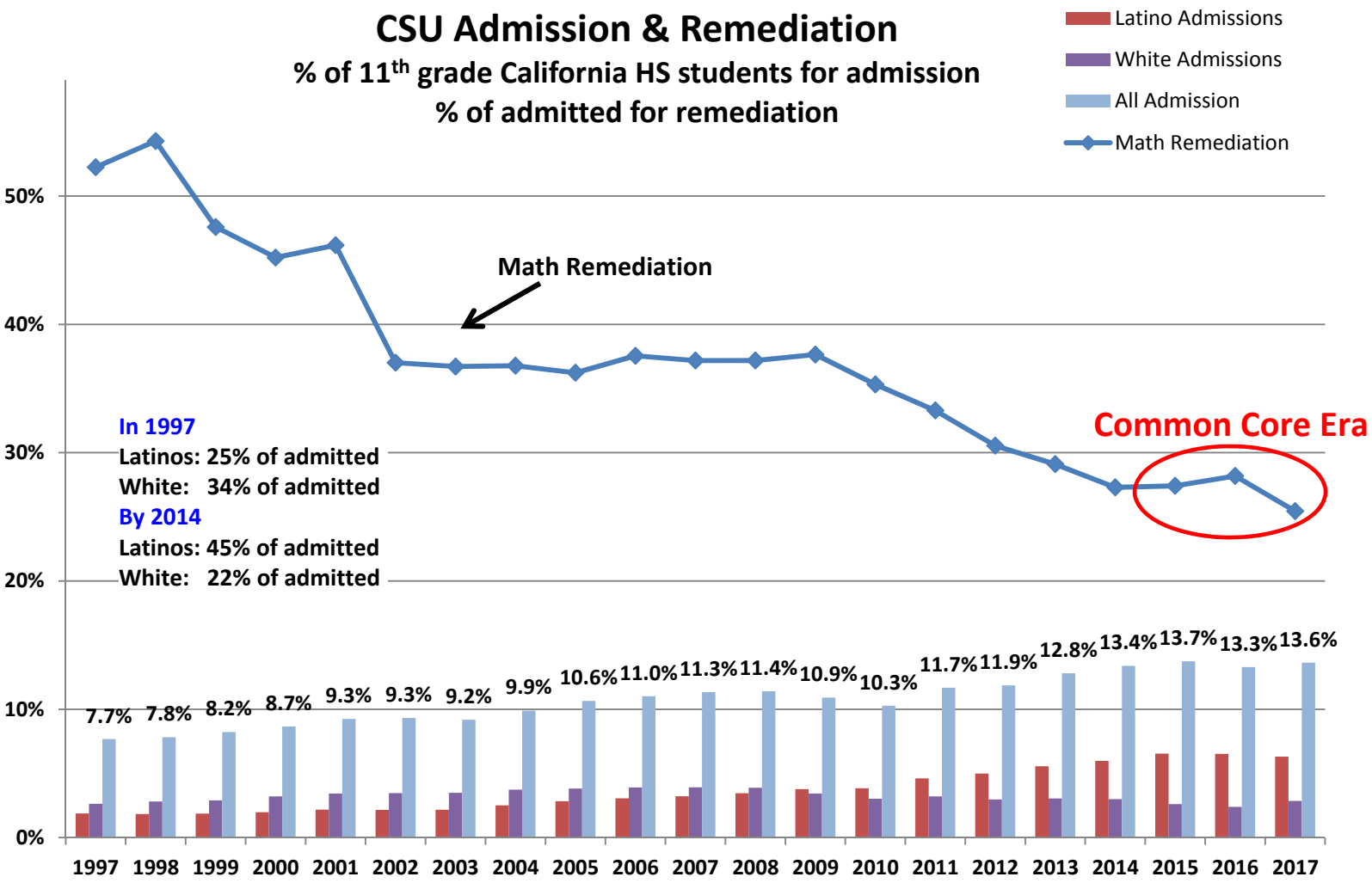




Increases in number of successful (score >= 3)
AP Calculus students in California Stopped or Reversed after 2014

