Technical Notes
Preliminary Analyses of the ABCs Model for 2005-06

The technical notes present preliminary analyses of the proposed ABCs model for 2005-06 using the c-scale. Eighteen tables are included and many compare findings from the proposed model and the original ABCs model. Please note that academic change is calculated using either 0.9 or 0.8 in all table unless otherwise noted.

Table 1. Standard Setting Years, Means and Standard Deviations for End-of-Grade (EOG) C-Scale Computation

EOG	Standard Setting Year	Mean	Standard Deviation
Reading (1st Edition)			
Grade 3 Pretest	1997	137.7	8.57
Grade 3	1997	146.9	9.29
Grade 4	1997	150.3	9.34
Grade 5	1997	160.0	9.62
Grade 6	1997	156.7	9.61
Grade 7	1997	159.9	8.50
Grade 8	1997	163.1	8.04
Reading (2nd Edition)			
Grade 3 Pretest	2003	238.7	9.94
Grade 3	2003	247.9	9.06
Grade 4	2003	252.3	8.68
Grade 5	2003	256.9	8.03
Grade 6	2003	258.7	8.55
Grade 7	2003	261.1	9.06
Grade 8	2003	263.9	9.05
Mathematics (1st Edition)			
Grade 3 Pretest	1997	130.9	7.96
Grade 3	1997	142.9	11.09
Grade 4	1997	152.3	10.28
Grade 5	1997	159.3	9.99
Grade 6	1997	164.8	10.84
Grade 7	1997	170.8	10.58
Grade 8	1997	174.2	11.96
Mathematics (2nd Edition)			
Grade 3 Pretest	2001	236.1	8.10
Grade 3	2001	250.6	7.75
Grade 4	2001	255.8	8.32
Grade 5	2001	260.0	9.62
Grade 6	2001	263.2	9.91
Grade 7	2001	267.1	10.63
Grade 8	2001	270.0	10.95

All values are rounded. Full precision was used for actual calculations.

Table 2. Standard Setting Years, Means and Standard Deviations for End-of-Course (EOC) C-Scale Computation

EOC	Standard Setting Year	Mean	Standard Deviation
Algebra I	1994	55.1	9.12
	2001	61.1	9.31
Algebra II	1997	58.5	10.26
	2001	63.8	9.90
Biology	1995	55.5	8.67
	2002	57.9	7.61
Chemistry	1997	56.8	8.53
	2002	60.0	8.16
ELPS	1995	44.4	11.72
	1997	53.8	9.30
English I	1995	53.1	8.94
	2003	57.7	7.63
Geometry	1997	57.3	10.32
	2001	59.8	8.85
Physics	1997	56.5	8.65
	2002	60.7	9.24
Physical Science	1997	54.0	9.41
	2002	55.8	7.90
U.S. History	1995	56.2	8.32

All values are rounded. Full precision was used for actual calculations.

The EOG and EOC c-scales are computed by subtracting the state mean (for the standard setting year) from the developmental scale score and dividing by the standard deviation (for the standard setting year).

There are two editions of the Reading and Mathematics EOGs. The first edition of the Reading and Mathematics EOG was given in 1997. The corresponding means and standard deviations for this standard setting year apply to all data up to the second edition. The second edition for Mathematics was given in 2001 whereas Reading was given in 2003, resulting in a second standard setting year for each assessment.

Each EOC, except U.S. History, has two editions with identical scales. Therefore, there are two standard setting years for each EOC except U.S. History.

Table 3. N Counts for EOG Proposed Formulas

	Reading	Mathematics
Grade 3	545,120	545,862
Grade 4	534,515	536,147
Grade 5	587,547	589,558
Grade 6	525,760	453,806
Grade 7	450,087	450,838
Grade 8	397,382	397,852

- The N counts for grades 3-8 for Reading and Mathematics correspond to the EOG correlations for

the proposed formulas in Tables 4 and 5.

