MEASURING STUDENT GROWTH: OPTIONS AND PROBLEMS

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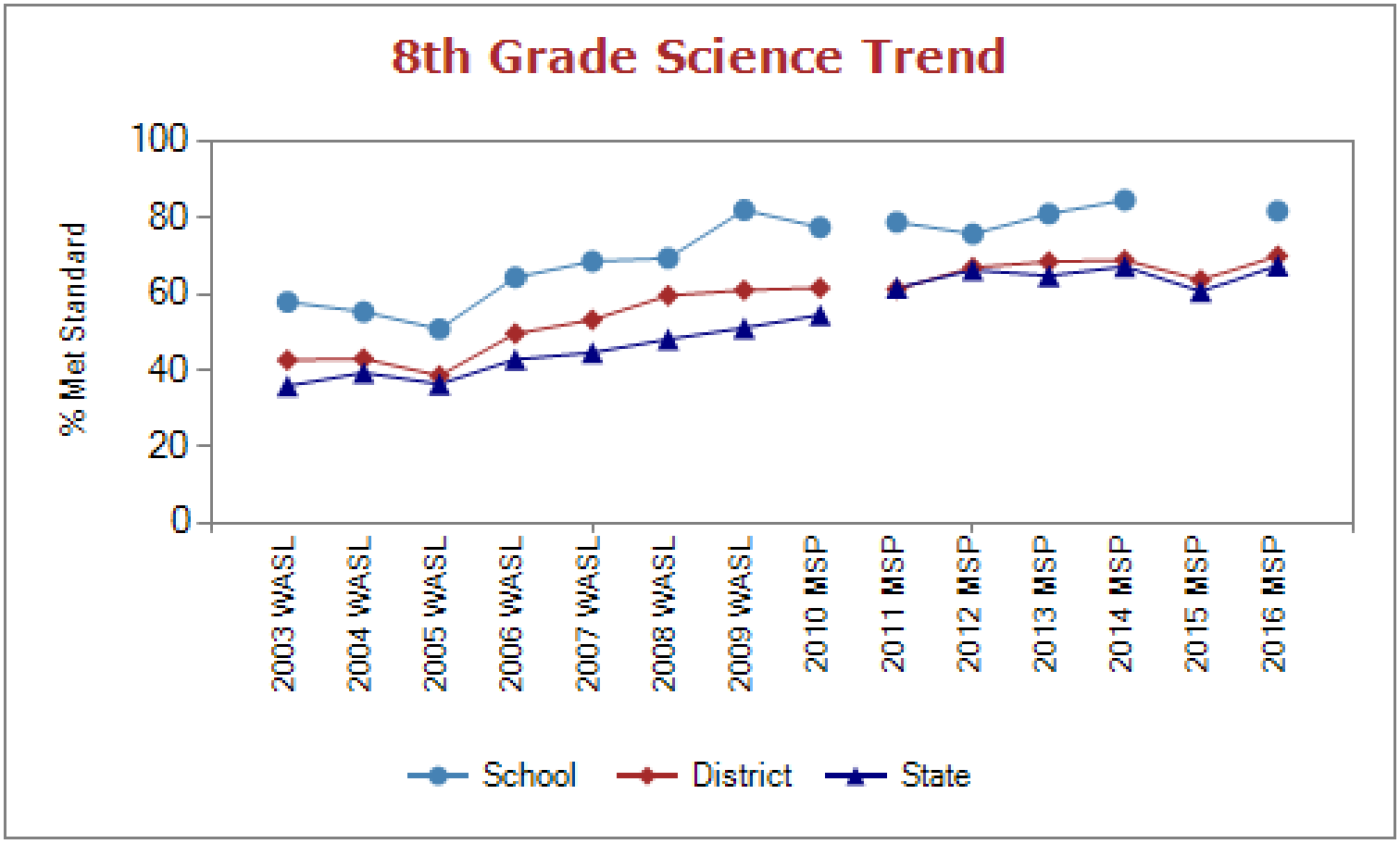
Context

- Teachers and school administrators want to know if students are learning.
- Federal and state laws require student growth for school and teacher accountability.
- Measuring student growth is part of teacher and principal evaluations.
- Measuring student growth is a politically charged topic.
- Measuring growth was difficult when state tests did not have a vertical scale or vertical alignment.
- Smarter Balanced Assessments (SBAs) have a vertical scale, but each grade has its own scale, and there is no vertical alignment.
- State Board of Education uses Student Growth Percentiles (SGP) in its accountability system to rate schools.
- Student growth percentiles (SGPs) only give ranks based on different cohorts of students; they do not indicate what “adequate” or enough growth is.
- Many grades and subjects have no way to measure growth from year to year.

Percent Meeting Standard

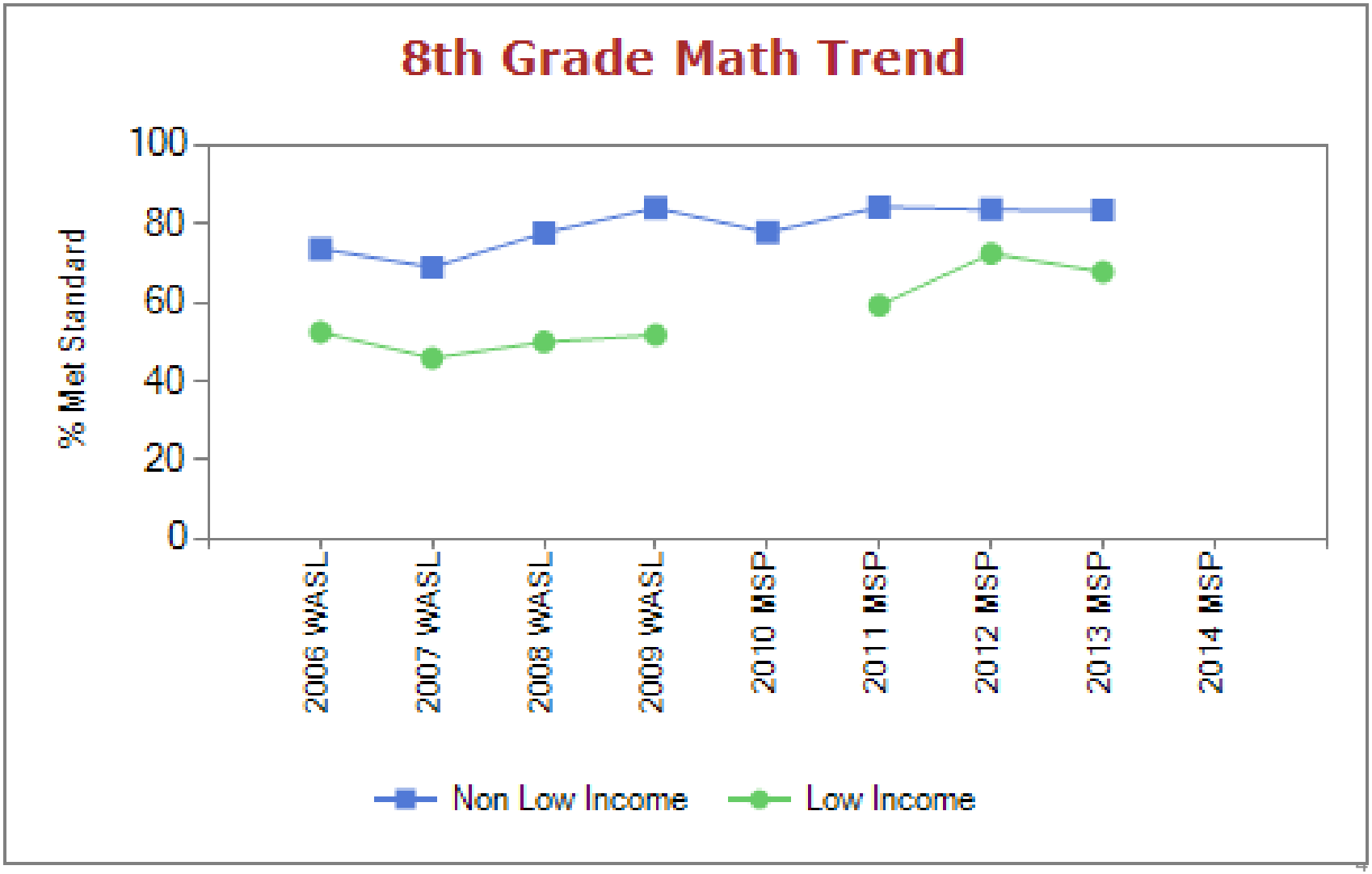
Educators and the public look at “growth”…

Example 1: Change in percent meeting standard of different cohorts over time



Percent Meeting Standard

... and compare groups to see “achievement gaps.”