Meaningless "College Readiness"

- Common Core assessment consortia tests claim to asses "college readiness" (nobody knows what "career readiness" means, including NAGB).
- For over a decade California has the highly-praised Early Assessment Program (EAP) for Calif. State University (CSU) college-readiness.
- It had a dozen extra items selected by CSU faculty added to the 11th grade "vanilla" STAR tests
- Student were classified into *Ready* and *Conditionally Ready* based on the results
- Under Common Core, SBAC grade 11 results determine college-readiness.
- No CSU input was solicited.



http://www.asd.calstate.edu/performance/proficiency.shtml

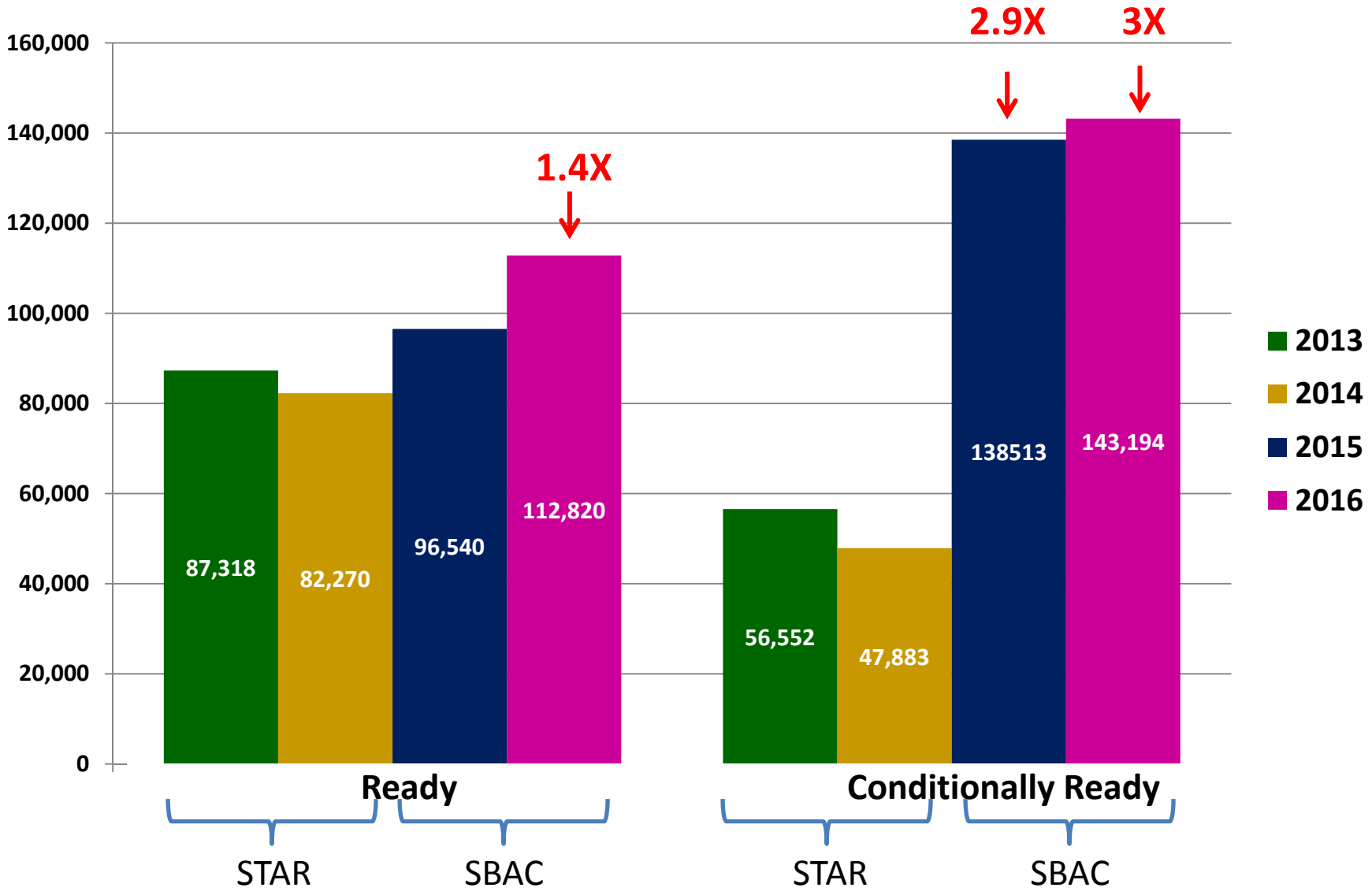
Since last Fall (2018), CSU is prohibited BY LAW to administer its own readiness tests and must place everyone, who is deemed college-ready by the SBAC test, in a non-remedial credit-earning class.

