

# Math Success for All Students: Results so Far



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1998 to 2006 Overview

MIND Institute - Andrew Coulson

# Before we hit the charts...



“Just passing a standardized math exam without actually mastering the math is not sufficient for opening the door to the high tech world”

- MIND Institute co-founder Dr. Gordon Shaw



# Defining Math Success

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- Major student growth on standardized tests
  - From every starting level of academic proficiency
  - Without a language barrier for ELL
- Schools on track to exceed rising NCLB math proficiency requirements
  - Turn around Program Improvement schools
  - Breakthrough performance “plateaus” at high performing schools
- Student confidence in problem-solving
  - Prepared to pass CAHSEE
  - Open doors to any future academic or career path



# Spatial Temporal Reasoning

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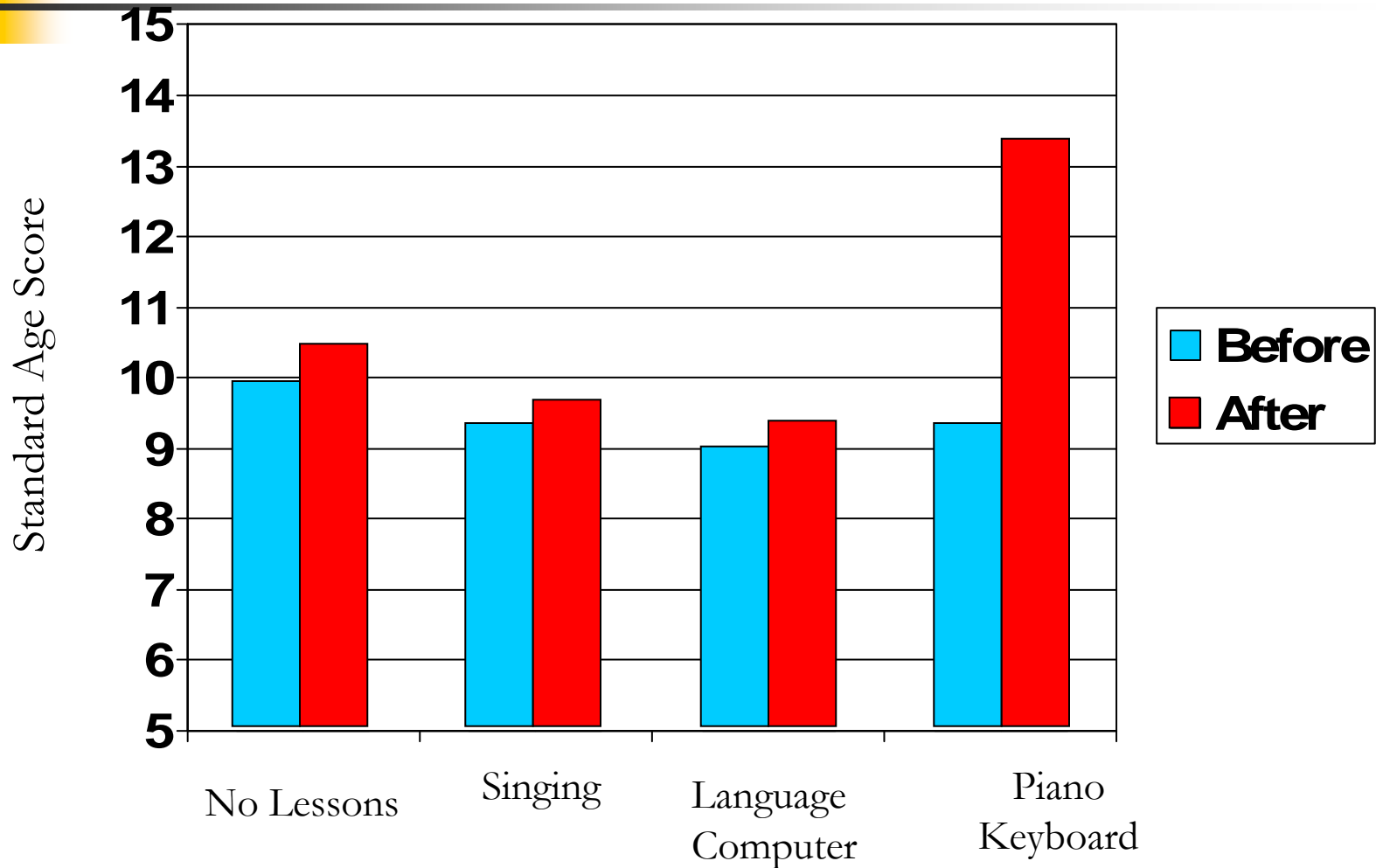
- Spatial Temporal Reasoning (STR) is the ability to form a mental image and manipulate it over a sequence of steps in space and time
- Examples include planning moves ahead in chess, in music, and in math
- This ability is highly valuable to general problem solving
- First research data was on STR