Change in Performance Levels

Example 2: Change in performance level for a cohort

ELA Growth Analysis, Level Change (2017 to 2018)

(applies only to students who have scores in both years)

Grade 4		2018 SBA ELA Level				
		1	2	3	4	Total
2017 SBA ELA Level	1	189	59	**24**	**4**	276
	2	46	86	96	**19**	247
	3	**5**	31	93	109	238
	4	**0**	**3**	46	207	256
	Total	240	179	259	339	1017

	2018 SBA ELA Level				
	1	2	3	4	Total
1	18.6%	5.8%	**2.4%**	**0.4%**	27.1%
2	4.5%	8.5%	9.4%	**1.9%**	24.3%
3	**0.5%**	3.0%	9.1%	10.7%	23.4%
4	**0.0%**	**0.3%**	4.5%	20.4%	25.2%
Total	23.6%	17.6%	25.5%	33.3%	100.0%

ELA, Grade 3 to 4			Weighted
Moved up 3 levels	4	0.4%	(x3)
Moved up 2 levels	43	4.2%	(x2)
Moved up 1 level	264	26.0%	(x1)
No change	575	56.5%	
Moved down 1 level	123	12.1%	(x -1)
Moved down 2 levels	8	0.8%	(x -2)
Moved down 3 levels	0	0.0%	(x -3)
Net Change in Avg. Level		0.22	

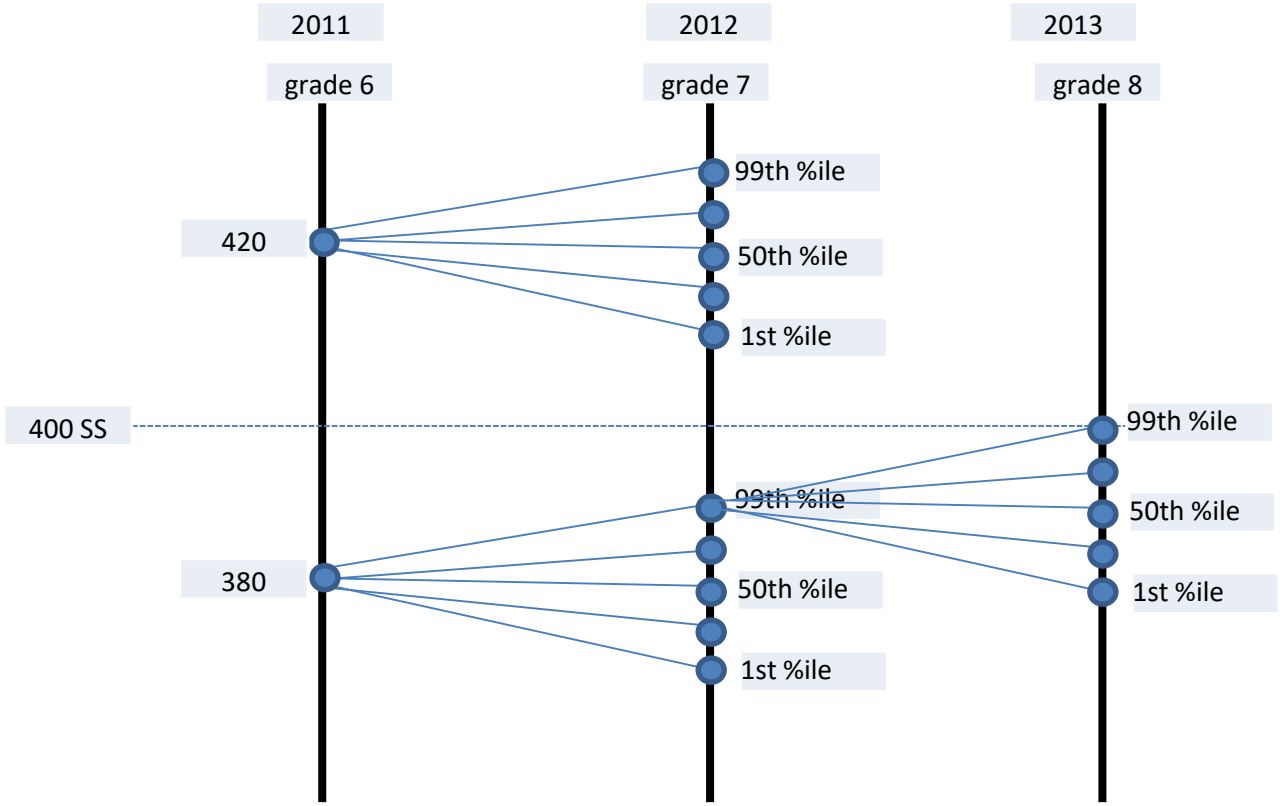
Student Growth Percentiles

Example 3: Student growth percentiles (SGP)

- SGPs used by state because growth is measured using a norm-referenced system and can be used regardless of the test or its scale.
- SGPs compare growth of students with the same score the previous year ("academic peers").
  - Does not compare growth rates of all students to each other (not the usual ranking method).
  - Does not control for differences in student demographics (e.g., ELL, sped).
- Student report shows trajectory to label future growth rates (high, typical, low).

SGPs Follow the Student Over Time

Compare growth of students with the same score the previous year (“academic peers”)



Problems with SGPs

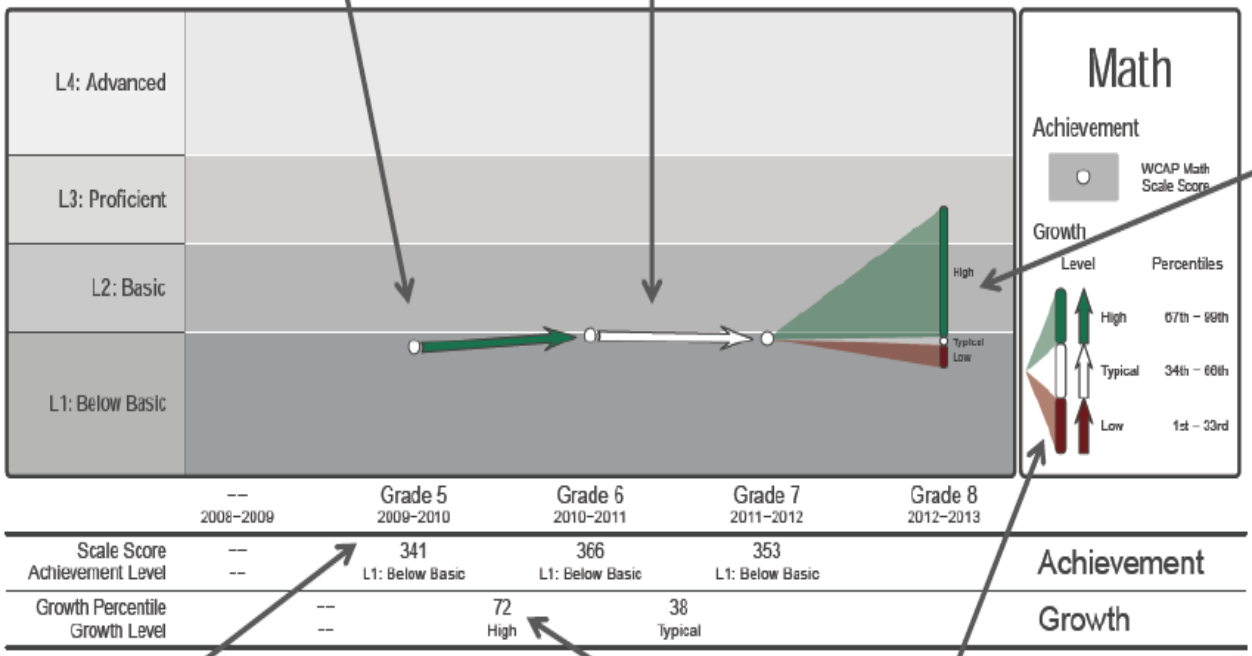
- Results are misleading because percentile rank is not based on all students. (50th percentile is not the middle of the entire distribution)
- SGPs do not provide a measure of adequate growth or a year's worth of growth.
- Results may not be an accurate measure of student growth or educator effectiveness (small Ns at extremes).
- Results are not available in a timely manner and therefore have limited usefulness.
- SGPs are hard to understand.
- Better metrics can be used to measure student growth.

Student Report Example
No growth Labeled "Typical"

The white circles represent the student's scale scores.

The arrows between the white circles represent the growth the student made from one year to the next. The color of the arrow represents the growth level that describes the student's SGP.

The shaded sections in the background represent the four proficiency levels. A student is meeting grade standard or "proficient" if they score in the Level 3 or Level 4 range.