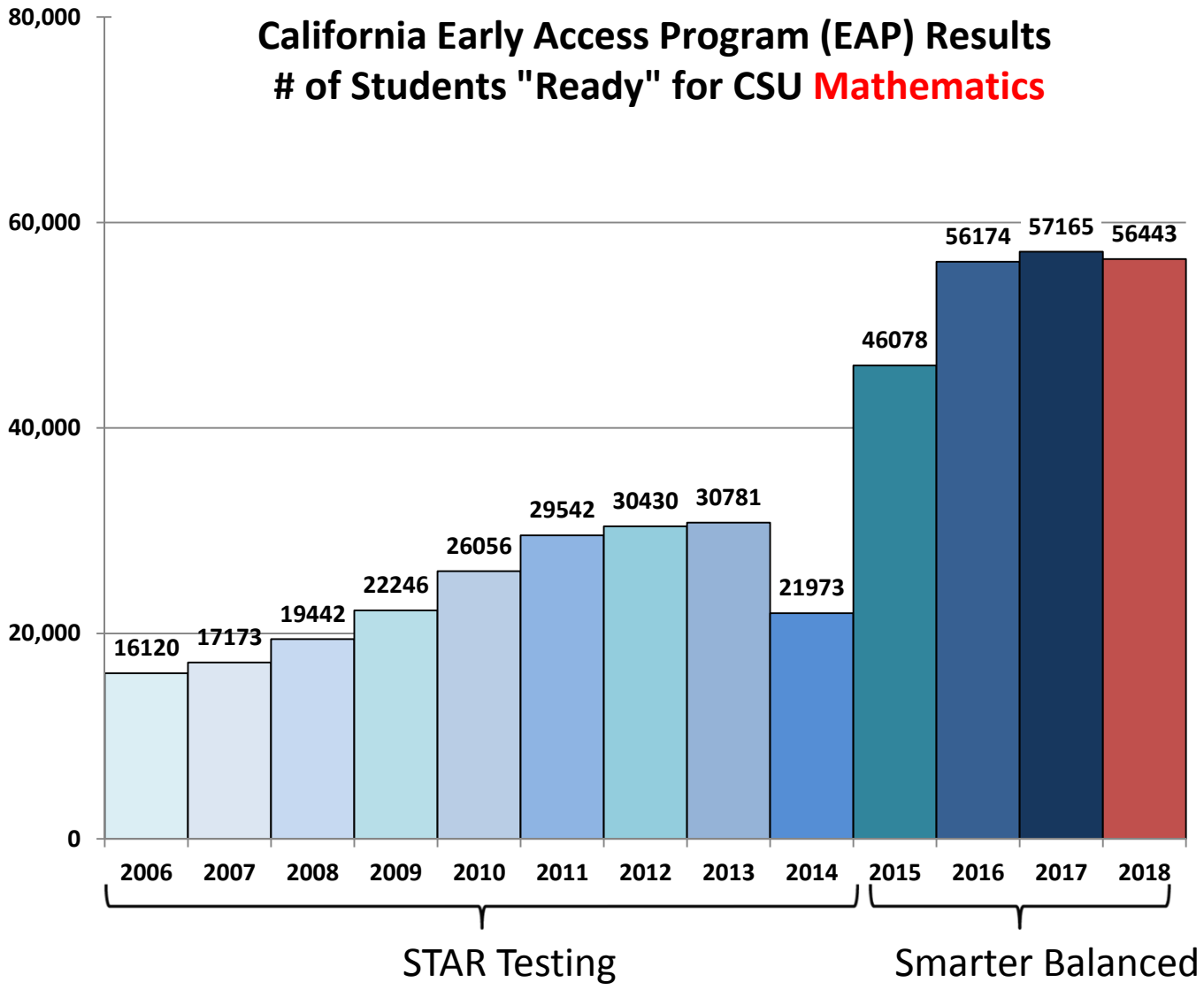
Last year (2017) over 30% of freshmen class at CSU needed remediation.