Table 4. EOG Correlations Between Predicted Values and Actual Performance

Proposed Formulas				Original Formulas		
	Reading	Mathematics			Reading	Mathematics
Grade 3	0.71	0.75		Grade 3	0.76	0.79
Grade 4	0.81	0.82		Grade 4	0.80	0.82
Grade 5	0.84	0.86		Grade 5	0.81	0.84
Grade 6	0.85	0.86		Grade 6	0.82	0.85
Grade 7	0.85	0.87		Grade 7	0.83	0.87
Grade 8	0.85	0.88		Grade 8	0.83	0.87

All numbers are Pearson's r.

The predicted values for grade 3 Reading and grade 3 Mathematics are computed by multiplying the grade 3 pretest c-scale score by 0.8.

The predicted values for grade 4 Reading and grade 4 Mathematics are computed by multiplying the average of the grade 3 pretest and the grade 3 c-scale scores by 0.9.

The predicted values for grades 5-8 Reading and grades 5-8 Mathematics are computed by multiplying the average of the two previous assessment scores (ATPA) by 0.9.

In the proposed formulas, the computed c-scale score for each grade is correlated with the corresponding predicted value. Using the original formulas, the anticipated score on the vertically aligned scale was correlated with the actual student score.

9 All proposed formulas' correlations, except grade 3, are at least as high as those from the current method of calculation. This suggests comparable prediction accuracy.

Table 5. EOG Correlations Between Predicted Values and Residuals*

Proposed Formulas		
	Reading	Mathematics
Grade 3	-0.13	-0.13
Grade 4	-0.04	-0.02
Grade 5	-0.19	-0.003
Grade 6	0.01	-0.04
Grade 7	0.04	0.06
Grade 8	-0.05	-0.02

Original Formulas		
	Reading	Mathematics
Grade 3	-0.15	-0.30
Grade 4	-0.03	-0.25
Grade 5	-0.30	-0.14
Grade 6	0.07	0.35

Grade 7	-0.15	0.06
Grade 8	-0.15	0.19

All numbers are Pearson's r.
* A residual is the difference between the predicted value and the actual value.

• High correlations between predicted values and residuals indicate systematic bias.

9 All proposed formulas' correlations between residuals and predicted values, except grade 4 Reading, are lower than the original formulas' correlations. 9 These lower correlations suggest a weaker relationship between actual student performance and erroneous estimates.

Table 6. N Counts and Equations for Proposed EOC Formulas

Algebra I	109,585	Grade 8 Mathematics EOG*0.8
Algebra II	265,165	Algebra I EOC*0.8
Biology[a]	197,455	Grade 8 Reading EOG*0.8
Biology[b]	193,548	The average of English I EOC and grade 8 Reading EOG*0.9
Chemistry	84,620	Biology EOC*0.8
English I	280,400	Grade 8 Reading EOG*0.8
Geometry[a]	172,713	Algebra I EOC*0.8
Geometry[b]	149,943	The average of Algebra I EOC and grade 8 Mathematics EOG*0.9
Physical Science	110,722	Grade 8 Mathematics EOG*0.8
Physics	12,084	The average of Chemistry and Geometry EOCs*0.9
US History	74,235	The average of English I and Biology EOC *0.92
US History	75,174	Biology EOC * 0.82
Civics and Economics	49,494	The average of English I and Biology EOC *0.92
Civics and Economics	90,197	English I EOC * 0.82

[a] denotes only one predictor used.
[b] denotes two predictors used.

The N counts correspond to the EOC correlations for the proposed formulas in Tables 7 and 8.

The predicted values for Algebra I and Physical Science are computed by multiplying the grade 8 Mathematics c-scale score by 0.8.

- The predicted value for Algebra II is computed by multiplying the Algebra I c-scale score by 0.8.

The predicted value for Biology[a] is computed by multiplying the grade 8 Reading c-scale score by 0.8, whereas the predicted value for Biology[b] is computed by multiplying the average of the English c-scale score and the grade 8 Reading c-scale score by 0.9.

- The predicted value for Chemistry is computed by multiplying the Biology c-scale score by 0.8.

The predicted value for English I is computed by multiplying the grade 8 Reading c-scale score by 0.8.

The predicted value for Geometry[a] is computed by multiplying the Algebra I c-scale score by 0.8, whereas the predicted value for Geometry[b] is computed by multiplying the average of the Algebra I c-scale score and the grade 8 Mathematics c-scale score by 0.9.