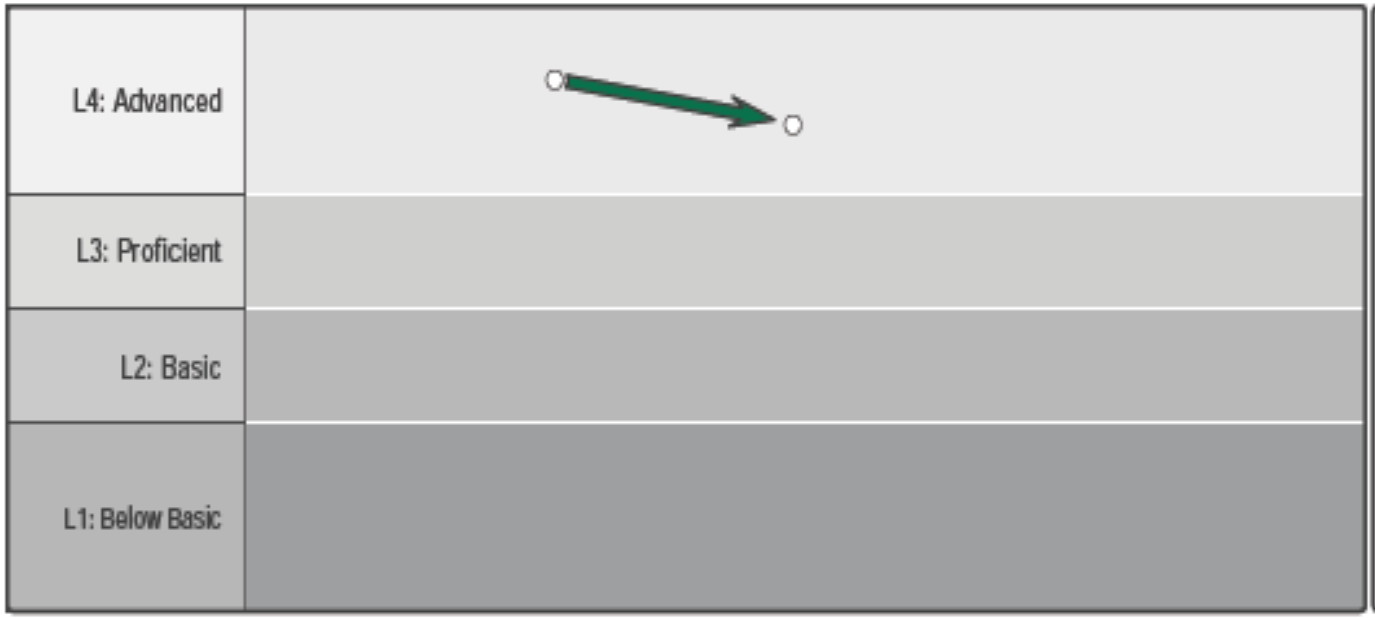
The colored fan shows the likely range of next year's scores for a student with this academic history. Low growth would put the student's 2013 score into the red area, typical growth into the white area, and high growth into the green range of scores. The fan tells us how much growth will be necessary for this student to achieve the next proficiency goal.

The student's scale score and proficiency level are shown below the grade and school year in which the student took the assessment.

The student growth percentile and the growth level are shown here.

The arrows are color coded by growth level. Red is low growth, white is typical and green is high growth.

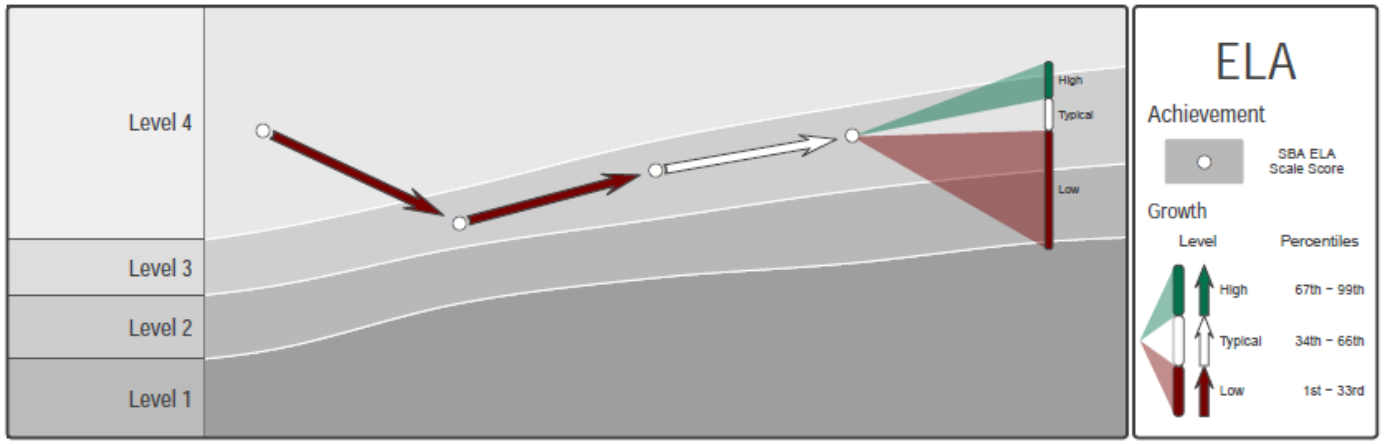
Student Report Example
Lower score labeled “High”



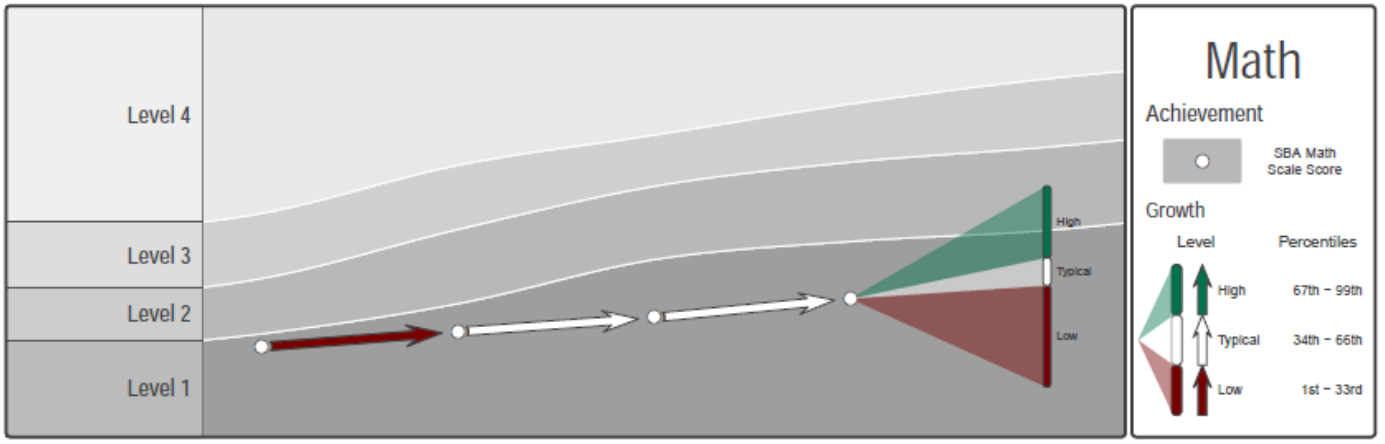
	-- 2008–2009	Grade 7 2009–2010	Grade 8 2010–2011	-- 2011–2012	-- 2012–2013	
Scale Score	--	575	522	--	--	Achievement
Achievement Level	--	L4: Advanced	L4: Advanced	--	--	
Growth Percentile		--	80	--	--	Growth
Growth Level		--	High	--	--	

Student Report Examples

Same slopes have different labels (low, typical)