Today, the 4-year graduation rate at CSU is about 25%. CSU 6-year graduation rate is about 60%.

Consider what removing remediation will do to the graduation rates or, alternatively, the pressure on CSU to lower its expectations.

EAP English Results under SBAC




California Early Access Program (EAP) Results
# of Students "Ready" for CSU Mathematics
80,000
60,000
40,000
20,000
0
16120
17173
19442
22246
26056
29542
30430
30781
21973
46078
56174
57165
56443
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
STAR Testing
Smarter Balanced

Why?

- Common Core promised "college-readiness" yet we know that only about 1/3 of the cohort is college ready
  - Some 2/3 of the cohort continues to college
  - About half of them never complete 2-year or 4-year degree
- Common Core assessment faced a dilemma:
  - Test for a true college-readiness and fail ~2/3
  - Test for a fake college readiness and fail ~1/3

Guess which one was chosen?

OK, so that was California.

What about Palo Alto?

Palo Alto Unified School District

- PAUSD is not a typical district – only about 10-15% disadvantaged students.
  - Some 40% each white and Asian students
- In early 2000s our middle schools were reluctant to aim for Algebra in grade 8 for all
- Some ten years back PAUSD made a decision to aim for Algebra for all by 8th grade
- This was generally successful, and by 2013 about 2/3 of the cohort took Algebra by grade 8, with the average score being in the **Advanced** range.

PAUSD after Common Core

The Good

- Middle school staff met and wisely decided to augment its math program with Common Core rather than replace it by Common Core
- PAUSD Board maintained Algebra I for all students in grade 8 as a district goal

The Bad

- PAUSD lost a measure of how are our 8th graders doing on Algebra
- PAUSD lost objective measure of how are our high school students doing
  - Smarter Balanced (CAASPP) offers no End-of-Course tests
- PAUSD lost a 2nd grade external assessment

However

- PAUSD has introduced annual assessments in English (BAS) in K-5, and in Math 2-5 (MAP).
- No plans for End-of-Course high school tests

- PAUSD replaced its deeply flawed *Everyday Mathematics with a new* K-8 *Bridges in Mathematics*
- PAUSD K-8 curriculum is not supportive of challenged students with limited home support.
- With disadvantaged students, Gilroy Unified does a better job than Palo Alto Unified!
  - Teachers seem to expect that parents will take care of basic reading and arithmetic, so they can focus on more "fun" stuff in the classroom
- Our high school programs are still very strong, yet there are efforts afoot to reduce the number of math lanes and challenging courses
  - Merging Algebra 1 and 1A at Gunn and refusing to look at the results.
  - Efforts to eliminate content in advanced math courses in Paly "*because they go beyond the standards*."

- Common Core, with its "multiple strategies" *ad nauseum,* and lowering expectations for all plays into such mindset
- Dr. Jo Boaler of Stanford is often used by such groups to provide their "research justification" that fluency and memorization are "damaging."
- Unfortunately, many of Dr. Boaler's theories and claims have no research basis, and actual research finding often directly oppose her claims.
  - **Practice and fluency is a remedy for math anxiety!**
  - **Counting on your fingers has never made anyone successful**
  - **Memorization is a key skill without which no learning can happen … not even reading this sentence!**

What Can (and should) Parents Do?