The predicted value for Physics is computed by multiplying the average of the Chemistry c-scale score and the Geometry c-scale score by 0.9.

Table 7. EOC Correlations Between Predicted Values and Actual Performance

Proposed Formulas

Algebra I	0.78
Algebra II	0.73
Biology[a]	0.73
Biology[b]	0.78
Chemistry	0.71
English I	0.79
Geometry[a]	0.77
Geometry[b]	0.83
Physical Science	0.73
Physics	0.77
US History[b]	0.77
Civics[b] and Ecnomics[b]	0.83

Original Formulas

Algebra I	0.75
Algebra II	0.76
Biology	0.03
Chemistry	0.76
English I	0.80

Geometry	0.82
Physical Science	0.72
Physics	0.72
US History [a]	0.75
Civics[a] and Economics[a]	0.74

All numbers are Pearson's r. [a] denotes only one predictor used. [b] denotes two predictors used.

- In the proposed formulas, the computed c-scale score for each grade is correlated with the corresponding predicted value. 9 The correlations for the proposed and the original formulas are comparable except as noted below. This suggests comparable prediction accuracy.

9 Geometry[a] relies on fewer predictors and therefore captures students who were not included in the original formulas. These students' scores are currently not used for prediction and therefore should not be compared.

9 The original formula's Biology correlation is much lower compared to the other EOCs. This is an artifact of the original formula. However, the correlation is much stronger using the proposed formula.

Table 8. EOC Correlations Between Predicted Values and Residuals Proposed Formulas

Original Formulas

Algebra I	0.06
Algebra II	0.009
Biology[a]	0.01
Biology[b]	0.04
Chemistry	0.06
English I	-0.006
Geometry[a]	0.02
Geometry[b]	0.09
Physical Science	-0.11
Physics	0.02

Algebra I	-0.18
Algebra II	-0.28
Biology	-0.63
Chemistry	0.08
English I	-0.20
Geometry	-0.30
Physical Science	-0.40
Physics	-0.11

All numbers are Pearson's r. [a] denotes only one predictor used. [b] denotes two predictors used.

9 All correlations between predicted values and residuals are lower using the proposed formulas than the original formulas. A lower correlation of residuals suggests a weaker relationship between the predicted score and the amount of error in the prediction. This implies less systematic bias in predicting student performance.

Table 9. Standard Error of Estimation (SEE) for EOG and EOC Predictions EOG EOC

Reading	**Proposed Formulas**	**Original Formulas**
Grade 3	0.663	0.635
Grade 4	0.571	0.579
Grade 5	0.530	0.505
Grade 6	0.513	0.569
Grade 7	0.503	0.438
Grade 8	0.489	0.439
Mathematics	**Proposed Formulas**	**Original Formulas**
Grade 3	0.565	0.564
Grade 4	0.530	0.640
Grade 5	0.444	0.432
Grade 6	0.489	0.604
Grade 7	0.469	0.467
Grade 8	0.446	0.506

	Proposed Formulas	**Original Formulas**
Algebra I	0.620	0.774
Algebra II	0.699	0.704
Biology[a]	0.685	1.370
Biology[b]	0.629	
Chemistry	0.734	0.681
English I	0.586	0.657
Geometry[a]	0.659	
Geometry[b]	0.596	0.630
Physical Science	0.634	1.083
Physics	0.922	1.284

[a] denotes only one predictor used. [b]

denotes two predictors used.

For comparability with the proposed formulas', the SEEs for the EOG and EOC assessments using the original formulas are standardized by dividing by the standard deviation.

Lower numbers imply greater accuracy.

Approximately 68% of actual student scores will be within one standard error of estimation from the predicted value.

The standard deviations of the test scale scores are approximately 9 points. An SEE of 0.5 would translate to 68% of actual students' scores being within 4.5 scale score points of the estimate.

- For grades 3 through 8, the SEEs are all within the same range for both the original and proposed formulas. Slight gains are made in the accuracy of Mathematics, compared to some losses in accuracy of Reading.
- All EOC SEEs are lower using the proposed formulas compared to the original formulas, with the exception of Chemistry.

