

The impact of the use of *Foundations for Algebra 1 and 2* on STAR math test scores in California

Summary

Analysis of the data from 2003 regarding scores on the 7th and 8th grade CAT9 tests shows that using the *Foundations for Algebra 1 and 2 (FFA)* series can significantly improve scores on the mathematics tests given by the State of California. A regression analysis shows that when all the factors have been taken into account, schools that used FFA books had mean scores 8.15 points higher than comparison schools on the 7th grade exams and 9.87 points higher on the 8th grade exams. The differences are significant at the 1% level for both years.

A difference of 8-10 points means that most schools would increase their percentile ranking by 5 to 15 points, moving, say, from the 40th percentile among schools to the 55th.

Methodology

All of these data are computed using the 2003 CAT6 data from the STAR report put out on the California Department of Education web site (<http://www.cde.ca.gov/ta/tg/sr/index.asp>). Of the 1930 schools who reported scores for seventh grade data, 29 were schools that used FFA. A school was identified as using FFA if they reported using FFA or CPM books for more than half of their classes at the relevant grade. Similarly, of the 1871 schools reporting CAT6 scores, the same 29 used FFA. Separate regression analyses were run on the data for seventh and eight grade school scores. The results of the regression are shown in Appendix A.

Significance of data.

Seventh grade.

As stated in the summary, the regression analysis shown in Appendix A shows that a typical school using FFA would expect to have a STAR score 8.15 points higher than an identical school using traditional textbooks. The range of mean school scores for the entire state was 544 for a school serving special needs children to 756 for a magnet school, so there is a 212 point range overall. However, it is rather more meaningful to see how an 8 point increase in mean score affects the percentile ranking of the school, which is the number most commonly reported in the newspaper.

To investigate this question, we found the percentile ranking for each of the 1954 schools and compared it to the ranking that this school would have had if their mean STAR score had been 8.15 points higher. The results are summarized in the partial table below. As an example of how the table should be read, the entry of 55 at the top of the third column is for a school that scored in the 55th percentile with their STAR score (670.8) while they would have scored in the 69th percentile if their STAR score had been 678.9. See Appendices B and C for details.

STAR scores

True rank	Projected rank
5	10
10	17
15	26
20	32
25	36
30	42
35	49
40	54
45	59
50	64

True rank	Projected rank
55	69
60	72
65	76
70	81
75	85
80	88
85	92
90	95
95	98

While not apparent from the table, it was found that such an increase would increase the percentile ranking of 63% of the schools by 10-14 percentile points.

Eighth grade.

For the 8th grade STAR scores the results are even more dramatic since the increase in test means was 9.87. A similar table is printed below. Here it was found that 64% of the schools could increase their ranking by at least 10 percentiles and 18% of the schools could increase their ranking by at least 15 percentiles.

STAR scores

True rank	Projected rank
5	8
10	17
15	25
20	32
25	39
30	45
35	49
40	56
45	60
50	66

True rank	Projected rank
55	70
60	75
65	78
70	82
75	85
80	89
85	93
90	96
95	98

Appendix A

All the scores came from the STAR 2003 data middle schools.

Variable	Obs	Mean	Std. Dev.	Min	Max
mean7	1930	665.2867	26.54679	544.9	756.5
mean8	1871	676.1923	34.2993	563.5	767.4

Regressions

Each table represents three separate regressions estimating the CAT6 score on the basis of the given variables. The first regression takes nothing into account other than whether or not the school was a school using FFA. The third column represents the regression using all seven listed variables. The coefficients of each regression are given in the columns marked (1), (2) and (3); the numbers in parentheses are the standard deviations associated to the coefficient immediately to its left.

In case you are unfamiliar with reading tables of this type, here is an example from the first table. A school does not use FFA, is 30% African American, 50% Hispanic and 20% white. At the school, the pupil teacher ratio is 20 to 1 and 25% of the students are on free and reduced price lunches. Then, the best estimator to the CAT6 score of the school would be:

$$676.43 + (0.3)*(-76.82) + (0.5)*(-37.3) + 20*0.6 + (.25)*(-14.76) = 643.044.$$

The numbers represent, respectively, the constant score, the change due to the percentage of African American students, the change due to the percentage of Hispanic students, the change due to the pupil-teacher ratio and the change due to the percentage of students on free and reduced price lunch. If the school had been using FFA, their scores would have been 8.15 points higher. In both tables, the ** indicates that all of the results are significant at the 1% level.