# Example of STR - Piano

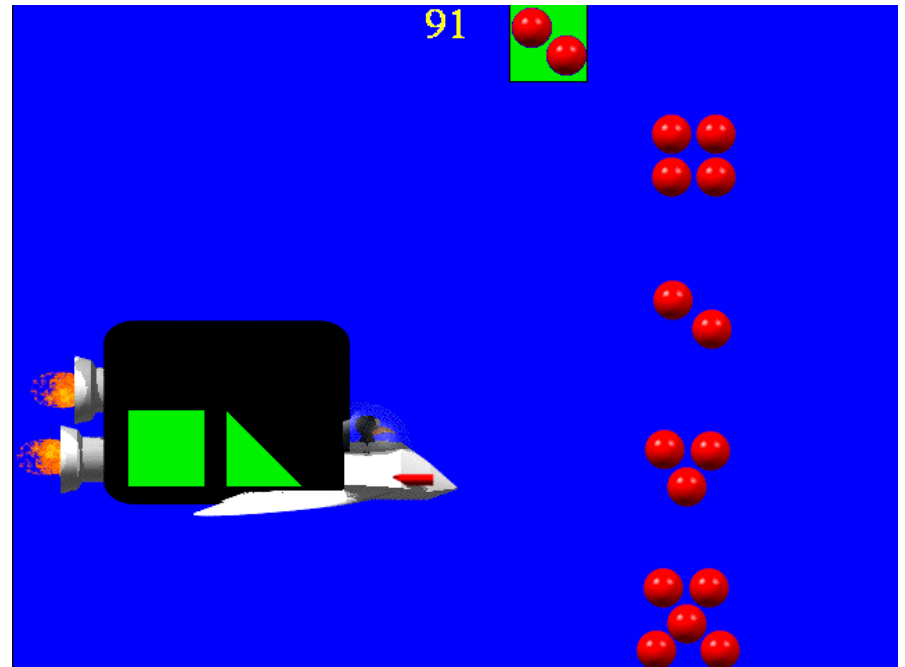


- Planning Next Moves in Space and Time

# First Results 1993: piano and spatial temporal testing



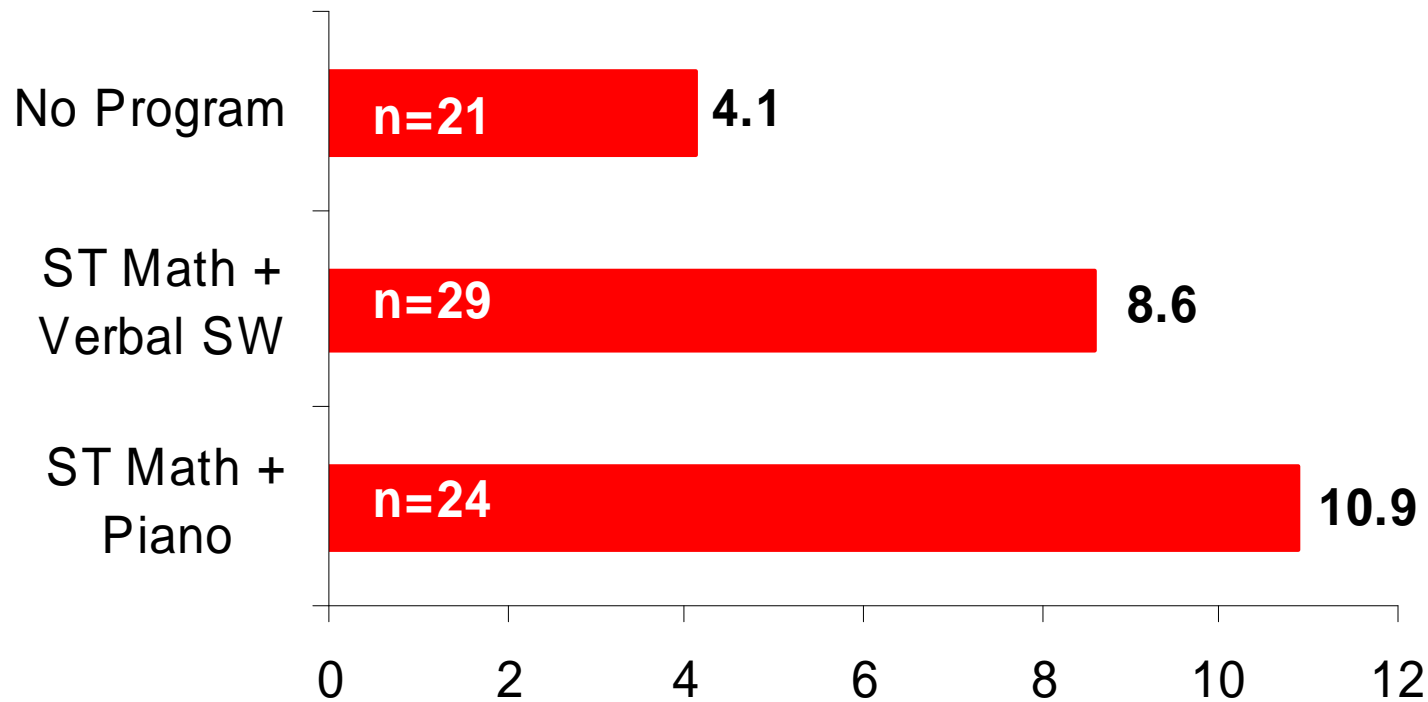
# First Spatial Temporal Software: 1997



- Dr. Matthew Peterson

# First Test Results of ST Math Software+Music: 1998

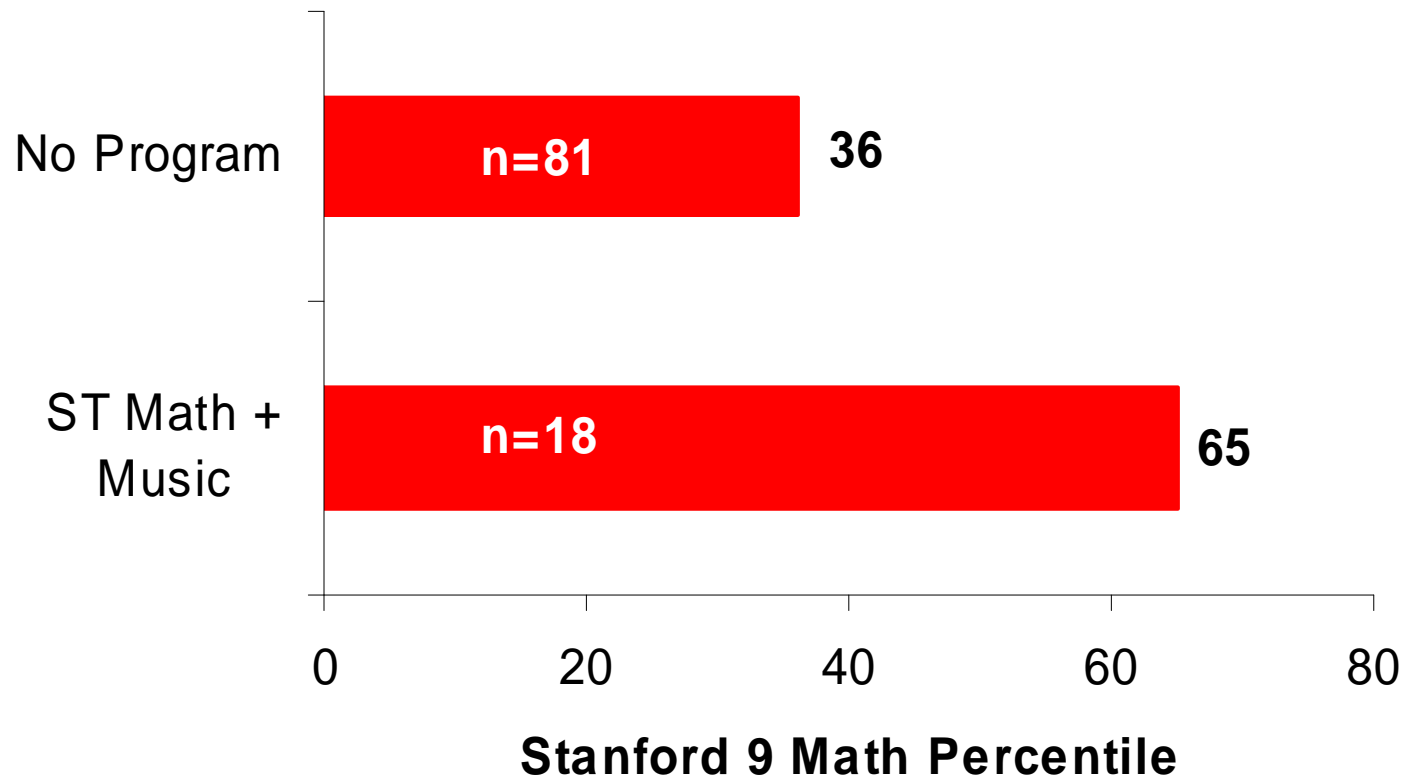
## 1998 First Study 95th Street



**Non Verbal Test: Fractions & Proportions, Raw Score**

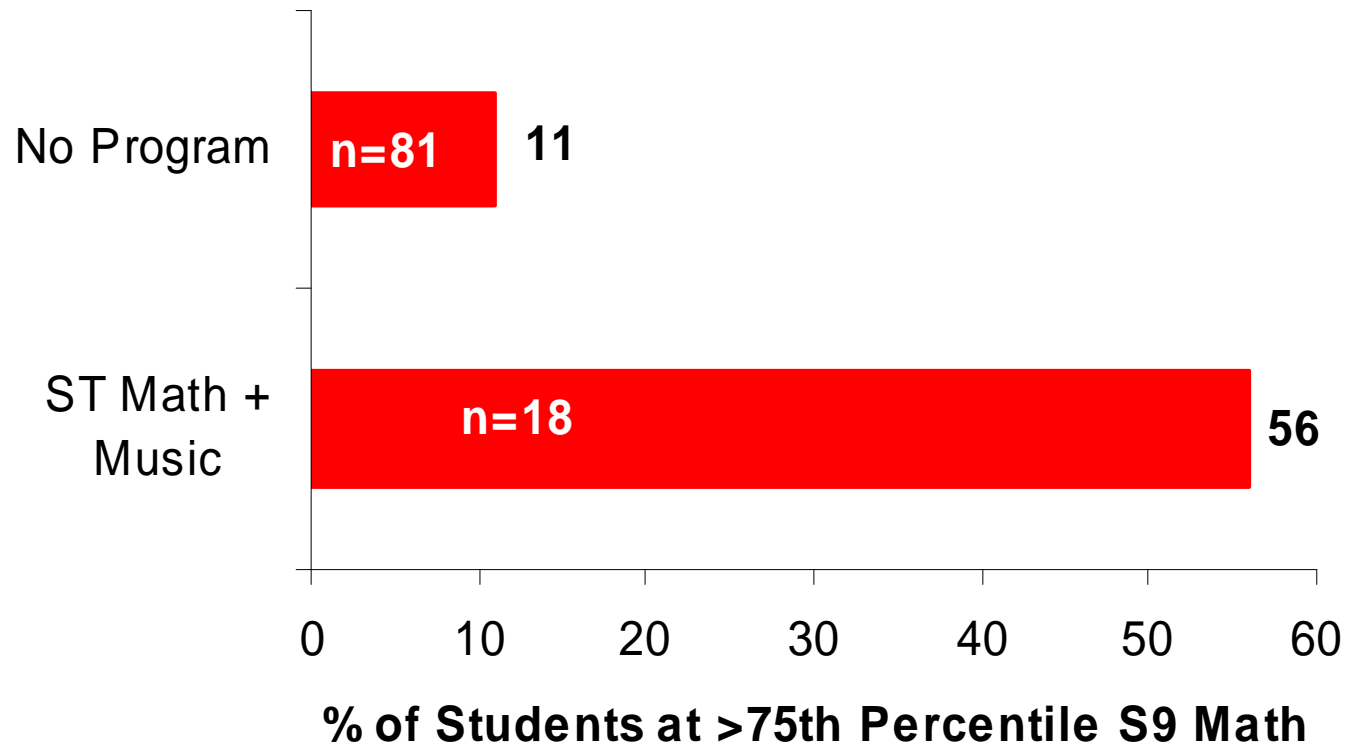
# First State Standardized Math Testing Results: 1999

## 95th Street 1999 2nd Grade



# Moving into the Top Quartile

## 95th Street 1999 2nd Grade





# Can this result scale up?

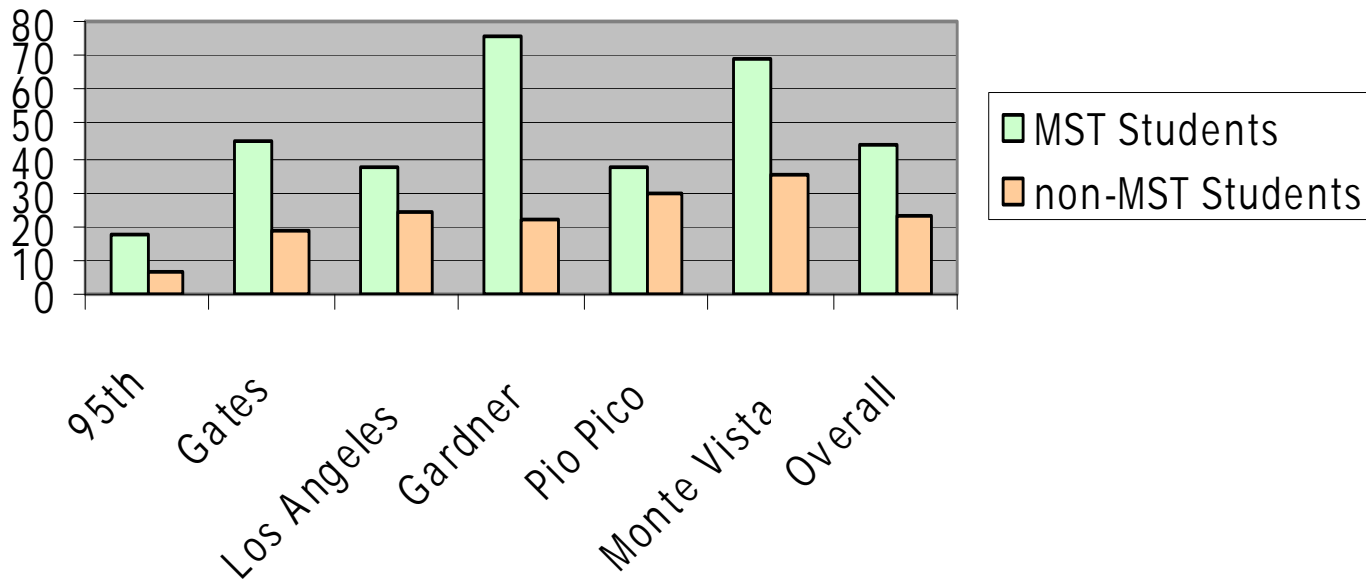
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- 1999 study showed great promise, but:
  - 2<sup>nd</sup> Grade Only
  - Small “n”
  - Taught by MIND Institute Researchers
- Next challenge was to scale up:
  - Wide variety of schools
  - Additional Grades
- Research Pilot Schools Joined Program