Table 10. Percent of Students Meeting Expectations in the Lower 10% and 50% and Upper 50% and 10% Using the Proposed Formulas Compared to the Original Formulas

Reading

Proposed Formulas					
	Overall	Lower 10%	Lower 50%	Upper 50%	Upper 10%
Grade 3	46.6	53.1	51.8	41.7	30.4
Grade 4	47.5	45.5	50.4	44.7	39.7
Grade 5	49.9	64.3	56.6	43.4	35.1
Grade 6	60.4	60.1	58.4	62.4	59.6
Grade 7	58.6	55.4	56.5	60.8	57.7
Grade 8	52.8	58.5	54.5	51.1	48.6

Original Formulas					
	Overall	Lower 10%	Lower 50%	Upper 50%	Upper 10%
Grade 3	55.7	53.3	59.6	51.8	35.0
Grade 4	45.4	50.5	46.1	44.8	38.6
Grade 5	54.0	73.9	64.2	44.9	33.1
Grade 6	26.0	31.7	27.8	24.5	19.5
Grade 7	54.1	62.5	58.4	50.7	37.5
Grade 8	39.6	55.3	46.6	33.3	28.8

Mathematics

Proposed Formulas					
	Overall	Lower 10%	Lower 50%	Upper 50%	Upper 10%
Grade 3	56.4	65.4	59.6	53.5	44.8
Grade 4	57.1	59.3	57.0	57.2	56.6
Grade 5	54.3	59.7	53.5	55.1	58.7
Grade 6	65.2	70.4	64.5	66.0	64.2
Grade 7	57.2	63.9	54.9	59.8	68.4
Grade 8	60.6	64.7	60.0	61.3	60.0

Original Formulas

	Overall	Lower 10%	Lower 50%	Upper 50%	Upper 10%
Grade 3	66.7	78.2	75.0	59.1	44.4
Grade 4	73.9	77.7	75.3	72.6	69.5
Grade 5	47.6	62.8	51.5	44.3	54.6
Grade 6	65.8	47.5	48.7	78.6	94.2
Grade 7	54.1	54.7	51.7	56.3	69.9
Grade 8	52.2	48.6	41.5	62.1	77.3

- Using the proposed formulas, academic change is calculated by subtracting the predicted values from the posttests. The predicted values for grade 3 Reading and Mathematics are computed by multiplying 0.8 by the grade 3 pretest. The computation for grades 4-8 Reading and Mathematics is the product of 0.9 and the average of the two previous assessments (ATPA). This table shows the percent of students meeting expectations, where academic change is greater or equal to zero, at the lower 10%, lower 50%, upper 50% and upper 10% percentile of predicted values.

  9 In most cases, the proposed formulas show a more equitable percent of students meeting and exceeding expectations across the range of student performance.

9 Grade 5 Reading is not as flat across the range. However, this may be the result of other factors that influence the results of the proposed and original formulas.

Table 11. Percent of Students Meeting Expectations by Quartiles Using the Proposed Formulas Compared to the Original Formulas

Reading

Proposed Formulas				
	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
Grade 3	52.2	51.6	46.2	36.3
Grade 4	49.6	51.3	46.4	43.1
Grade 5	61.4	51.4	46.7	40.4
Grade 6	58.8	57.9	62.0	62.7
Grade 7	56.0	57.0	61.2	60.2
Grade 8	56.9	52.0	51.9	50.4
Original Formulas				
	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
Grade 3	56.2	63.0	59.0	41.1
Grade 4	47.8	44.7	46.5	41.8
Grade 5	67.6	57.1	49.3	39.0
Grade 6	28.5	26.5	25.4	21.7
Grade 7	59.3	55.0	57.5	42.1
Grade 8	33.2	41.2	34.0	30.4

Mathematics

Proposed Formulas				
	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
Grade 3	60.8	58.2	55.1	51.0
Grade 4	57.5	56.4	56.8	57.7
Grade 5	55.7	51.1	52.6	57.8
Grade 6	66.1	62.6	65.7	66.5
Grade 7	57.9	51.7	54.8	65.0
Grade 8	61.3	58.7	60.6	61.9

Original Formulas				
	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
Grade 3	76.2	72.0	64.6	51.8
Grade 4	75.7	74.6	73.8	70.5
Grade 5	55.0	45.3	38.9	51.3
Grade 6	46.4	55.6	75.0	89.0
Grade 7	51.0	51.2	52.7	61.7
Grade 8	44.1	45.8	54.8	67.3

- In the few instances where the proposed formula's distribution is not flat, more students in the lower quartiles met the standard than at the upper quartile.
- Results for the proposed formulas indicate that meeting growth standards is attainable for students with low scores from previous years.