Seventh grade CAT6 data

CAT6 Mathematics	(1)		(2)		(3)	
FFA	14.89	(2.98)**	7.37	(2.22)**	8.15	(2.15)**
% African American Students			-81.68	(1.98)**	-76.82	(1.98)**
% American Indian Students			-62.18	(4.80)**	-40.8	(4.86)**
% Asian Students			37.83	(2.07)**	38.5	(2.01)**
% Hispanic Students			-48.05	(0.94)**	-37.3	(1.28)**
Pupil Teacher Ratio					0.6	(0.04)**
% Free & Reduced Price Lunch					-14.76	(1.19)**
Constant	665.09	(0.34)**	688.06	(0.55)**	676.43	(1.11)**

Eighth grade CAT6 data

CAT6 Mathematics	(1)		(2)		(3)	
FFA	19.75	(3.90)**	9.01	(3.24)**	9.87	(3.21)**
% African American Students			-89.12	(2.73)**	-87.42	(2.77)**
% American Indian Students			-66.57	(6.04)**	-56.25	(6.26)**
% Asian Students			51.18	(2.99)**	49.68	(2.96)**
% Hispanic Students			-46.26	(1.36)**	-45.27	(1.78)**
Pupil Teacher Ratio					0.73	(0.06)**
% Free & Reduced Price Lunch					-1.5	(1.60)**
Constant	675.95	(0.43)**	698.48	(0.80)**	682.36	(1.56)**

Appendix B. Listing of 100 7th grade schools in middle of each percentile rank.

School Name	Mean7	Actual rank	Mean7 + 8.15	Adjusted rank	Increase
SAN LUIS OBISPO COUNTY JUVENILE COURT	609.2	1	617.4	3	2
REID SENIOR HIGH (CONT.)	614.4	2	622.6	3	1
MUIR (JOHN) MIDDLE	619.9	3	628.1	5	2
BERENDO MIDDLE	626.2	4	634.4	7	3
GOLDEN POPPY	629.4	5	637.6	10	5
ADAMS (JOHN) MIDDLE	631.4	6	639.6	11	5
DESERT MOUNTAIN COMMUNITY DAY	633.4	7	641.6	13	6
CALIFORNIA CHARTER ACADEMY OF ORANGE COUNTY	635.3	8	643.5	14	6
LA PAZ MIDDLE	636.6	9	644.8	15	6
SIERRA INTERMEDIATE	638.2	10	646.4	17	7
TIOGA MIDDLE	639.5	11	647.7	19	8
WASHINGTON MIDDLE	640.7	12	648.9	21	9
WASHINGTON ACADEMIC MIDDLE	641.9	13	650.1	23	10
MOUNTAIN VIEW MIDDLE	643.3	14	651.5	25	11
LINCOLN ELEMENTARY	644.4	15	652.6	26	11
MORADA MIDDLE	645.4	16	653.6	28	12
LOS CERRITOS ELEMENTARY	646.5	17	654.7	30	13
NEW HOPE ELEMENTARY	647.1	18	655.3	30	12
LE GRAND ELEMENTARY	647.8	19	656.0	31	12
SOJOURNER TRUTH LEARNING ACADEMY	648.3	20	656.5	32	12
MOUNTAIN VIEW MIDDLE	649.1	21	657.3	33	12
JOHNSON (LLOYD G.) JR. HIGH	649.7	22	657.9	34	12
WHITE (STEPHEN M.) MIDDLE	650.3	23	658.5	34	11
SERRANO MIDDLE	650.9	24	659.1	35	11
NORTHRIDGE MIDDLE	651.4	25	659.6	36	11
HORACE MANN MIDDLE	652.2	26	660.4	37	11
SHANDON HIGH/MIDDLE	652.9	27	661.1	38	11
LINCOLN MIDDLE	653.6	28	661.8	40	12
HESPERIA JUNIOR HIGH	654.2	29	662.4	41	12
LUCERNE VALLEY MIDDLE	654.9	30	663.1	42	12
MARSHALL FUNDAMENTAL	655.7	31	663.9	43	12
BLAKER-KINSER JUNIOR HIGH	656.5	32	664.7	44	12
SOUTHWEST MIDDLE	657.3	33	665.5	46	13
NEW VISTA MIDDLE	658.2	34	666.4	47	13
AMERICAN ELEMENTARY	659	35	667.2	49	14
DAIRYLAND ELEMENTARY	659.5	36	667.7	50	14
VISTA VERDE MIDDLE	660.2	37	668.4	51	14
PALO VERDE ELEMENTARY	660.9	38	669.1	52	14
HUGHES-ELIZABETH LAKES ELEMENT	661.4	39	669.6	53	14
SHASTA ELEMENTARY	661.9	40	670.1	54	14
KWACHIIYAO	662.4	41	670.6	55	14
WASHINGTON INTERMEDIATE	663.1	42	671.3	56	14
BROOKHURST JUNIOR HIGH	663.8	43	672.0	57	14
LA QUINTA MIDDLE	664.4	44	672.6	58	14
ALTERNATIVE/OPPORTUNITY	664.9	45	673.1	59	14
MANZANITA MIDDLE	665.5	46	673.7	60	14
GREER (VERNON E.) MIDDLE	666.1	47	674.3	61	14