# 2002 Top Quartile Comparison

Stanford9 Math

## % of Students In Top Quartile Nationally



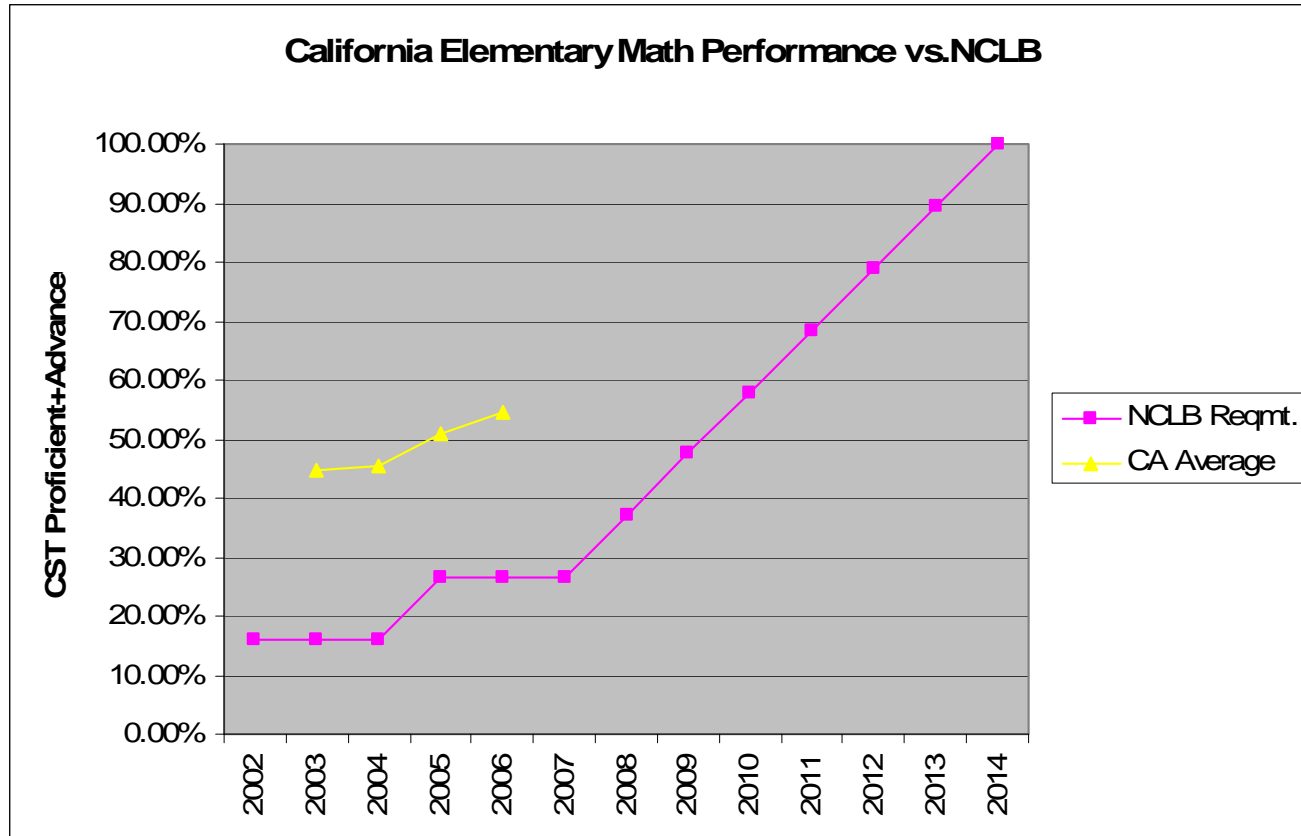


# 2002: NCLB Enters the Scene

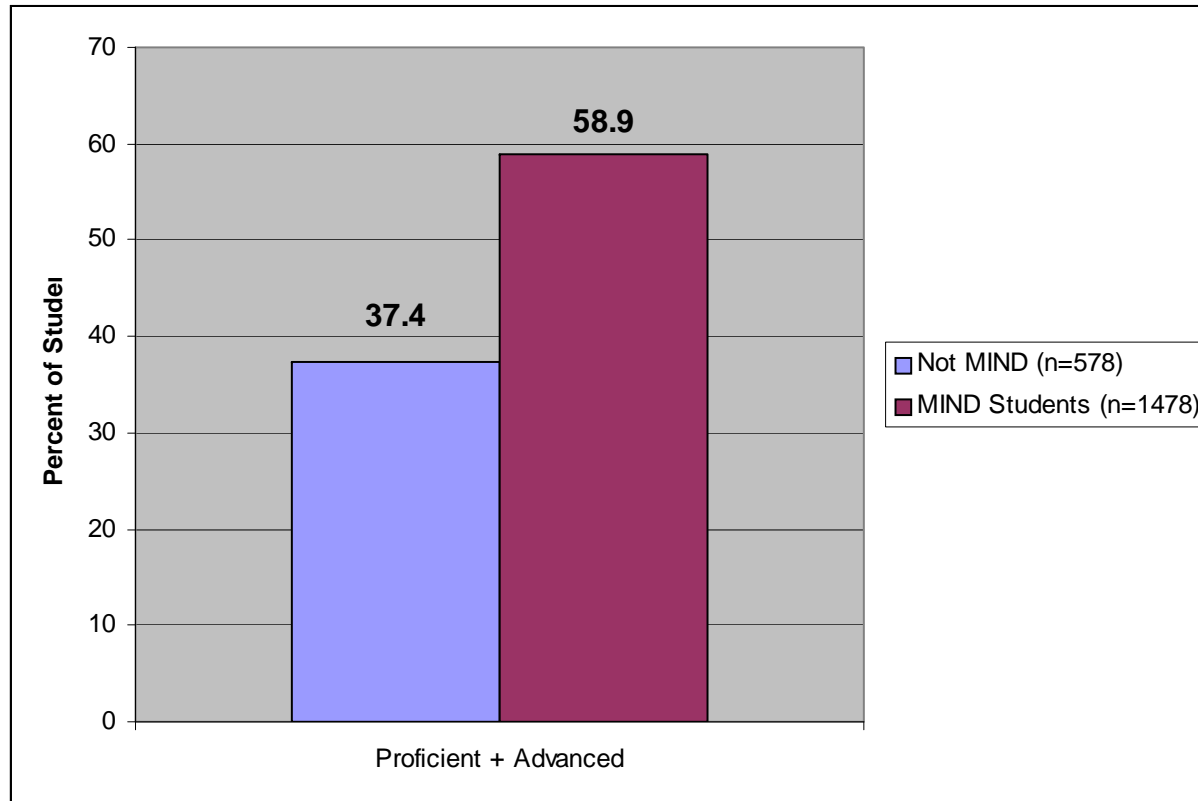
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- Criterion referenced tests
  - New tests – CST in California
- Accountability focused on “Proficient”
  - In CA approximately 65-75% correct raw score is “Proficient”
  - In CA “Advanced” is approx. 88%
- Goal is 100% Proficient in all subgroups by 2014

# NCLB ramp and CA performance



# 2003 Grade 2: California CST State Math Testing Results MIND vs. not MIND



- For participating students in the MIND program in 2002/03, Grade 2, 58.9% passed the NCLB proficiency requirement
- For non-participants at the same schools, only 37.4% passed



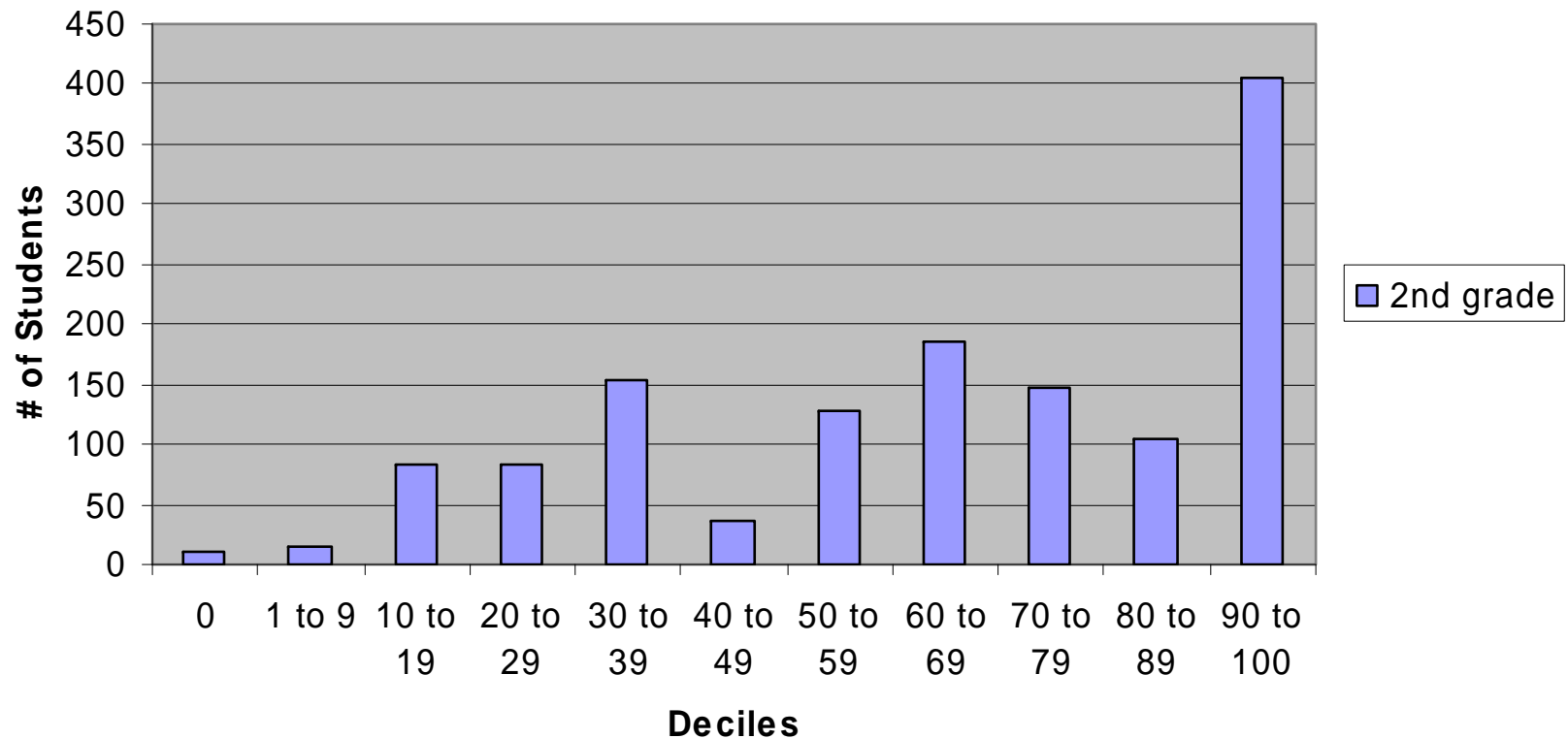
# Let's go further up!