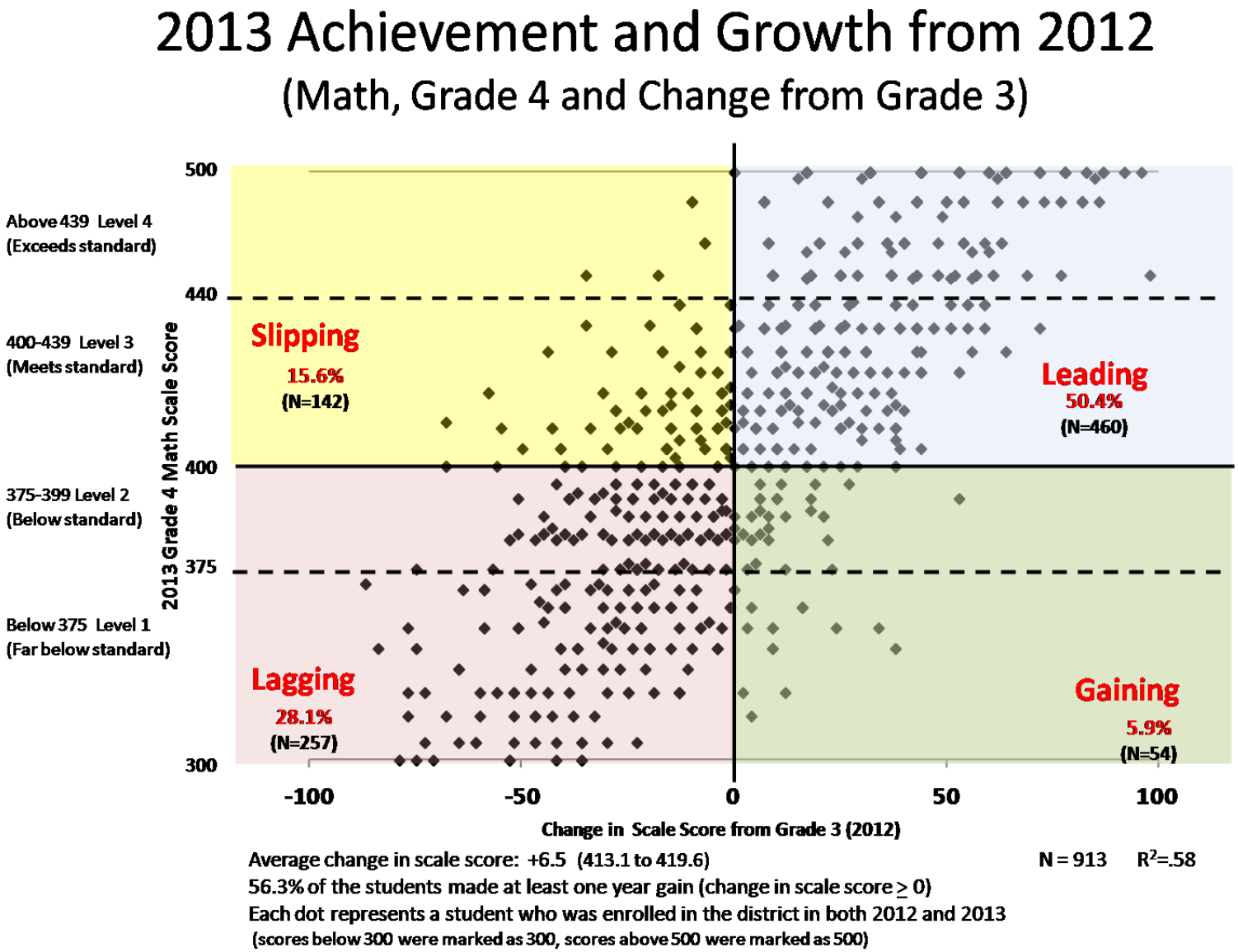
	Grade 3 2014–2015	Grade 4 2015–2016	Grade 5 2016–2017	Grade 6 2017–2018	Grade 7 2018–2019	
Scale Score Achievement Level	2592 Level 4	2498 Level 3	2551 Level 3	2586 Level 3		Achievement
Growth Percentile Growth Level		1 Low	18 Low	43 Typical		Growth



	Grade 3 2014–2015	Grade 4 2015–2016	Grade 5 2016–2017	Grade 6 2017–2018	Grade 7 2018–2019	
Scale Score Achievement Level	2368 Level 1	2383 Level 1	2397 Level 1	2416 Level 1		Achievement
Growth Percentile Growth Level		20 Low	39 Typical	51 Typical		Growth

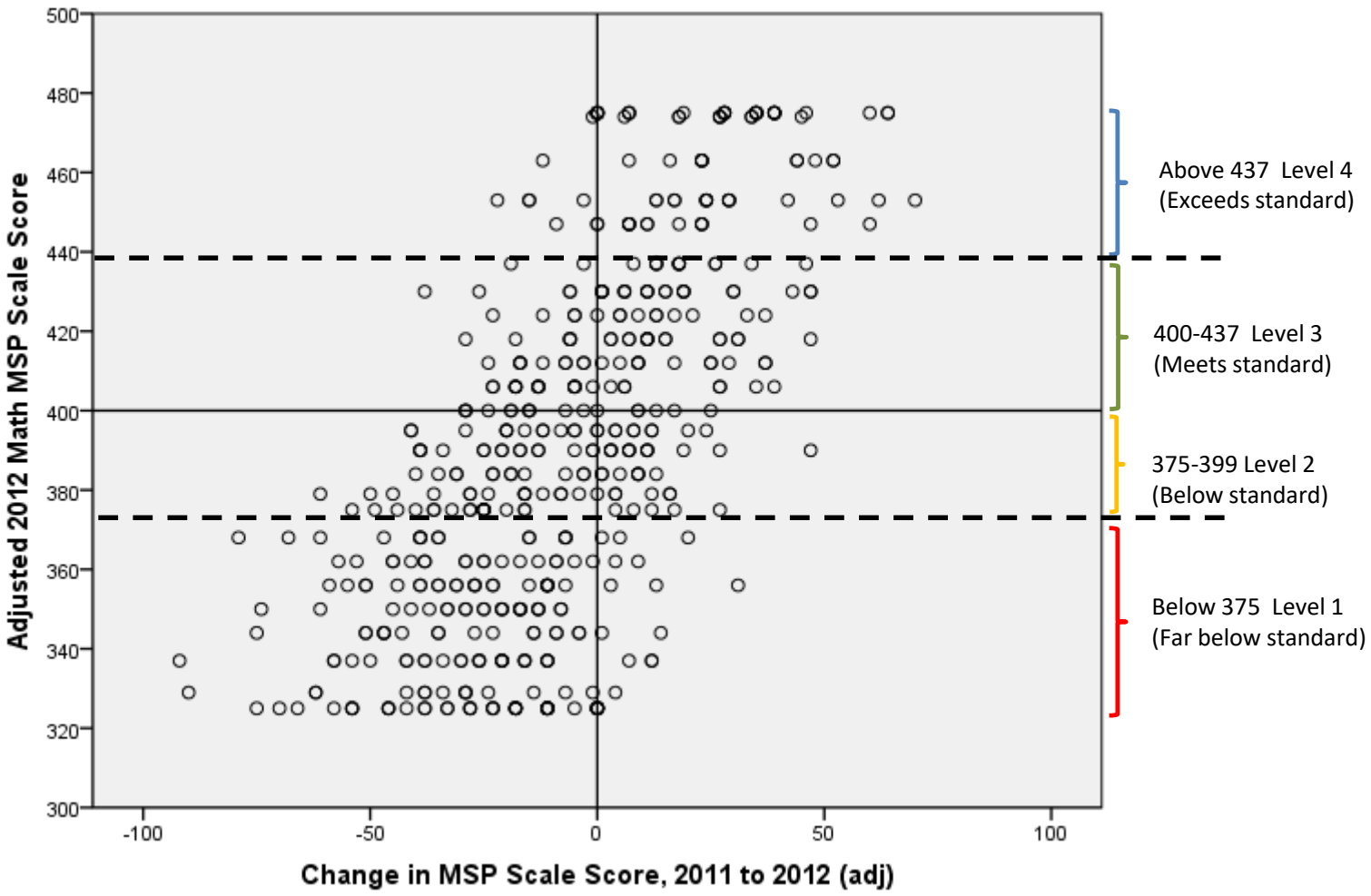
“Adequate” Growth

Example 4: Change in scale scores



Low Income Achievement and Growth

(Math, Grade 5 and Change from Grade 4)



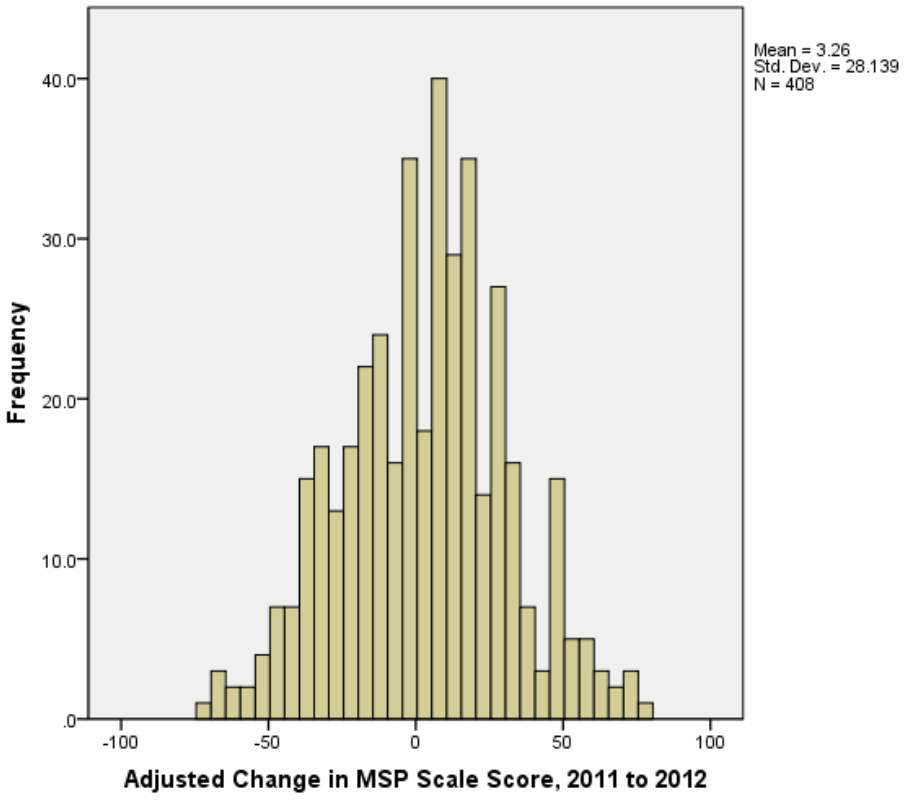
Average change in scale score: -7.0 N = 518