SHIVELY (DEAN L.) ELEMENTARY	666.6	48	674.8	62	14
SPRING GROVE ELEMENTARY	667.2	49	675.4	63	14
VALLEY MAGNET	667.7	50	675.9	64	14
JUNIPER ACADEMY	668.2	51	676.4	65	14
BALLICO ELEMENTARY	668.8	52	677.0	66	14
MARY P. HENCK INTERMEDIATE	669.6	53	677.8	67	14
EDWARDS (GLEN) MIDDLE	670	54	678.2	68	14
CAMPTONVILLE ACADEMY	670.8	55	679.0	69	14
PARKER DAM ELEMENTARY	671.5	56	679.7	70	14
WALLACE (WOODROW W.) MIDDLE	672.1	57	680.3	70	13
WARNER MIDDLE	672.5	58	680.7	71	13
VANDENBERG MIDDLE	672.9	59	681.1	71	12
MONTGOMERY ELEMENTARY	673.6	60	681.8	72	12
ORO LOMA ELEMENTARY	674.1	61	682.3	73	12
TAFT ELEMENTARY	674.5	62	682.7	73	11
RIVER GLEN SCHOOL	675	63	683.2	74	11
CRESCENT ELK MIDDLE	675.9	64	684.1	76	12
SANTA YNEZ ELEMENTARY	676.4	65	684.6	76	11
JANESVILLE ELEMENTARY	677.3	66	685.5	77	11
ABBOTT MIDDLE	677.8	67	686.0	78	11
LEWIS (DANIEL) MIDDLE	678.4	68	686.6	79	11
LADERA VISTA JUNIOR HIGH	679.3	69	687.5	80	11
ADAMS (JOHN) MIDDLE	680	70	688.2	81	11
BLUE LAKE ELEMENTARY	680.9	71	689.1	82	11
STACEY MIDDLE	681.7	72	689.9	83	11
BUTTE VALLEY MIDDLE	682.5	73	690.7	84	11
ALVARADO MIDDLE	683.1	74	691.3	84	10
HILLCREST MIDDLE	683.6	75	691.8	85	10
MONTGOMERY CREEK ELEMENTARY	684.4	76	692.6	85	9
ANDERSON VALLEY JR./SR. HIGH	685.3	77	693.5	86	9
RANCHO-STARBUCK INTERMEDIATE (685.9	78	694.1	87	9
SHERIDAN SCHOOL	686.5	79	694.7	87	8
CARLTON HILLS ELEMENTARY	687.2	80	695.4	88	8
SPRING VIEW MIDDLE	687.8	81	696.0	89	8
PACIFIC GROVE MIDDLE	688.8	82	697.0	90	8
BOLINAS ELEMENTARY	690.1	83	698.3	91	8
FRUITVALE JUNIOR HIGH	691.2	84	699.4	91	7
DARTMOUTH MIDDLE	692.2	85	700.4	92	7
NIGUEL HILLS MIDDLE	693.2	86	701.4	93	7
BROWNS ELEMENTARY	694.2	87	702.4	93	6
LOS OLIVOS ELEMENTARY	695.2	88	703.4	94	6
SUTTER MIDDLE	696.1	89	704.3	94	5
OAK MIDDLE	697.4	90	705.6	95	5
SCOTTS VALLEY MIDDLE	698.6	91	706.8	96	5
JOHNSTONVILLE ELEMENTARY	700.2	92	708.4	96	4
OAK AVENUE INTERMEDIATE	701.7	93	709.9	97	4
HYDE (WARREN E.) MIDDLE	703.5	94	711.7	98	4
EL SEGUNDO MIDDLE	705.1	95	713.3	98	3
HOLMES (OLIVER WENDELL) JR. HIGH	707.1	96	715.3	98	2
MANHATTAN BEACH MIDDLE	709.8	97	718.0	99	2
ARCADE MIDDLE	712.7	98	720.9	99	1
CUPERTINO MIDDLE	718.1	99	726.3	100	1
RANCHO SANTA FE MIDDLE	726.6	100			