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- Student Progress in Software is tracked
- % completion of software curriculum for all participating students is available

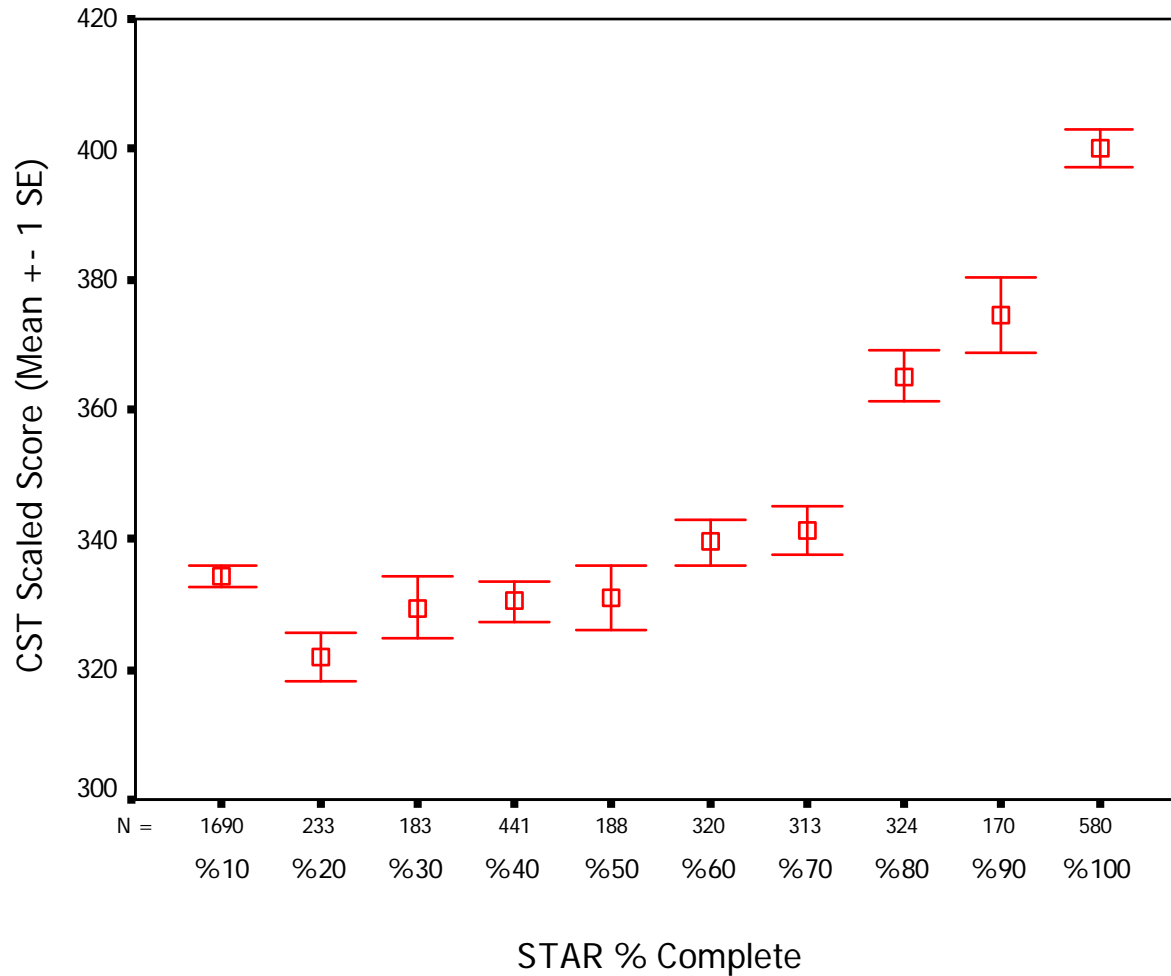
# % Completion by Year-end

STAR % Complete 2003\_04

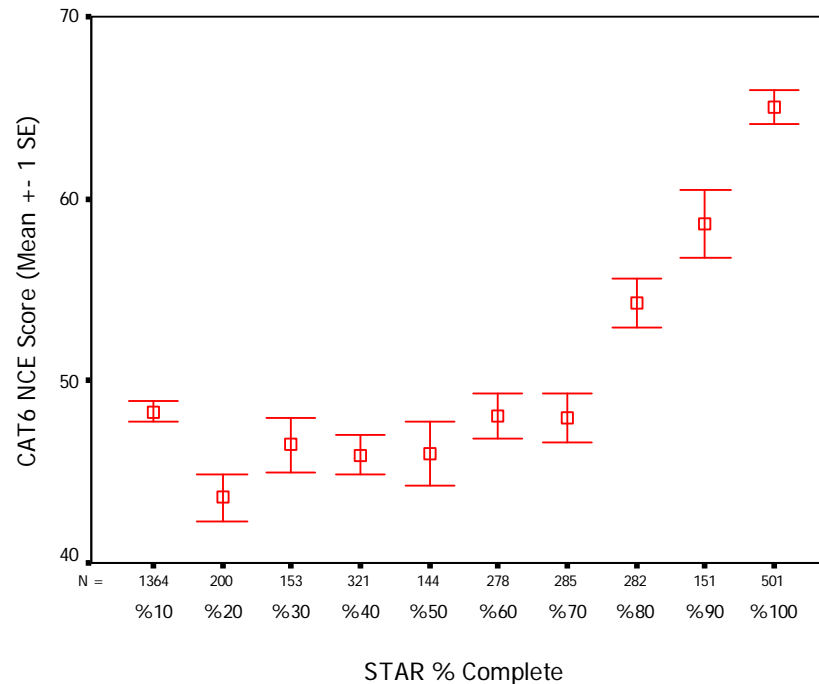


Many students not completing program, what is impact on test scores?

# The Impact of Implementation: CST%



# Impact of Implementation: CAT6



- Conclusion: effects begin at 50% completion
  - Studies use 50% as cut point
  - Average % completion of students in research studies is 75%
  - Aim for  $\geq 75\%$  completion!



# How does the program benefit low and high performers?

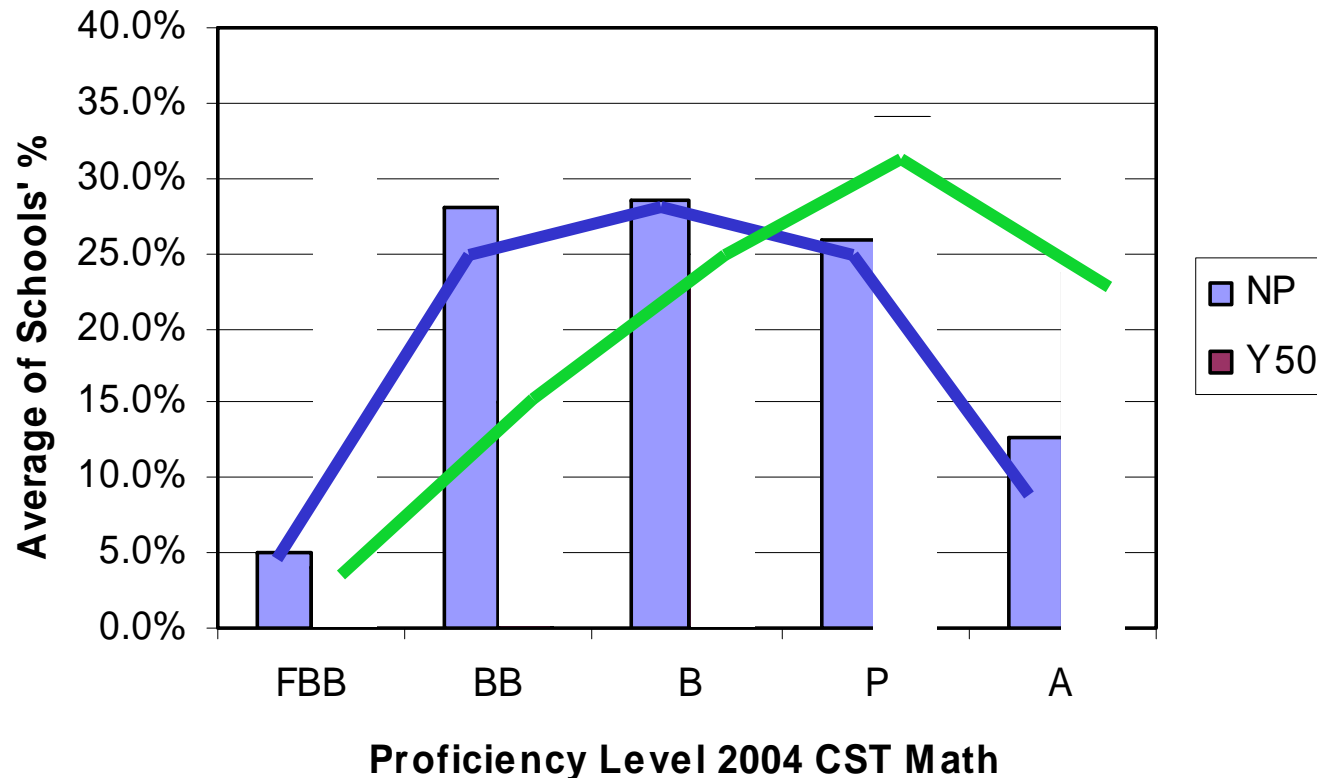
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- New focus on criterion-referenced performance bins allows easy analysis
  - CA's 5 bins are: Far Below Basic, Below Basic, Basic, Proficient, Advanced
- Many schools in 2003 or 2004 had significant number of students not in the program
  - Enabled comparison of in-program to out-of-program, controlled for school/year/grade