43% of the students made at least one year gain (change in scale score $\geq$ 0)

Each dot represents a low income student (FRL) who was enrolled in the district in both 2011 and 2012

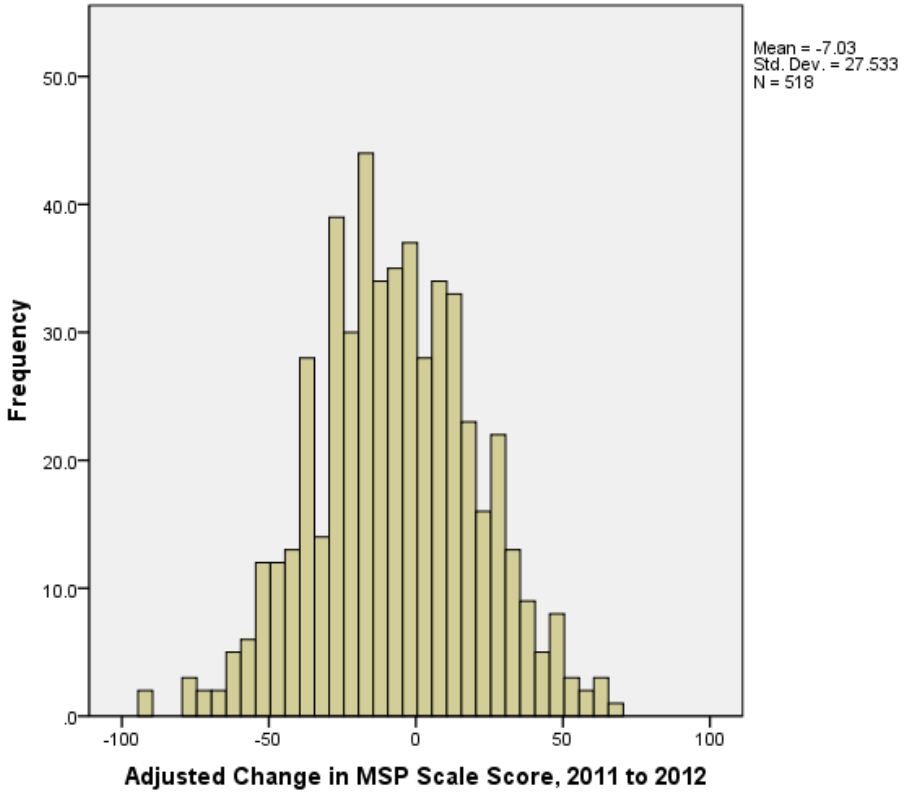
Change in Math Scale Scores, 2011 to 2012

Non-Low Income



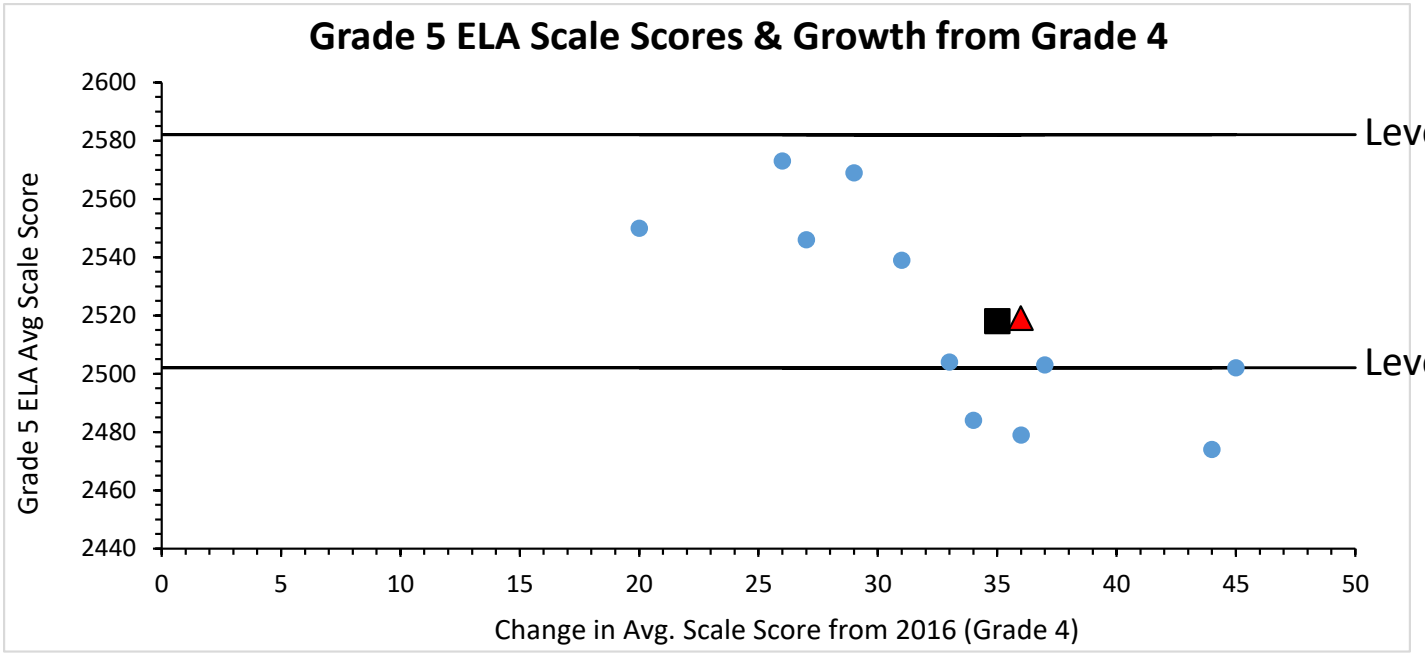
60% made 1+ years gain

Low Income (FRL)



43% made 1+ years gain

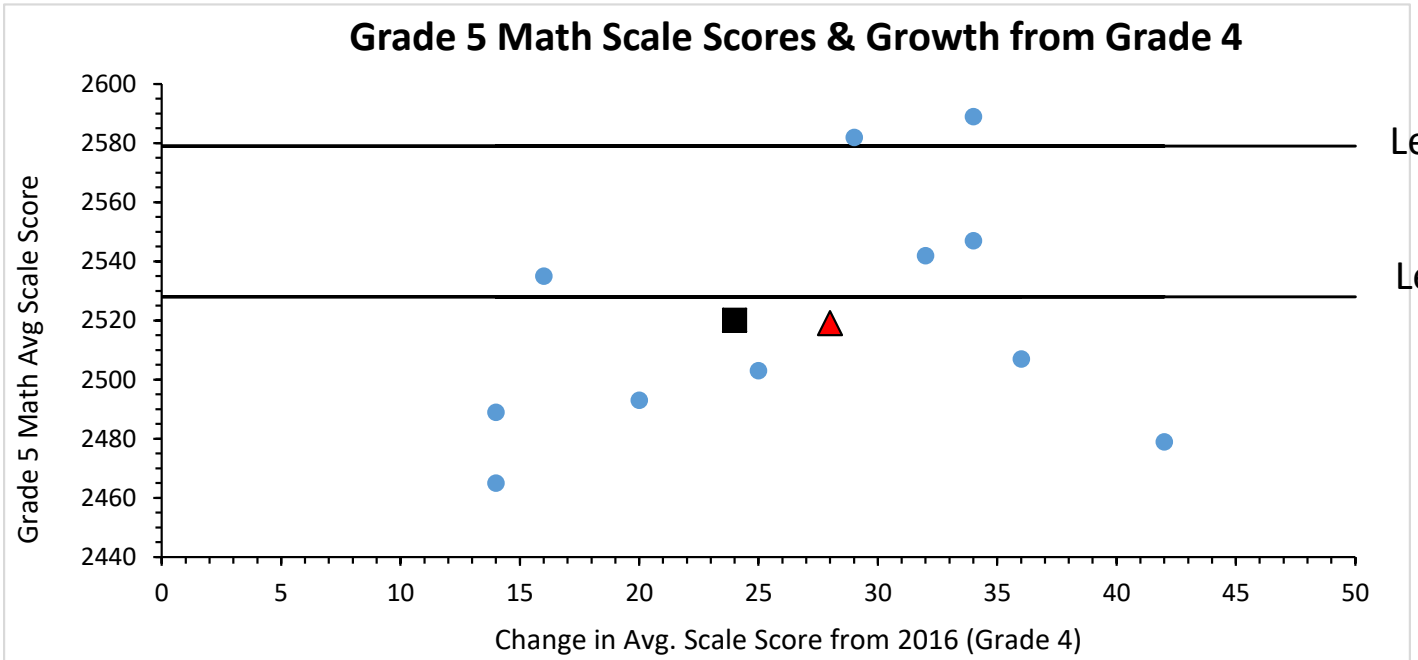
Elementary School Cohort Growth (Gr. 4 to 5)