Appendix C. Listing of 100 8th grade schools in middle of each percentile rank.

School Name	Mean8	Actual rank	Mean8 + 9.87	Adj. Rank	Increase
PINNACLE MIDDLE SCHOOL ACADEMY					
COMMUNITY DAY SCHOO	599.3	1	609.2	2	1
CORNERSTONE ACADEMY	613.1	2	623.0	4	2
SAN DIEGO COUNTY JUVENILE COURT	620.1	3	630.0	5	2
SPECIAL EDUCATION	625.3	4	635.2	6	2
SAN LUIS OBISPO COUNTY JUVENILE COURT	630.4	5	640.3	7	2
SUMMIT SCHOOLS	635	6	644.9	9	3
EDISON-MCNAIR ACADEMY	638.9	7	648.8	11	4
3 R COMMUNITY DAY	641.7	8	651.6	13	5
OAKLAND CHARTER ACADEMY	645.4	9	655.3	15	6
ALTERNATIVE/OPPORTUNITY	647.2	10	657.1	17	7
ALTERNATIVE LEARNING CENTER	648.4	11	658.3	18	7
HELMS MIDDLE	649.8	12	659.7	20	8
SOUTH GATE MIDDLE	651	13	660.9	21	8
WEBSTER MIDDLE	652.9	14	662.8	23	9
OPTIONS FOR YOUTH-VICTORVILLE CHAR	654.5	15	664.4	25	10
RIVERA (TOMAS) MIDDLE	655.4	16	665.3	26	10
MARINA DEL REY MIDDLE	656.8	17	666.7	28	11
FREMONT MIDDLE	657.9	18	667.8	29	11
BARTLETT INTERMEDIATE	658.8	19	668.7	30	11
OPTIONS FOR YOUTH - SAN GABRIEL, INC.	659.8	20	669.7	32	12
ROSELAND ACCELERATED MIDDLE SCHOOL	660.9	21	670.8	34	13
WILTSEY (RAY) MIDDLE	661.8	22	671.7	35	13
HARRIS (RUTH O.) MIDDLE	662.6	23	672.5	36	13
PACOIMA MIDDLE	663.7	24	673.6	38	14
VANGUARD LEARNING CENTER	664.7	25	674.6	39	14
LOS BANOS JUNIOR HIGH	665.3	26	675.2	40	14
TERRACE HILLS MIDDLE	665.9	27	675.8	41	14
WINTON MIDDLE	666.4	28	676.3	42	14
MCCLOUD ELEMENTARY	667.5	29	677.4	44	15
CECIL AVENUE MIDDLE	668.3	30	678.2	45	15
MONTGOMERY MIDDLE	669.1	31	679.0	46	15
LEON H. OLLIVIER MIDDLE	669.9	32	679.8	47	15
SEQUOIA MIDDLE	670.3	33	680.2	48	15
LANDMARK MIDDLE	670.9	34	680.8	49	15
LIVINGSTON MIDDLE	671.4	35	681.3	49	14
KNODT (AUGUST) ELEMENTARY	672.3	36	682.2	51	15
COOMBS (NORMA) ALTERNATIVE	672.9	37	682.8	52	15
LODI USD ALTERNATIVE CENTER	673.6	38	683.5	53	15
SUTTER (JOHN) MIDDLE	674.2	39	684.1	54	15
YORBA MIDDLE	675	40	684.9	56	16
MOUNTAIN SHADOWS MIDDLE	675.8	41	685.7	57	16
GAMBETTA (JOSEPH) MIDDLE	676.5	42	686.4	58	16
PLEASANT VIEW ELEMENTARY	677	43	686.9	59	16
LOS NIETOS MIDDLE	677.5	44	687.4	59	15
KENNEDY (JOHN F.) MIDDLE	678	45	687.9	60	15
CAMPOS VERDES ALTERNATIVE MAGNET	678.7	46	688.6	61	15
MARIPOSA COUNTY INDEPENDENT LEARNING (ALTERN)	679.4	47	689.3	63	16