Table 12. Correlations Between Growth Composite Scores and Selected School Characteristics at the School Level (Grades 3-8), 2003-04

Proposed Formulas

	Total Number of Students	Percent of Minority Students
Academic Change	0.005	-0.32

Original Formulas

	Total Number of Students	Percent of Minority Students
Expected Growth	-0.26	-0.19

Correlation analyses for the proposed formulas were performed using the academic change composite for Reading and Mathematics for grades 3-8.

Correlation analyses for the original formulas were performed using the expected standardized growth composite for Reading and Mathematics for grades 3-8.

- Using the original formulas, schools with greater numbers of students had lower expected growth composites.
- Using the original formulas, schools with higher percentages of minority students had lower expected growth composites.
- Using the proposed formulas, there was no correlation between the number of students and academic change scores.
- Using the proposed formulas, schools with higher percentages of minority students had lower academic change scores.

Table 13. Correlations Between Growth Composite Scores and Percent of Minority Students by School Size (Grades 3-8), 2003-04 Proposed Formulas

	Percent of Minority Students		
	Small Schools1	Medium Schools2	Large Schools3
Academic Change	-0.25	-0.37	-0.47

Original Formulas

	Percent of Minority Students		
	Small Schools1	Medium Schools2	Large Schools3

Expected Growth	-0.16	-0.21	-0.34

School size range: 16 to 1,706 [1] Less than 200 students: 28.8% [2] Between 200 and 400 students: 42.4% [3] More than 400 students: 28.8%

Correlation analyses for the proposed formulas were performed using the academic change composite for Reading and Mathematics for grades 3-8.

Correlation analyses for the original formulas were performed using the expected standardized growth composite for Reading and Mathematics for grades 3-8.

- Using the proposed formulas, there are negative correlations between the percent of minority students and academic change for small, medium, and large schools. The magnitude of the correlations increases as school size increases. Small schools with higher percentages of minority students have lower academic change scores. This relationship is stronger for large schools.
- Using the original formulas, there are lower negative correlations between the percent of minority students and expected growth composite for small, medium, and large schools.

Table 14. Percent of Schools (Grades 3-8) Meeting or Exceeding Growth Expectations by Quartiles of Percent Minority, 2003-2004

Proposed Formulas				
	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
Met Academic Change	89.6	82.6	63.2	41.3
Original Formulas				
	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
Met Expected Growth	76.9	71.0	57.7	55.8

The results using the proposed formulas show less equity across the range of percent minority students compared to the original formulas. The percent of schools meeting expected growth declines over the quartiles as the percent of minority students in the school increases. For both formulas, the expectation is neutral toward demographic factors because the formulas use only student's past achievement to predict future achievement.

Note: When viewing the results of analyses correlating demographic factors and school growth, as one demographic factor decreases in importance, others appear to increase in importance.

Table 15. Percent of Schools (Grades 3-8) Meeting or Exceeding Expectations by Quartiles of Number of Students, 2003-2004

Proposed Formulas				
	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
Met Academic Change	64.9	75.2	79.4	72.3
Original Formulas				
	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
Met Expected Growth	72.0	83.9	77.8	34.9

9 In the proposed formulas, the percent of schools meeting academic change remains stable over the quartiles as the number of students in the school increases. A majority of schools are meeting academic change across all school sizes.
9 In the original formulas, the percent of schools meeting expected growth declines after the second quartile as the number of students in the school increases.

Note: When viewing the results of analyses correlating demographic factors and school growth, as one demographic factor decreases in importance, others appear to increase in importance.