# Moving the curve to the right

2<sup>nd</sup> Grade 2003\_04

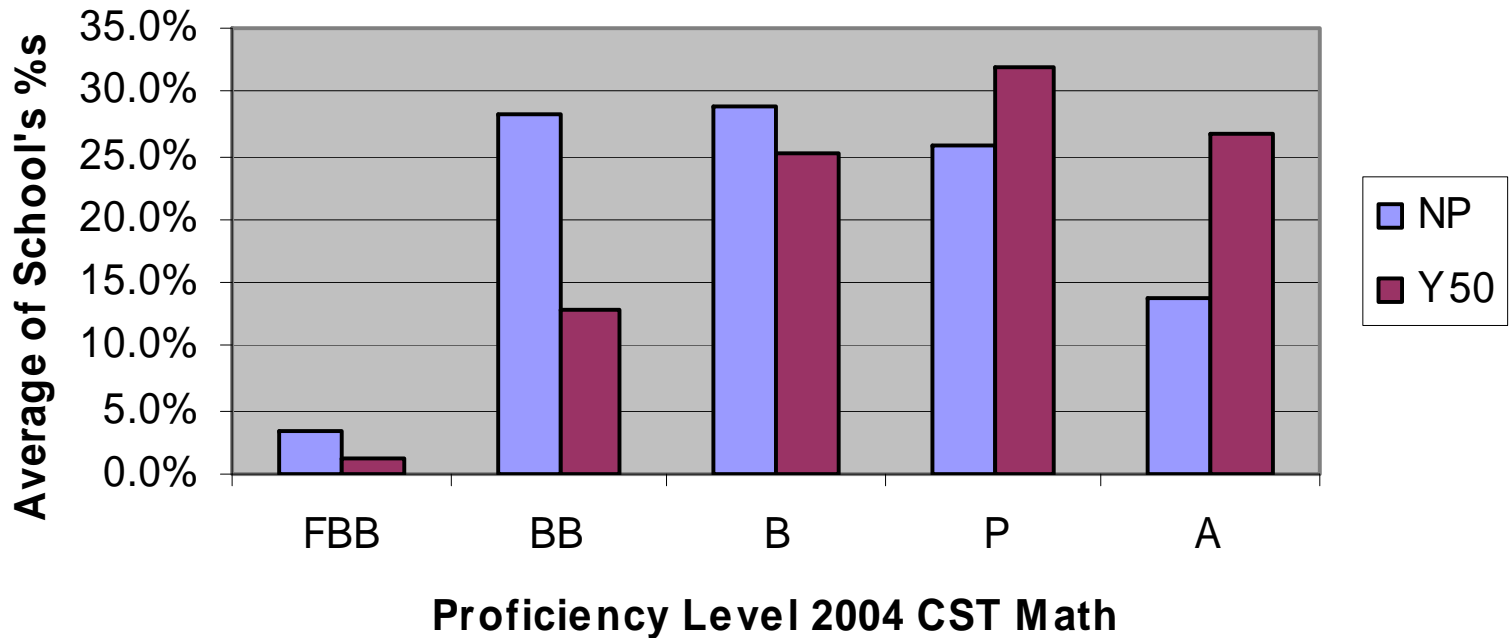
2nd Grade Intraschool Average (7 schools n=984)



# How about other grades?

3rd Grade 2003\_04

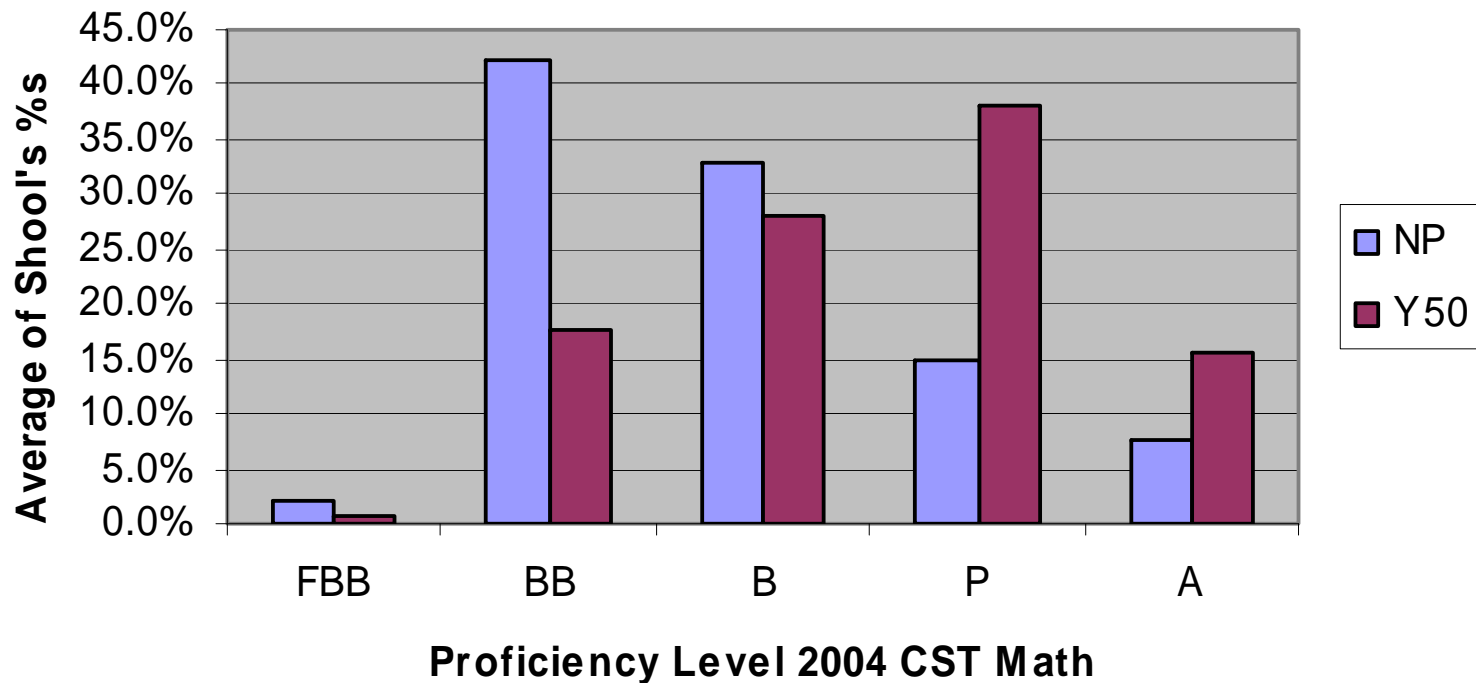
3rd Grade IntraSchool Average (8 Schools  
n=904)



# Similar patterns at each grade

4th Grade 2003\_04

4th Grade IntraSchool Average (3 Schools n-297)





# 2005 data analysis shifts to grade-wide averages

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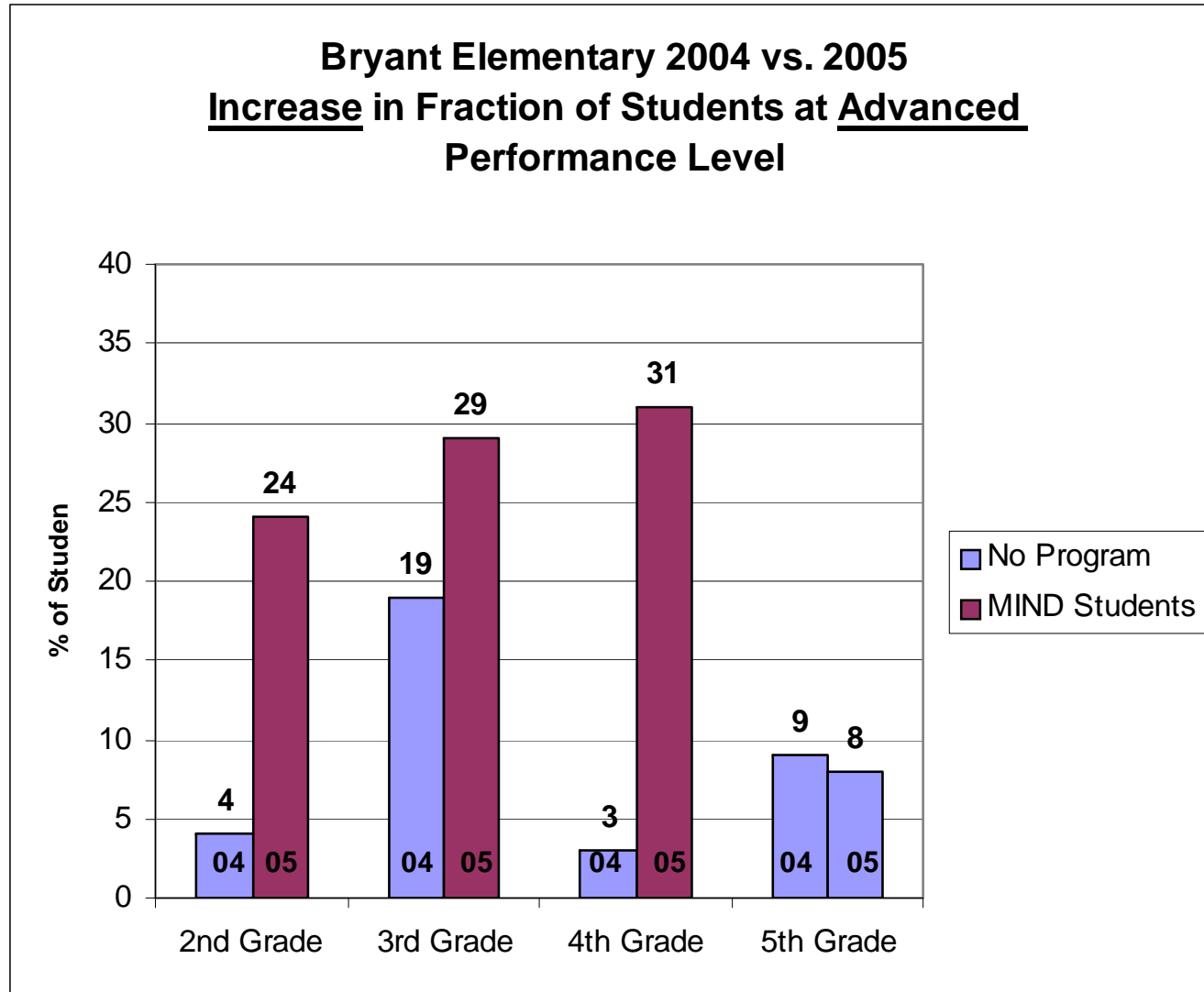
- By 2005, most participating schools no longer have significant numbers of students not-in-program in a grade
- Switch to publicly available grade-wide test data (includes all students in grade regardless of % completion of software)
- Unit of analysis is “grade” not student or school
- Compare performance same grade, same school from year to year