WA

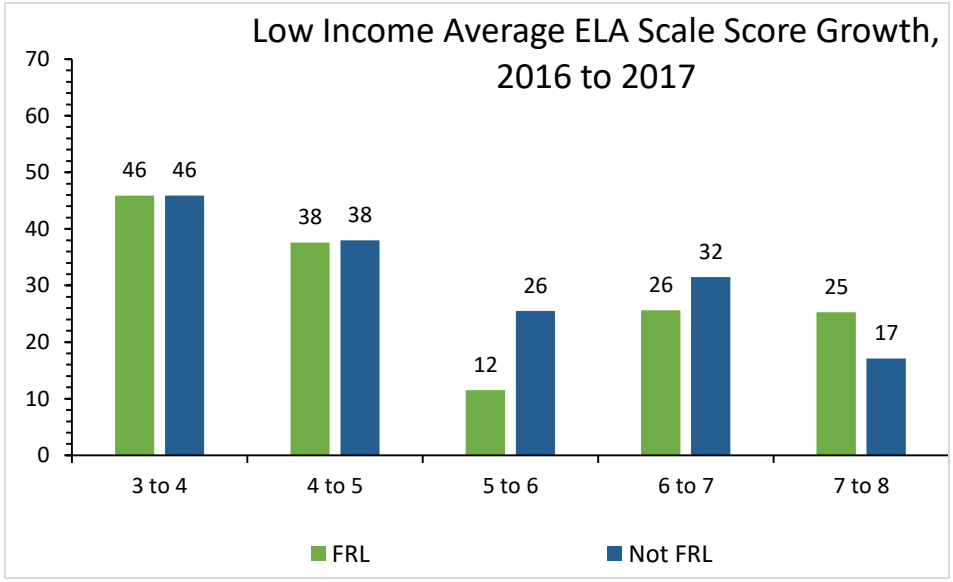
MSD

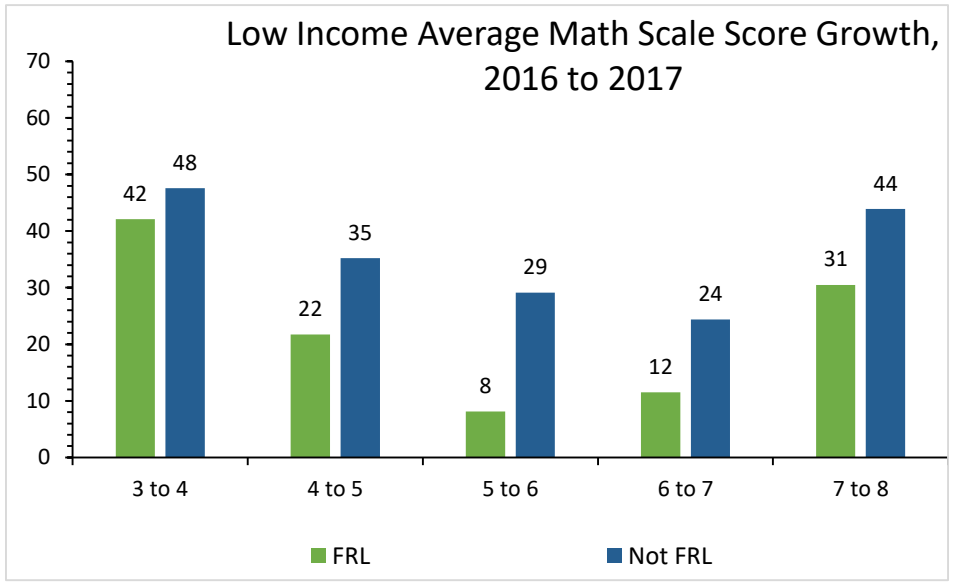
School



District SBA Scale Score *Growth*

Low Income vs Not Low Income





Note: This "cohort" analysis applies only to students with results in both years.

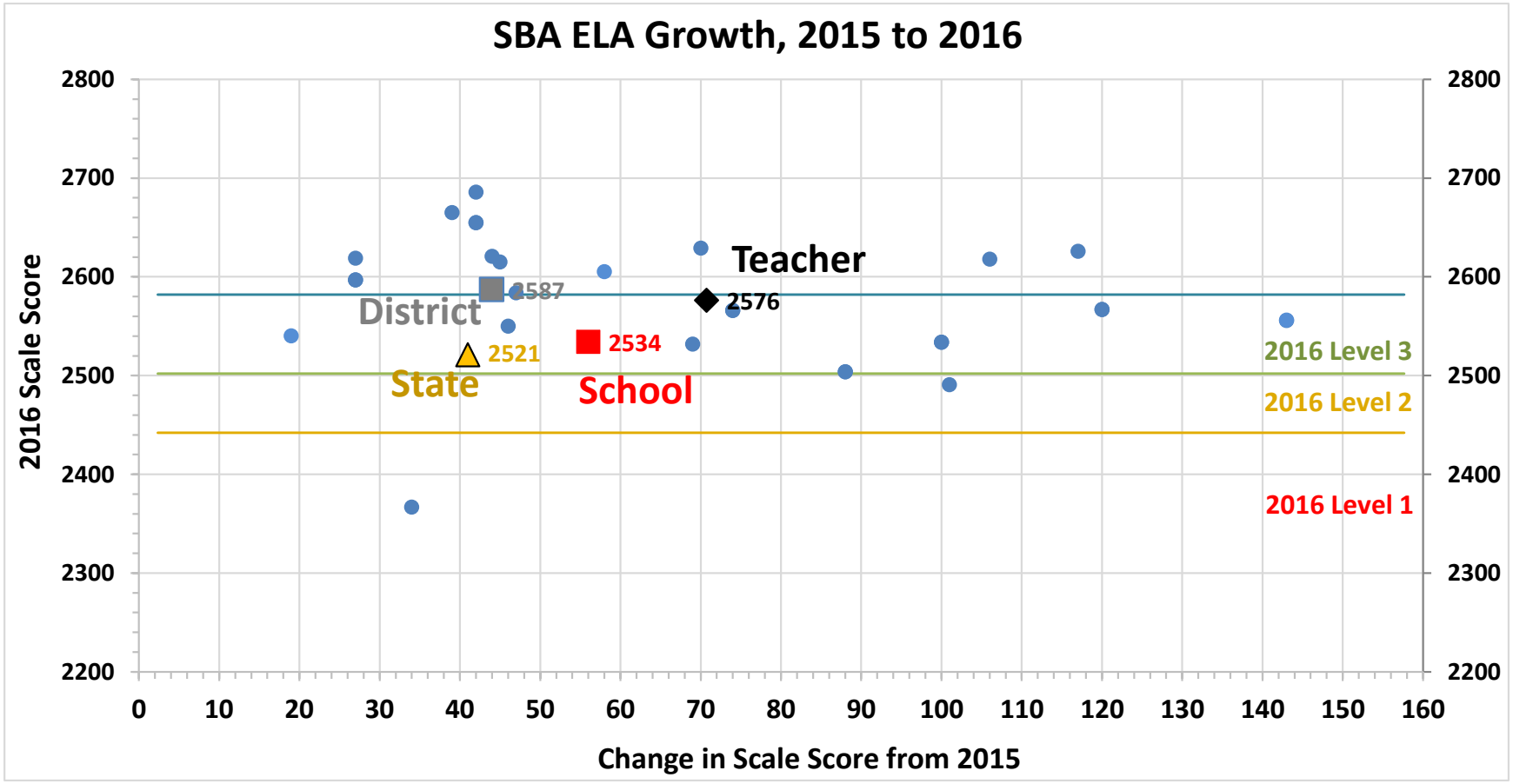
Measuring Growth of SBA Scale Scores for a Class

Assessment	*ELA*	*School*	*xxx*		*Grade*	*5*		*Teacher*	*xxx*		Period	*na*
			2015 (4th gr)			2016						
EXAMPLE for 30 students	Student Firstname	Student Lastname	Scale Score	Level		Scale Score	Level		Score change	Level Change	Notes	
1	Anna	Angelo	2463	2		2532	3		69	1		
2	Bill	Bantu	2626	4		2665	4		39	0		
3	Cindy	Crimea	2570	4		2597	4		27	0		
4	Dave	Denmark	2613	4		2655	4		42	0		
5	Edgar	Ecuador	2416	2		2504	3		88	1		
6	Felipe	Finn	2434	2		2534	3		100	1		
7	Gary	Garoui	2559	4		2629	4		70	0		
8	Henry	Holland	2447	2		2567	3		120	1		
9	Ivan	Izbec	2492	3		2566	3		74	0		
10	Jose	Janny	2577	4		2621	4		44	0		
11	Karen	Kosmos	2644	4		2686	4		42	0		
12	Lisa	Latvia	2413	1		2556	3		143	2		
13	Maria	Moore	2333	1		2367	1		34	0	IEP/Pull Out	
14	Nina	Nguyen	na	1			1	2407		0	ELL/Pull Out	
.												
.												
30	Zuba	Zulu	2509	3		2626	4		117	1		
	Average	**xxx**	**2505**	**2.83**		**2576**	**3.30**		**71**	**0.47**		
	Average	**xxx**	**2478**	**2.59**		**2534**	**2.90**		**56**	**0.31**		
	Average	**District**	**2543**	**2.57**		**2587**	**2.73**		**44**	**0.16**		
	Average	**State**	**2480**	**2.60**		**2521**	**2.68**		**41**	**0.08**		