Table 16. Percent of Schools (Grades 3-8) Meeting or Exceeding Expectations by Average Pretest Score Quartiles Reading

Proposed Formulas				
Year	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
1999	27.6	44.9	52.3	62.5
2000	14.1	35.7	47.0	62.7
2001	15.7	38.8	53.1	73.3
2002	30.0	51.9	61.8	73.7
2003	17.5	36.0	47.5	72.3
2004	25.3	47.4	63.4	81.0
				Original Formulas
Year	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
2002	29.8	44.1	55.1	68.4
2004	30.5	40.5	39.9	45.0

Mathematics

Proposed Formulas				
Year	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
1999	41.6	64.0	72.6	86.0
2000	32.3	53.7	73.5	85.7
2001	19.0	25.3	38.9	68.2
2002	33.5	59.3	72.7	88.0
2003	82.5	96.9	98.7	98.9
2004	58.3	82.2	92.2	98.0
				Original Formulas
Year	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
2004	68.8	83.4	94.3	98.5

- Results using the original formulas are based on 2003-04 Reading and Mathematics data. Results are also computed using 2001-02 Reading data because this was the last year of the first Reading test edition.

9 The distribution of schools meeting or exceeding growth in Reading using the proposed formulas is uneven.
9 In 2001-02 the two sets of formulas produce similar results. This indicates that schools are as likely to meet or exceed expectations using the proposed formulas as they were using the original formulas. However these results imply that schools in the lower quartiles have a more difficult time adjusting to new curriculum implementation.
9 Mathematics results for 2003-04 are very similar regardless of the formula used to predict growth. These results suggest that the proposed formulas are as equitable for Mathematics as the original

formulas.

- Results of the underlying analysis for Reading in 2003-04 using the proposed formulas showed that schools in the first quartile were widely scattered. No trend is apparent in the first quartile.
- The observed school-level results in Table 15 are contradictory to what is observed at the student level (see Table 11), which shows that students with low pretest scores are meeting standards at least as well as other students.

Table 17. Trend in Percent of Schools with a C-Ratio of 1.5 or Greater by Reading Quartiles, Using the Proposed Formulas

Year	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
1999	11.8	15.8	20.7	19.9
2000	2.3	7.9	10.0	18.4
2001	2.5	6.9	11.7	22.0
2002	8.1	6.2	12.0	18.9
2003	4.6	3.5	4.8	16.7
2004	6.6	6.1	10.7	18.6

The c-ratio is computed by dividing the number of students who met their expectation for academic change ("0" or greater) by the number of students who did not meet their expectation.

The schools are classified in quartiles based on the average previous year's Reading average c-scale score.

- A c-ratio is an indicator of school performance. Fundamentally, c-ratios greater than 1.5 mean that schools are helping a vast majority of their students meet individual growth standards.
- In most years, schools in the lowest quartile have a lower ratio of students meeting the growth standard than the upper quartiles.
- Schools that have a lower ratio of students who are meeting the growth standard should also be less likely to meet the growth standard. This is reflected in Tables 15 and 16.

Table 18. Trend in Percent of Schools Meeting or Exceeding Expectations by EOGs

Reading

Proposed Formulas						
Grade	**1998-99**	**1999-00**	**2000-01**	**2001-02**	**2002-03**	**2003-04**
3	29.3	22.8	29.1	38.2	50.1	51.2
4	51.1	33.8	38.8	43.3	22.0	49.4
5	19.2	55.0	59.1	56.8	46.5	45.0
6	90.5	76.8	72.1	75.8	63.9	68.4
7	71.7	58.4	71.8	65.6	57.3	66.0
8	39.1	36.0	44.9	64.7	58.4	52.1

Original Formulas						
Grade	**1998-99**	**1999-00**	**2000-01**	**2001-02**	**2002-03**	**2003-04**
3	85.8	76.2	51.1	54.6	70.0	68.1
4	22.4	17.9	26.4	29.2	61.5	28.3
5	58.0	80.2	85.4	87.0	97.3	73.0

6	44.0	19.7	18.1	24.9	15.3	2.2
7	72.9	33.2	44.9	29.7	76.4	70.4
8	55.2	31.4	51.9	56.2	57.8	10.9