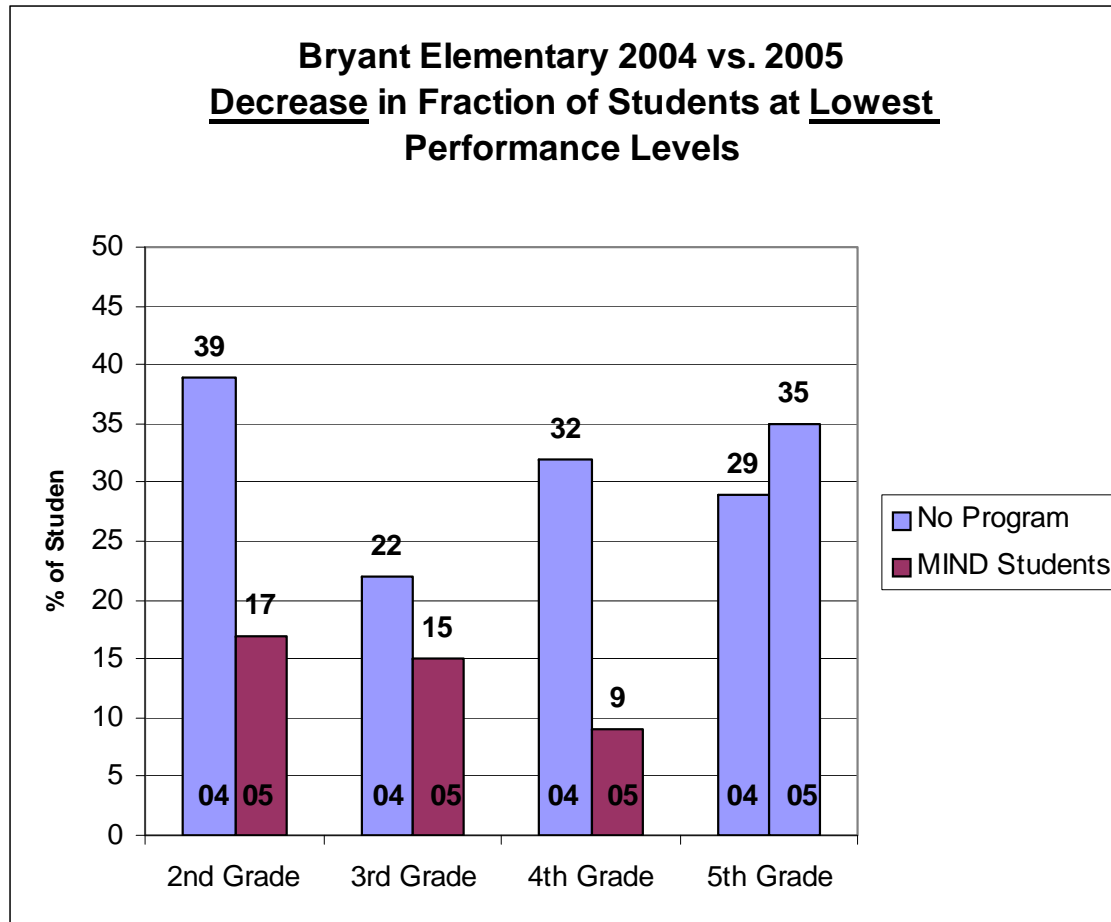
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- School Case Study 2005

# 2005 Grades 2,3,4 Case Study Long Beach Unified



# 2005 Grades 2,3,4 Case Study



- Brain based program reaches all levels of learners



# How can more schools succeed big like this?

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- Research Data can Inform

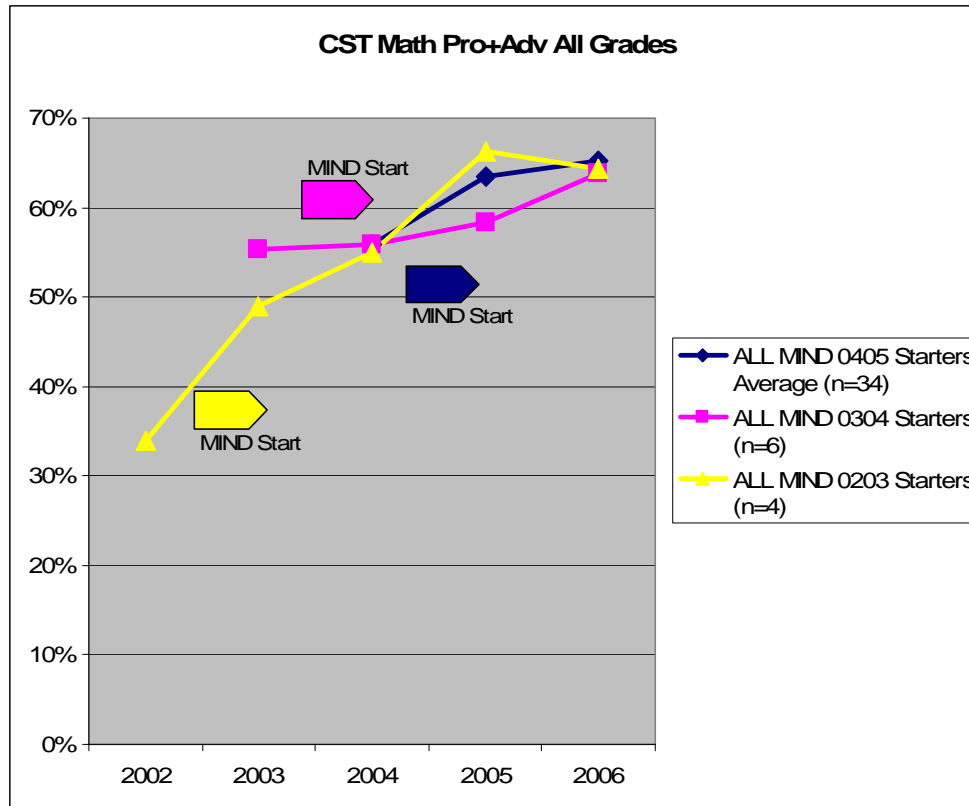
- Objective Measures

- Years in Program
    - Computer Lab – Hardware, net, tech support
    - Attendance of students/teachers (SW, Music)
    - % Completion of Program

- Subjective Measures

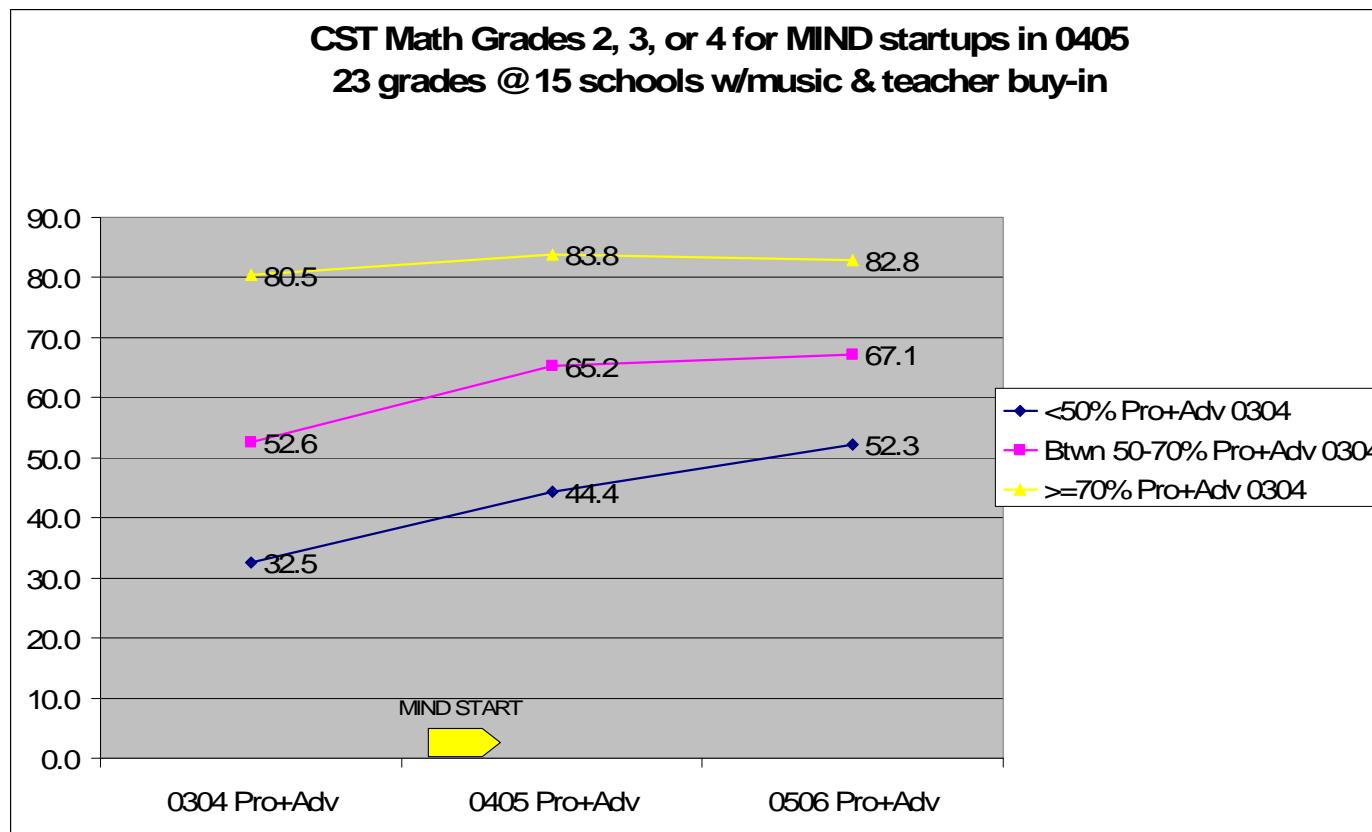
- Principal and/or teacher “buy-in”
    - Connection to classroom teaching