Gain needed to achieve minimum Level 3 score from grade 4 to 5:	**29**	(look up this number on the next worksheet)
Number of students with at least **29** point gain from grade 4 to 5:	**25**	(count the students reaching the needed gain)
Total number of students in analysis:	**29**	(count the students in the analysis)
Percentage of students analyzed who had at least 29 point gain:	**86%**	
Gain compared to minimum gain needed to reach Level 3 in grade 5:	**2.44**	

Scatterplot of Growth of SBA Scale Scores

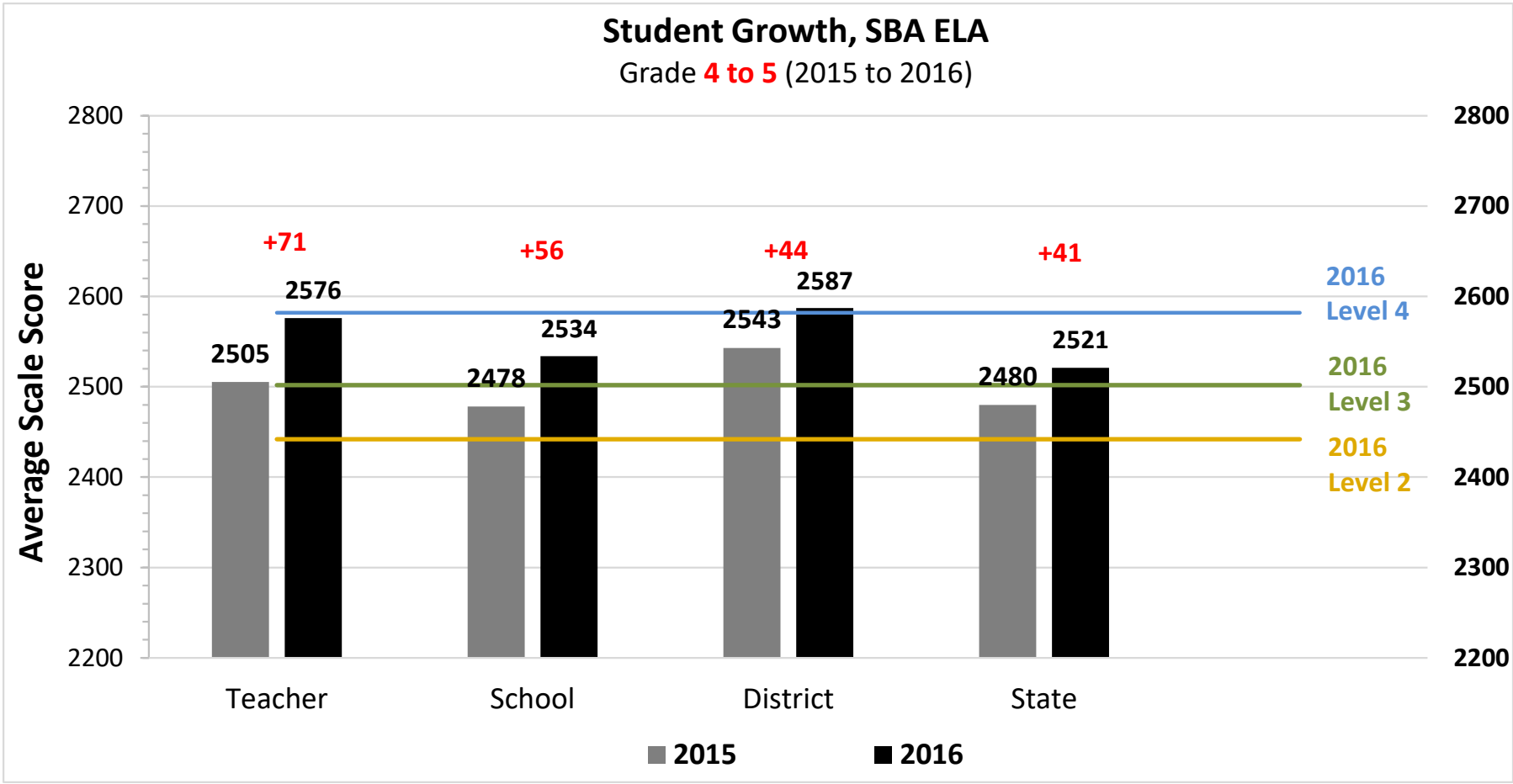
Blue dots are students



Black diamond = teacher
Red square = school
Gray square= district
Orange triangle = state

The above example has no negative growth.

Comparing Growth of SBA Scale Scores



BEWARE! Inconsistent SBA Scale Score Cut Points

Do not compare growth across grades – the difficulty of reaching the cut score the next year varies from grade to grade and level to level.

ELA Scale Score Thresholds

	Minimum scale score									
Grade	Level 1	Level 2	Level 3	Level 4	High Score	Sum of Scale Scores by Level				*Range*
Gr. 11	2102	2493	2583	2682	3032	391	90	99	350	*930*
Gr. 8	2097	2487	2567	2668	2989	390	80	101	321	*892*
Gr. 7	2082	2479	2552	2649	2964	397	73	97	315	*882*
Gr. 6	2079	2457	2531	2618	2937	378	74	87	319	*858*
Gr. 5	2056	2442	2502	2582	2916	386	60	80	334	*860*
Gr. 4	2032	2416	2473	2533	2867	384	57	60	334	*835*
Gr. 3	2001	2367	2432	2490	2811	366	65	58	321	*810*

Gain needed to reach the minimum of the *same* level the next year

ELA	Level 1	Level 2	Level 3	Level 4	High Score
8 to 11	5	6	16	14	43
7 to 8	15	8	15	19	25
6 to 7	3	22	21	31	27
5 to 6	23	15	29	36	21
4 to 5	24	26	29	49	49
3 to 4	31	49	41	43	56

Gain needed to reach the minimum of the *next* level the next year

ELA	Level 1 to 2	Level 2 to 3	Level 3 to 4
8 to 11	396	96	115
7 to 8	405	88	116
6 to 7	400	95	118
5 to 6	401	89	116
4 to 5	410	86	109
3 to 4	415	106	101

Uneven SBA MATH Scale Score Cut Points

Math Scale Score Thresholds

Grade	Minimum scale score: Level 1	Level 2	Level 3	Level 4	High Score	Sum of Scale Scores by Level				*Range*
Gr. 11	2118	2543	2628	2718	3085	425	85	90	367	*967*
Gr. 8	2113	2504	2586	2653	2993	391	82	67	340	*880*
Gr. 7	2108	2484	2567	2635	2964	376	83	68	329	*856*
Gr. 6	2103	2473	2552	2610	2911	370	79	58	301	*808*
Gr. 5	2095	2455	2528	2579	2891	360	73	51	312	*796*
Gr. 4	2090	2411	2485	2549	2834	321	74	64	285	*744*
Gr. 3	2071	2381	2436	2501	2762	310	55	65	261	*691*