AMERICAN CANYON MIDDLE	680.2	48	690.1	64	16
OPHIR ELEMENTARY	681.1	49	691.0	65	16
SYLVAN MIDDLE	681.7	50	691.6	66	16
PRICE INTERMEDIATE	682.2	51	692.1	67	16
EAGLE ROCK JUNIOR-SENIOR HIGH	682.7	52	692.6	68	16
CARQUINEZ MIDDLE	683.4	53	693.3	69	16
CAMPBELL MIDDLE	684.1	54	694.0	70	16
TERRA COTTA MIDDLE	684.5	55	694.4	70	15
BIG PINE ELEMENTARY	684.9	56	694.8	71	15
BORREGO SPRINGS MIDDLE	685.7	57	695.6	72	15
LADERA VISTA JUNIOR HIGH	686.4	58	696.3	73	15
ANACAPA MIDDLE	687.3	59	697.2	74	15
POTTER (JAMES E.) INTERMEDIATE	687.8	60	697.7	75	15
WILLIAMS (EARLE E.) MIDDLE	688.4	61	698.3	76	15
CORREIA JUNIOR HIGH	689	62	698.9	76	14
LANDEEN (CLAUDIA) ELEMENTARY	689.5	63	699.4	77	14
MULBERRY ELEMENTARY	690.2	64	700.1	77	13
DI GIORGIO ELEMENTARY	690.8	65	700.7	78	13
JORDAN (DONALD S.) INTERMEDIATE	691.5	66	701.4	79	13
BURROUGHS (JOHN) MIDDLE	692.1	67	702.0	80	13
LA MESA MIDDLE	692.7	68	702.6	80	12
FOOTHILL MIDDLE	693.7	69	703.6	82	13
QUAIL VALLEY MIDDLE	694.2	70	704.1	82	12
VAIL RANCH MIDDLE	694.9	71	704.8	83	12
HUDSON ELEMENTARY	695.6	72	705.5	84	12
RAMONA MIDDLE	696.2	73	706.1	84	11
MESA VERDE MIDDLE	697	74	706.9	85	11
JONATA ELEMENTARY	697.9	75	707.8	85	10
MOUNTAIN VIEW LEARNING ACADEMY	698.6	76	708.5	86	10
PETERSON MIDDLE	699.7	77	709.6	87	10
LINNS VALLEY-POSO FLAT ELEMENTARY	700.5	78	710.4	88	10
LARSEN (LILLIAN) ELEMENTARY	701.3	79	711.2	88	9
SIERRAMONT MIDDLE	702.2	80	712.1	89	9
PLUMAS ELEMENTARY	703.1	81	713.0	90	9
ATASCADERO JUNIOR HIGH	703.8	82	713.7	90	8
ROUND VALLEY ELEMENTARY	704.8	83	714.7	91	8
GRIZZLY HILL	706.1	84	716.0	92	8
HILL MIDDLE	707.2	85	717.1	93	8
VISTA VIEW MIDDLE	708.4	86	718.3	93	7
LORBEER MIDDLE	709.5	87	719.4	94	7
FRUITVALE JUNIOR HIGH	711.1	88	721.0	95	7
MAGNOLIA INTERMEDIATE	712	89	721.9	95	6
HARVEST PARK INTERMEDIATE	713.5	90	723.4	96	6
WESTBOROUGH MIDDLE	715	91	724.9	96	5
ALISO VIEJO MIDDLE	716.2	92	726.1	97	5
BELLEVIEW ELEMENTARY	717.5	93	727.4	97	4
HICKMAN MIDDLE	719.8	94	729.7	98	4
LAMMERSVILLE ELEMENTARY	721.4	95	731.3	98	3
EMERSON (RALPH WALDO) JR. HIGH	723.3	96	733.2	99	3
WESTON ELEMENTARY	727.3	97	737.2	99	2
ENGLISH (C. T.) MIDDLE	729.8	98	739.7	99	1
LA ENTRADA MIDDLE	736.7	99			