# All Schools: Improved Grade-Average Proficiency for new grades starting in 2002, 2003, and 2004



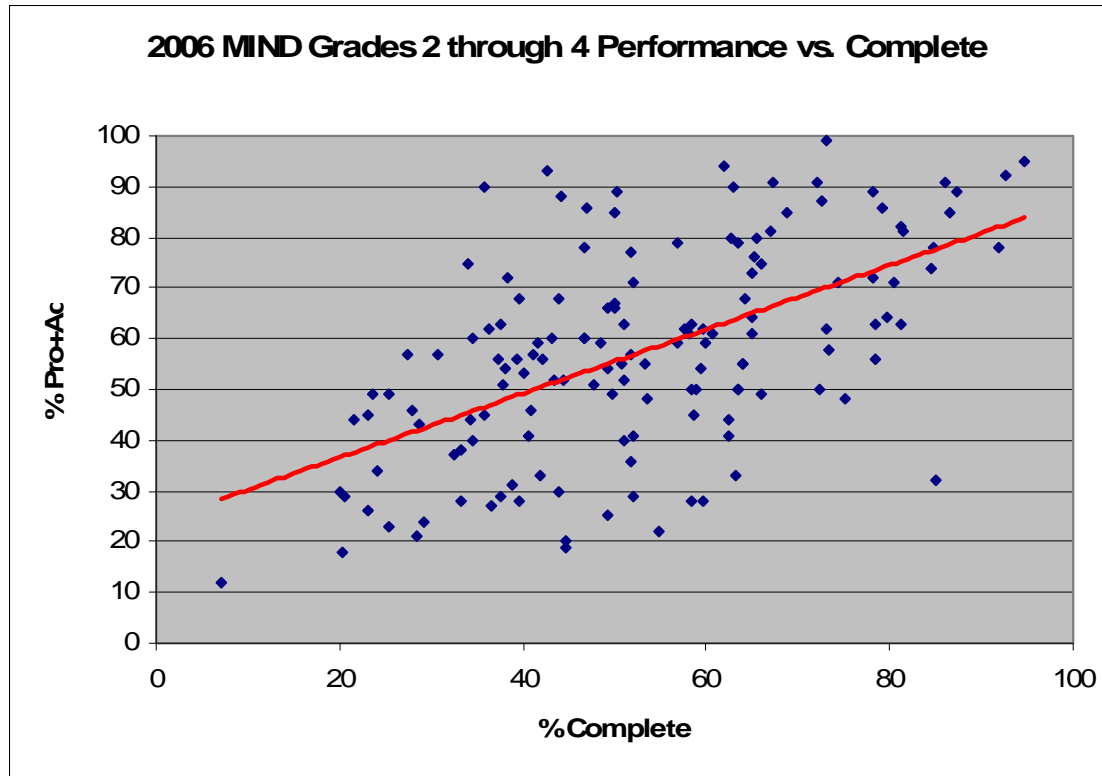
- Each line begins at 1 year before start of MIND program
- Yellow line: average of grades which started in 02/03. Pink: 03/04. Blue: 04/05
- 0405 is first year with significant “n” of new grade starts (n=34)

# Separate 0405 starting grades by starting proficiency level



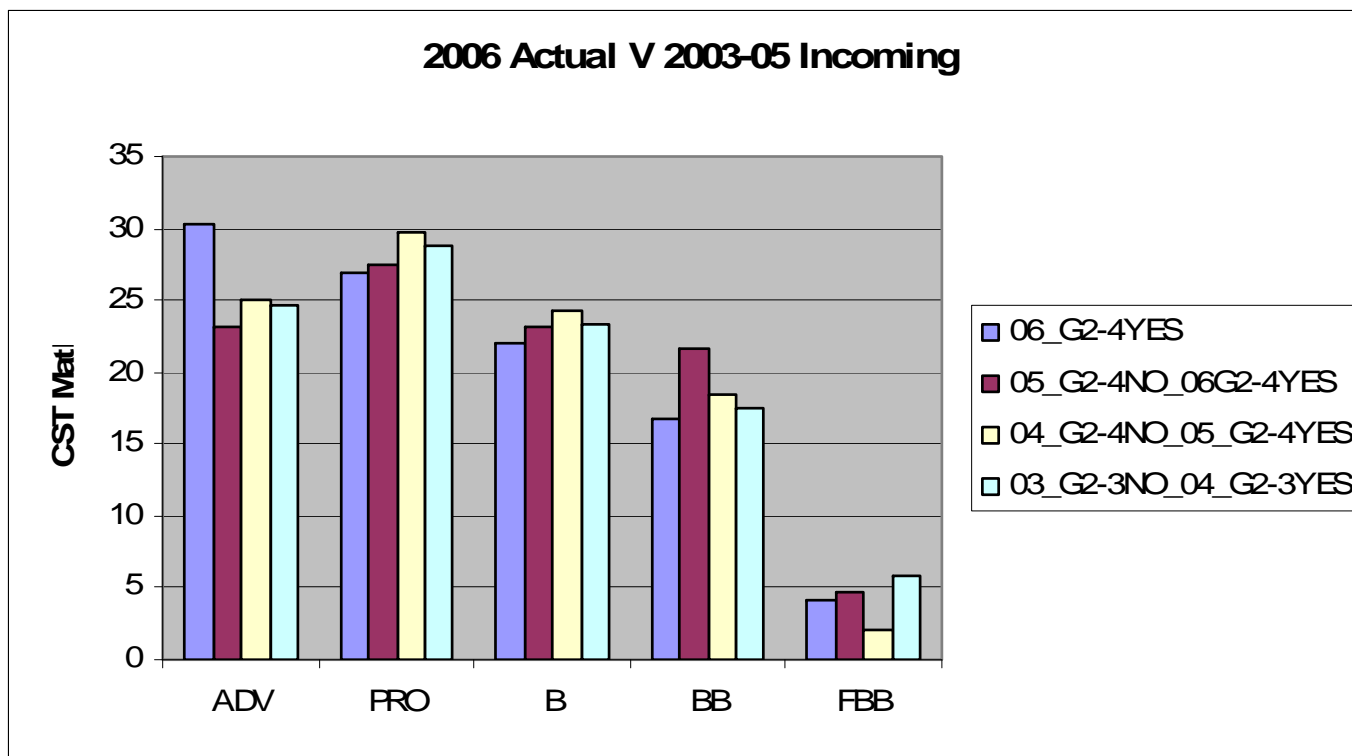
- Blue: <50% Proficient in 03/04: Increase of 19.8 %
- Pink: between 50% & 70% Proficient in 03/04: Increase of 14.5%
- Yellow: >70% Proficient in 03/04: Increase of 2.3%

# Grade-wide proficiency still correlates to % Completion



% of students Proficient or Better still correlated to grade average % completion of program