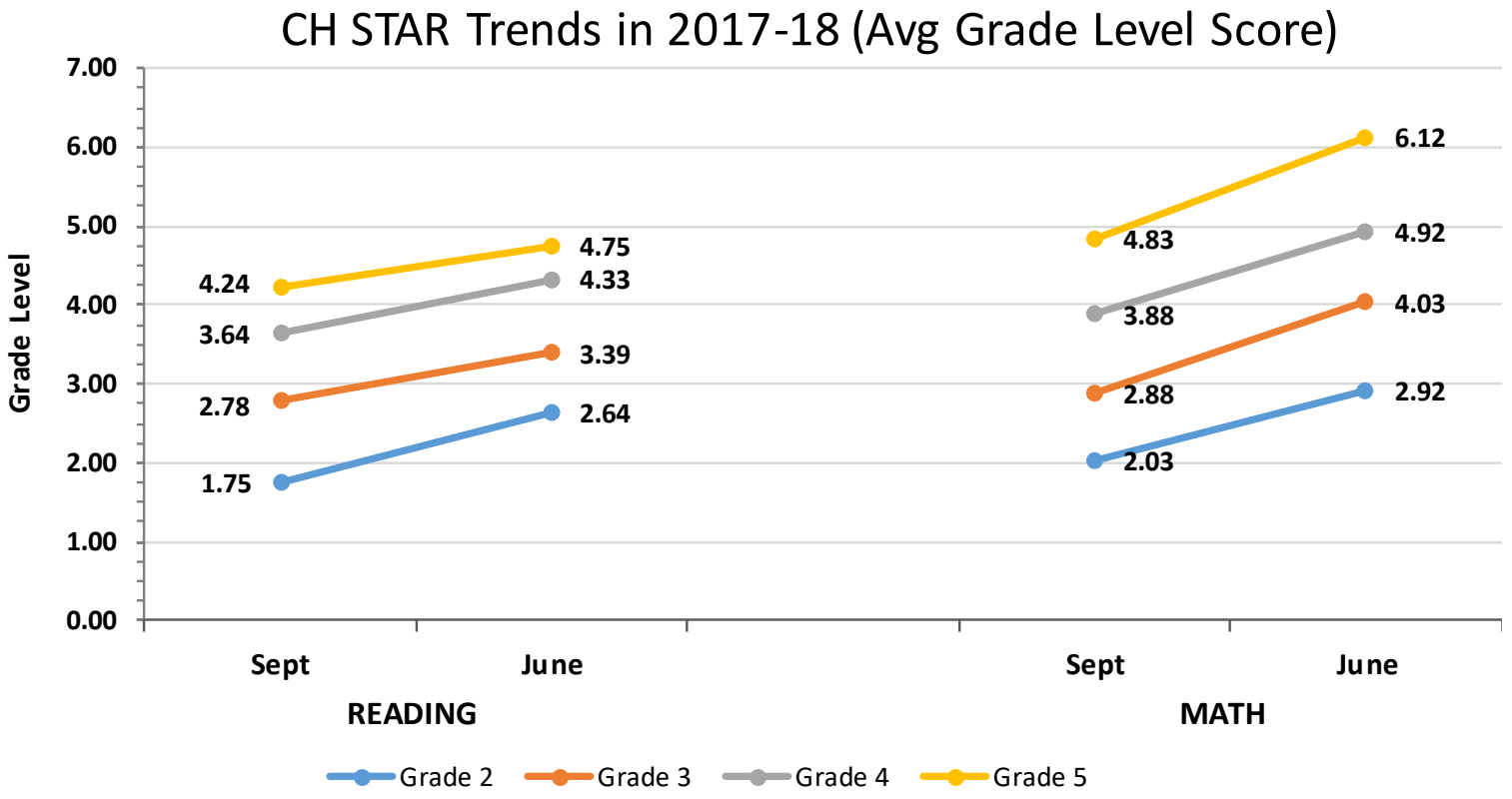
Gain needed to reach the minimum of the *same* level the next year

Math	Level 1	Level 2	Level 3	Level 4	High Score
8 to 11	5	39	42	65	92
7 to 8	5	20	19	18	29
6 to 7	5	11	15	25	53
5 to 6	8	18	24	31	20
4 to 5	5	44	43	30	57
3 to 4	19	30	49	48	72

Gain needed to reach the minimum of the *next* level the next year

Math	Level 1 to 2	Level 2 to 3	Level 3 to 4
8 to 11	430	124	132
7 to 8	396	102	86
6 to 7	381	94	83
5 to 6	378	97	82
4 to 5	365	117	94
3 to 4	340	104	113

Measure Growth Within the Year



(Note: 0.1 is equivalent to one month. For example, 2.1 means the first month of 2nd grade.)

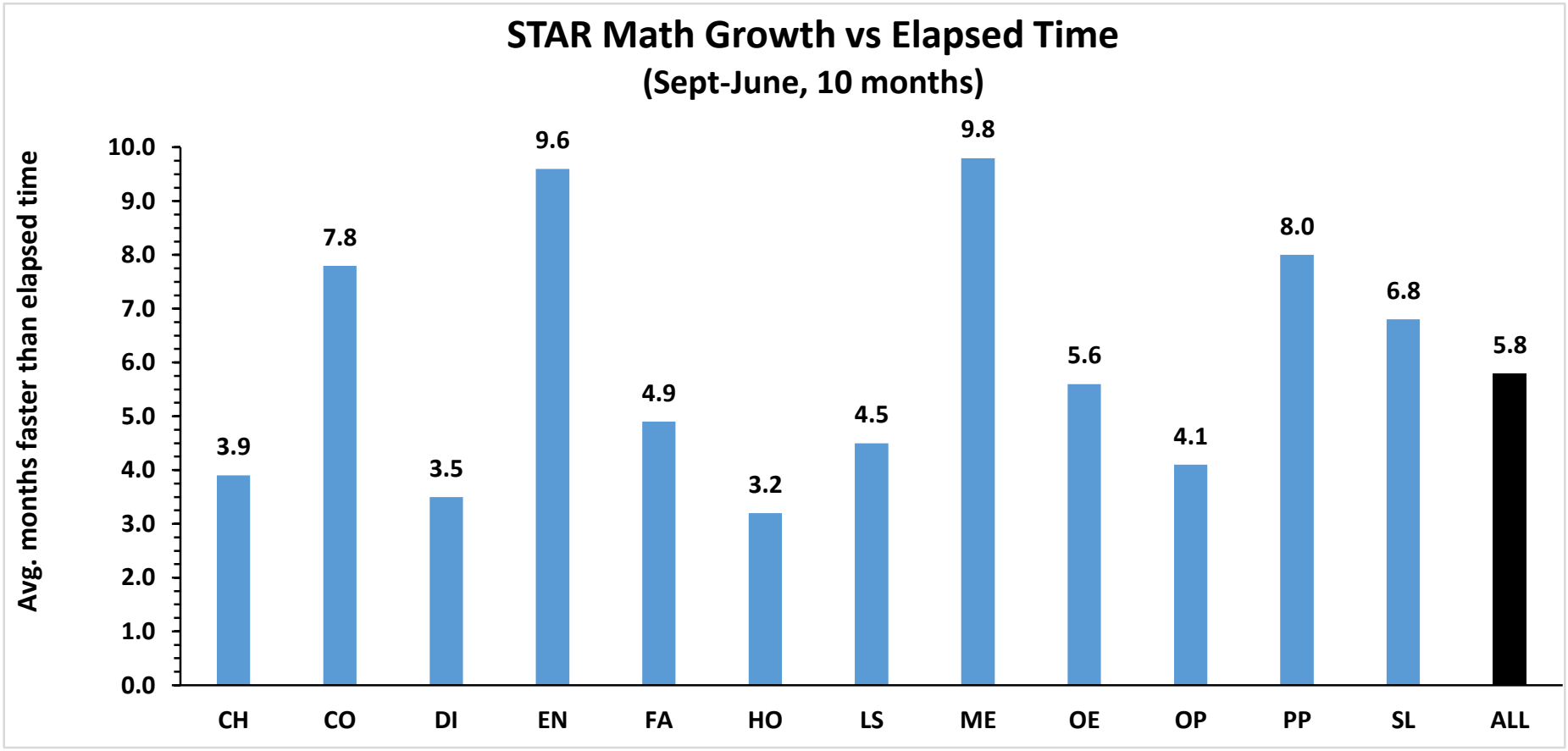
Reading			Math		
GE change	GP change	Diff	GE change	GP change	Diff
0.89	0.83	0.06	0.89	0.83	0.06
0.61	0.84	-0.23	1.15	0.80	0.35
0.69	0.84	-0.15	1.04	0.84	0.20
0.51	0.87	-0.36	1.29	0.87	0.42

Elementary School STAR Math Results

Mean Growth vs Time, STAR Math*						
	GRADE					Wgt
School	1	2	3	4	5	Avg
CH	0.34	0.08	0.36	0.67	0.44	**0.39**
CO	0.37	0.37	0.39	1.03	1.07	**0.78**
DI	0.44	-0.10	0.41	0.30	0.61	**0.35**
EN	0.37	0.37	0.50	1.34	2.51	**0.96**
FA	0.38	0.16	0.33	0.35	1.22	**0.49**
HO	0.06	-0.01	0.41	0.38	0.77	**0.32**
LS	0.42	0.19	0.17	0.68	0.88	**0.45**
ME	0.28	0.63	0.95	1.53	1.25	**0.98**
OE	0.29	0.26	0.29	0.40	1.75	**0.56**
OP	0.03	0.33	-0.24	0.69	1.21	**0.41**
PP	0.17	0.60	0.45	1.21	1.42	**0.80**
SL	0.51	0.50	0.25	0.57	1.34	**0.68**
Elem.	**0.29**	**0.26**	**0.36**	**0.76**	**1.17**	0.58

*Each tenth represents the number of months of average academic gain (grade equivalent or GE) compared to average months of elapsed time. *Positive numbers mean a greater gain than the amount of months of elapsed time; negative numbers mean growth was slower than the elapsed time.* For example, a 0.00 means growth took place at the same pace as the amount of elapsed time, and a 0.25 represents 2.5 months of gain faster than the average number of months that elapsed.

Elementary School STAR Math Growth
(Avg. of All Grades)



Other Problems Complicating Analyses

- Some students don't take a test
- Tests have different scales and difficulty
- Mobility/stability of students
- Boundary changes and new schools
- Demographic changes over time
- Location (& relocation) of specialized programs
- Students receive instruction from several teachers
- Finding the right comparison group is challenging
- No advice about how much growth is enough
- Many external factors affect student performance

Final Thoughts

- It’s complicated even when you have data!
- Understand different ways to measure growth and their pros/cons.
- Don’t let perfect be the enemy of the good.
- Pick a method and keep it simple.
- Use data as part of a larger set of results to confirm general trends (use multiple measures).