- Perhaps the most important, don't trust the SBAC test results. Results of external tests such as the MAP test tend to be more reliable. In particular, SBAC "cluster" results are meaningless.
- Don't assume that just finishing Algebra 2 course in HS will prepare your child for college.
- At the same time, don't push/accelerate you child unless s/he is ready and expresses interest. Try to create the interest if it is absent.
- Don't buy into the myth that high academic expectations necessarily generate stress or lead to suicide.
  - Gunn, where much of the suicide cluster occurred, has better CHKS (California Healthy Kids Survey) socio-emotional results!
  - CDC found that cluster of suicided was random, with most cases having prior, not necessarily school-related, psychological issues.

What Can Parents Do? II

- *Distributed Practice* is one of the most effective ways to help retention with robust research support.
  a) Teach and assess
  b) Sprinkle homework items over the following 2-4 weeks
  c) Give a short quiz (no need for preparation or re-teaching)

  This is NOT spiralling!
- Teach number facts early and to *automaticity*!
  – Addition/subtraction of 1-digit numbers (up to 18-20) in first grade
  – Multiplication table up to 10x10 in second grade

  Your child will bless you, even if his/her PAUSD teacher may not!

  Stress symmetries to save on memorization and point out the logic behind them, but don't stress speed beyond ascertaining automaticity.

  Automaticity is critical, as it off-loads the limited short-term memory!

What Can Parents Do? III

- Multiple ways of solving every problem are typically a *waste of time*.
  - Different problems tend to have different “natural” paths to solutions
  - Offer multiplicity of types of problems to elicit different approaches rather than forcing multiple solutions on the same problem.
- Worked-out problems are your best friends. Use them a lot and often.
  - If your child struggles, clearly solve a few problems of the class and let him try to solve more, rather than prompt him step-by-step
- Don’t force your child to skip grade/class unless s/he is clearly bored and asks for it.
  - Big problem with skipping 6^{th} grade in PAUSD.

What Can Parents Do? IV

- Much of explicit teaching of mental “tricks” such as using “friendly numbers” is a huge waste of time.
  - Students should be able to calculate by standard procedure quickly and effortlessly
  - Mental shortcuts are helpful to a small subset of problems and most will develop naturally with sufficient practice anyway
  - Explicit teaching of those tricks is wasteful and confusing, often leaving kids confused which trick to use rather than simply solve the problem
- The Number Line is your friend for sorting and comparing numbers.
  - It is a clumsy tool for addition and subtraction
  - It is a handicap for multiplication and division

Yet Common Core insists on using it everywhere

What Can Parents Do? V

- Teach rounding early, and stress it repeatedly over time
  - Pay attention to rounding decimals in the age of the calculator
  - Include estimation skills
- Fluently converting numbers between different forms – decimals, fractions, and percent – is an important skill that is largely neglected in Common Core.
  - Teach and practice it from early grades (grade 4 and up)

In summary

- Pay attention to you child's knowledge & skills
  Don't assume the school does
- Help & challenge your child, but don't push against his/her will

Opting Out of State Test

- The most obvious response of parents
- Parents shouldn't feel bad about pulling kids out. The tests don't provide meaningful insight into your child's performance.
  - In PAUSD less than 40% of 11th graders participated in SBAC in 2018. Less than 20% in 2017.
  - In grades 3-8 participation is much higher.
- Guaranteed by California law
  - *Notwithstanding any other provision of law, a parent's or guardian's written request to school officials to excuse his or her child from any or all parts of the assessments administered pursuant to this chapter* ***shall*** *be granted*
- Empty threats to school funding.

  Never happened, never will
- Intimidation campaign from Sacramento and Washington, DC.

It is a profoundly erroneous truism that we should cultivate the habit of thinking of what we are doing. The precise opposite is the case. Civilization advances by extending the number of important operations which we can perform without thinking about them.

Alfred North Whitehead

Thank You!