# Performance Distribution: More students Advanced than Proficient: 2006

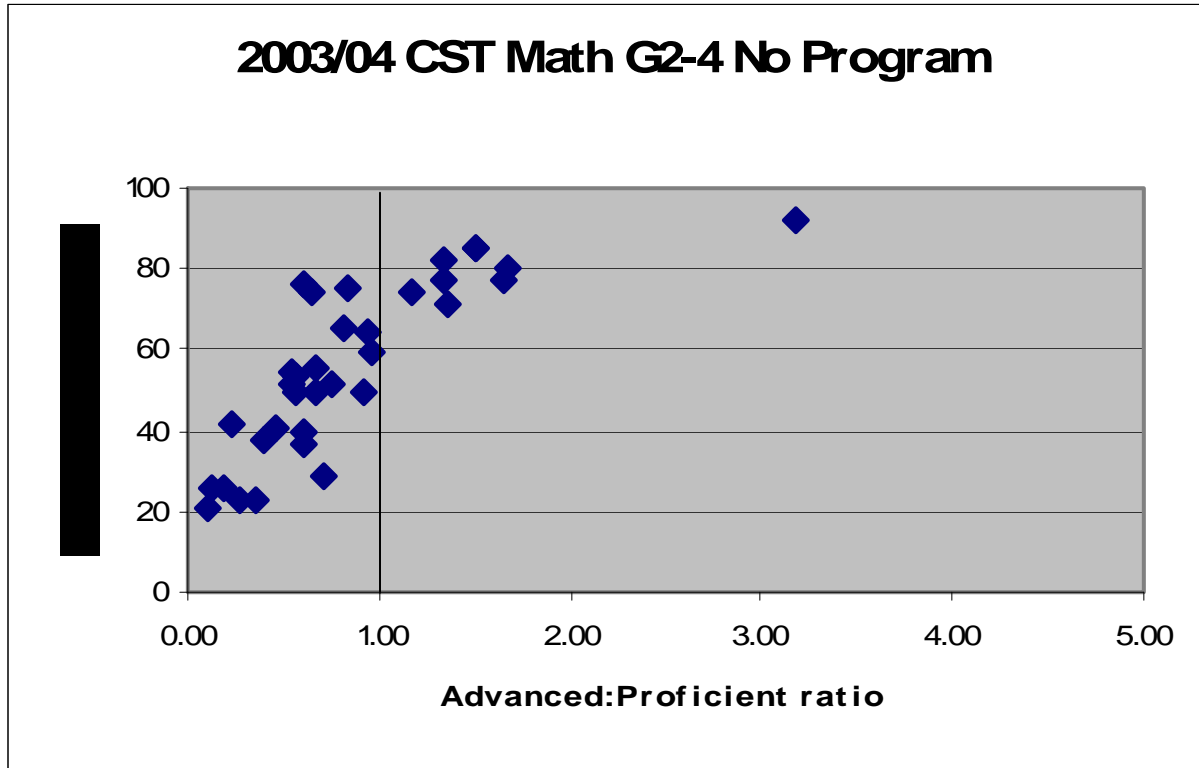


Blue: all participating grades 2 through 4, 2006

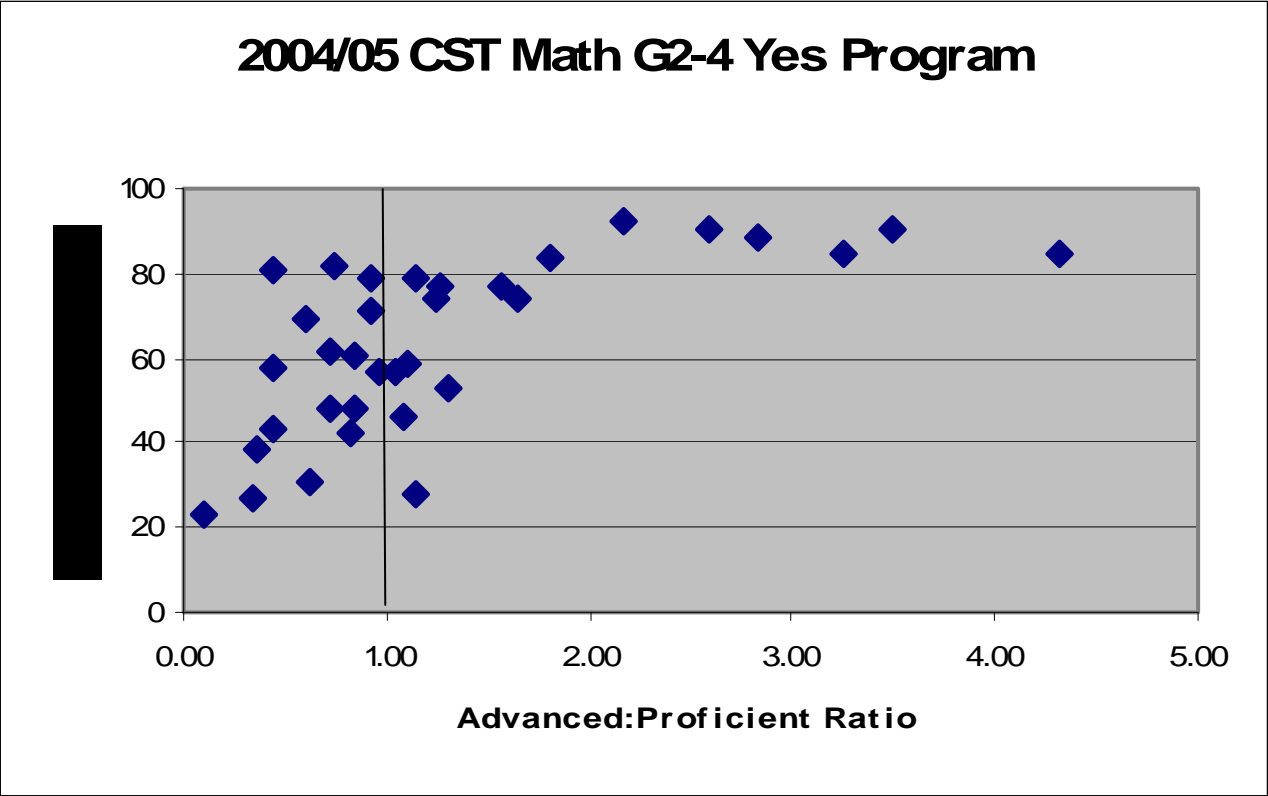
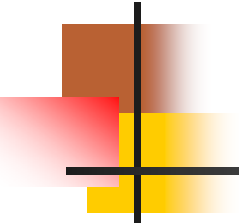
Other bars: incoming “classes” of grades 2003, 2004, 2005

Note different shape of curves: only blue has more ADV than PRO

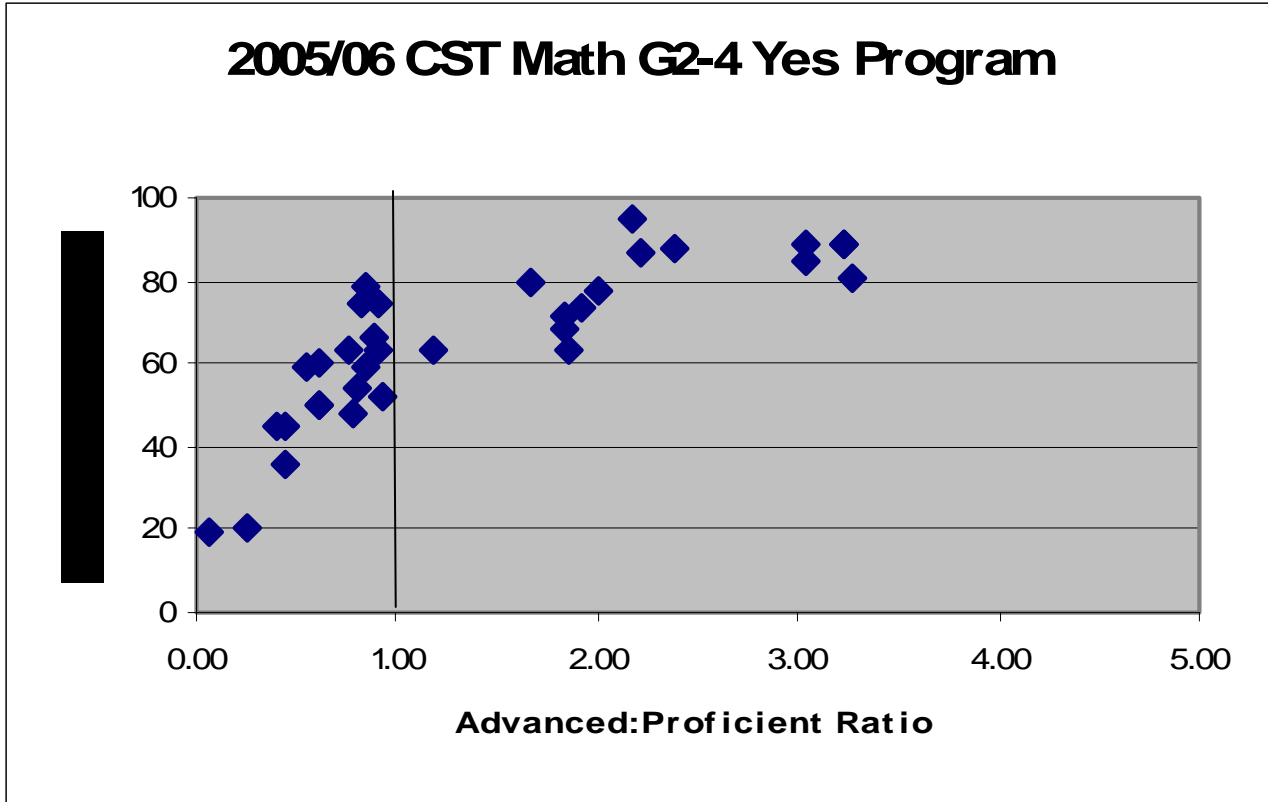
# Track Grades which started in 0405



In year before program begins, 26.5% of grades have more % Advanced than % Proficient



After 1 year of program, 50.0% of grades have more % Advanced than % Proficient



Pattern continues in 2005/06: 44% have more students advanced than proficient; many over 2x more



# Case Study: Madison Elementary, Santa Ana Unified 2002-2006

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- From 2002 to 2006:
- Madison moved to Top 10 in state for its demographic and district type
  - High poverty, high Hispanic and ELL
  - Urban districts over 25,000

Educators

Parents

Policy makers

Corporate  
Partners



Home -> Search -> School Summary -> 4-bar Chart -> Multiyear

More Charts ▾

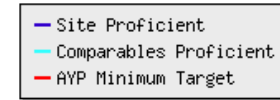
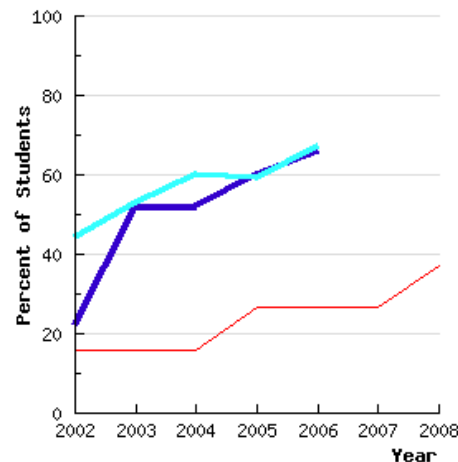
Madison Elementary, Santa Ana Unified  
Grade 2 Mathematics Multiyear Results

Statewide Comparable Schools: 2002: 138 --- 2003: 66 --- 2004: 103 --- 2005: 108 --- 2006: 134

Update

Display Proficient and Above

Display Basic and Ab



- Madison (dark blue line) moved into top 10 comparable in state (turquoise line) for 2<sup>nd</sup> grade math

# Longitudinal Effects: Madison 6<sup>th</sup> Graders

- Students Participated in Program as 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> graders
- Students did not participate as 5<sup>th</sup> or 6<sup>th</sup> graders
- Yet they were the highest performing 6<sup>th</sup> graders in the entire district

Santa Ana Unified School District  
 2005 California Standards Test (CST) Reporting Clusters: Mean Percent Correct  
 Grade 6

	Mathematics = 65 items				
	15 items	10 items	19 items	10 items	11 items
	Ratios/ Proportions/ Percentages/ Neg Fractions	Operations & Problem Solving with Fractions	Algebra & Functions	Measurement & Geometry	Statistics, Data Analysis, & Probability
District	52	56	58	47	45
Carr	54	57	62	55	47
Lathrop	46	49	52	40	38
MacArthur	62	71	67	47	56
Madison Elementary	66	73	74	57	57
McFadden	51	57	57	44	44
Mendez	60	61	66	57	54
Sierra	47	53	54	48	40
Spurgeon	46	50	50	40	38
Taft	53	54	55	49	44
Villa	54	57	58	47	50
Willard	47	51	52	43	37

Source: ETS STAR reports (8/2005)

# Language Arts Correlation...

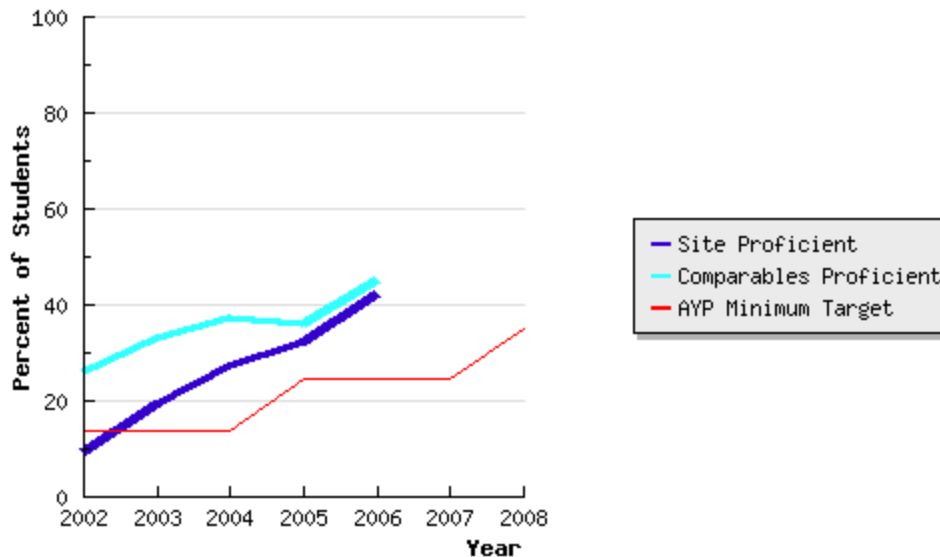
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Display Basic ar



Just for the Kids California - <http://www.jftk-ca.org>  
CDS: 30-66670-6030324  
January 10, 2007, 8:48 am PST



# Steady Progress

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- Research into efficacy is a continual feedback loop
- Our goal is “all students can speak algebra”
- This work results each year in:
  - Improved recommendations for implementation
  - Better feedback tools for teachers
  - Improved games

# Creative Problem Solvers!

*"Equations are just the boring part of mathematics. I attempt to see things in terms of geometry."*

- Stephen Hawking