Mathematics

Proposed Formulas						
Grade	**1998-99**	**1999-00**	**2000-01**	**2001-02**	**2002-03**	**2003-04**
3	51.1	50.0	49.3	49.0	91.2	86.5
4	54.0	59.1	31.4	62.4	94.6	82.2
5	61.5	55.8	36.8	56.6	90.5	62.5
6	79.0	60.0	49.3	75.9	90.9	78.5
7	68.3	60.8	40.5	62.2	67.5	47.0
8	71.9	74.8	40.4	65.3	78.0	73.6

Original Formulas						
Grade	**1998-99**	**1999-00**	**2000-01**	**2001-02**	**2002-03**	**2003-04**
3	39.9	38.1	51.9	54.9	93.9	91.2
4	85.9	86.3	83.2	93.1	99.8	95.8
5	74.3	66.0	56.0	72.2	92.0	46.4
6	71.4	55.5	66.2	81.3	94.4	83.8
7	82.6	61.0	80.2	86.6	81.1	57.4
8	66.8	64.6	32.1	49.1	58.9	48.8

9 The percent of schools making growth at any grade level in any year is expected to be different using the proposed formulas compared to the original formulas since the proposed formulas use a different standard of growth.

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9 Some of the notable differences are at the years when the posttest is the second edition and the pretest is the first edition. A fundamental strength of the proposed formulas is the ability to more accurately predict growth across test editions.

9 Using the original formulas, the percent of schools meeting growth in grade 6 Reading is low across all years. Using the proposed formulas, the results show a higher percentage. This is a function of using a different method of setting the growth standards and more closely reflects the implementation of curriculum.

Table 19. Trend in Percent of Schools Meeting or Exceeding Expectations by EOCs

Proposed Formulas

	2001-02	**2002-03**	**2003-04**
Algebra I	59.4	56.3	52.7
Algebra II	24.6	26.8	15.4
Biology	52.1	18.2	12.8
Chemistry	14.4	18.9	24.2

English I	92.8	39.3	42.0
Geometry	20.3	16.3	13.1
Physical Sciences	50.2	52.6	62.3
Physics	1.3	1.6	0.7

Original Formulas

	2001-02	**2002-03**	**2003-04**
Algebra I	91.8	89.0	89.1
Algebra II	71.4	63.6	56.0
Biology	61.4	26.1	26.3
Chemistry	70.0	77.3	72.9
ELPS	44.5	39.6	
English I	61.3	97.9	98.7
Geometry	34.0	30.1	26.8
Physical Sciences	58.4	61.8	67.6
Physics	76.2	69.4	70.2
US History	20.4	28.5	

9 The percent of schools making growth across EOCs in any year is expected to be different using the proposed formulas compared to the original formulas since the proposed formulas use a different standard of growth.

Table 20. Percent of Schools Meeting Expected Growth and High Growth

Proposed Formulas

	2001-02		**2002-03**		**2003-04**	
	N	Percent	N	Percent	N	Percent
Met At Least Expected Academic Change	1,424	65.4	1,839	85.0	1,582	72.1
Met High Academic Change	395	18.1	751	34.6	536	24.4

Original Formulas

	2001-02		**2002-03**		**2003-04**	
	N	Percent	N	Percent	N	Percent
Met At Least Expected Growth	1,642	74.8	2,092	94.3	1,676	75.1
Met High Growth	779	35.5	1,617	72.9	785	35.2

- In the proposed formulas, high growth is met when Academic Change is greater or equal to "0" **and** the c-ratio is greater than 1.5.

9 Using the proposed formulas, the percent of schools meeting both the expected and high growth

expectations in these three years is similar except for results for the high growth standard in 2002-03.

9 The percent of schools meeting these standards is different between the two sets of formulas.

Table 21. Percent of Schools Meeting Expected Growth and High Growth by Grade Span*

Proposed Formulas

	Grade Span	2001-02		2002-03		2003-04	
Met At Least Expected Academic Change	K-5	577	52.8	964	86.4	842	75.0
	6-8	299	78.9	327	85.8	279	71.9
	9-12	319	96.4	319	98.1	246	73.6
Met High Academic Change	K-5	125	11.4	472	42.3	359	32.0
	6-8	139	36.7	162	42.5	104	26.8
	9-12	70	21.1	12	3.7	8	2.4

Original Formulas

	Grade Span	2001-02		2002-03		2003-04	
Met At Least Expected Growth	K-5	904	79.6	1151	98.9	988	85.1
	6-8	222	59.4	320	84.0	124	32.0
	9-12	264	81.7	277	85.7	310	96.9
Met High Growth	K-5	486	42.8	1095	94.1	504	43.3
	6-8	126	33.7	214	56.2	46	11.9
	9-12	63	19.5	96	29.7	139	43.4

* Elementary (K-5) schools include schools with students no lower than kindergarten and no higher than grade 5. Middle (6-8) schools are schools with students no lower than grade 6 and no higher than grade 8. High schools (9-12) consist of schools with students no lower than grade 9.

9 The percent of schools making growth among the three grade spans in any year is expected to be different using the proposed formulas compared to the original formulas since the proposed formulas use a different standard of growth.

9 Using the original formulas, the percent of middle (6-8) schools meeting growth is low in 2001-02 and 2003-04. Using the proposed formulas, the results show a higher percentage.

Table.22 Correlations between Residuals and the Average of the Two Previous Assessment Scores

(ATPA)

	Reading	Mathematics
Grade 3*	-0.39	-0.41
Grade 4	-0.20	-0.18
Grade 5	-0.36	-0.19
Grade 6	-0.16	-0.23
Grade 7	-0.13	-0.13
Grade 8	-0.23	-0.23

*The grade 3 pretest c-scale score is used since two previous assessment scores are not available.

Numbers do not include an adjustment for regression to the mean.
Conservatively, most of the grades with 2 previous assessments have a correlation of 0.1X
Grade 7 is a non-controversial grade and the correlations round down to a -0.1

√ In the original proposal, a factor of 0.1 was used to help offset the correlation between residuals and predicted values. See Table 24 below for the results of this adjustment (including the adjustment for PA). Since in Table 24 all correlations to residuals decreased to the hundredths place of the decimal, the decision was made to leave the factor at 0.1 since is reduced (along with the 0.2) a vast majority of the systematic error except for grade 5 reading. Additionally, the grade 3 systematic error was deemed inherent in the pretest post test system and other factors due to the age of the students involved.

Table.23 Correlations between Residuals and the Assessment Scores (PA)

	Reading	Mathematics
Grade 3*	-0.39	-0.41
Grade 4	-0.17	-0.14
Grade 5	-0.32	-0.19
Grade 6	-0.05	-0.19
Grade 7	-0.20	-0.10
Grade 8	-0.20	-0.22

*The grade 3 pretest c-scale score is used since two previous assessment scores are not available.

Actual growth for grade 3 is computed by subtracting the grade 3 pretest c-scale score from the grade 3 EOG c-scale score. Actual growth for grades 4-8 is computed by subtracting the previous grade c-scale score from the current grade c-scale score.

These numbers do not include an adjustment for regression to the mean.

√ In the original proposal, a factor of 0.2 was used when only a single predictor was used (due to the similarity between those correlations and -0.2). The results of incorporating the 0.1 factor are shown below.

Table 24. EOG Correlations Between Predicted Values and Residuals using 0.1 and 0.2 for

Regression Coefficients*

Proposed Formulas		
	Reading	Mathematics
Grade 3	-0.13	-0.13
Grade 4	-0.04	-0.02
Grade 5	-0.19	-0.003
Grade 6	0.01	-0.04
Grade 7	0.04	0.06
Grade 8	-0.05	-0.02

After careful consideration of the effects on traditionally high achieving students, the regression factor was adjusted to 0.08 for two previous assessments and 0.18 for a single previous assessment.

Table 25. Correlations Between Predicted Values and Residuals using 0.08 and 0.18 for Regression Coefficients*

	Reading	Mathematics
Grade 3	-0.16	-0.16
Grade 4	-0.08	-0.05
Grade 5	-0.23	-0.04
Grade 6	-0.02	-0.07
Grade 7	0.01	0.02
Grade 8	-0.09	-0.06