

# Technical Notes

## **Standard Conventions used in the 2006-07 ABCs Analyses**

95R – Percent tested below 95% for the 2006-07 ABCs, a percentage of students tested was computed by combining information from EOG reading, EOG mathematics, EOC and alternate assessments across all grades in a school. The percentage must be greater than or equal to 95, when rounded to the nearest whole number. (To determine the 95% participation rate for meeting Adequate Yearly Progress (AYP) per the No Child Left Behind legislation, the cohort of 10<sup>th</sup> grade students on the first day of spring testing for the school were analyzed to determine the number of students who had taken the required tests.) Schools identified as having fallen below the 95% threshold for the ABCs were asked to justify their rate. Their explanations were reviewed at DPI and if rejected, the school was assigned a 95R status. This assigned status means that the school was in violation of the rule and ineligible to receive incentive awards or recognition (other than low performing). A school in violation for two consecutive years may be identified as low-performing by the State Board of Education.

## **Full Academic Year**

Students must have been in membership in a school for at least 140 days as of the first day of spring testing in order for their test scores to be included in the growth calculations or AYP. By contrast for ABCs in block scheduled high schools, the student must be in membership 70 days in the semester the course is taught.

## **Medical Exclusions**

In compliance with NCLB and in light of the full availability of alternate assessments, only exclusions for serious medical emergencies and/or conditions were allowed in 2005-06. Examples included students who were (1) in the final stages of terminal or degenerative illnesses, (2) comatose, or (3) receiving extensive short-term medical treatment due to a medical emergency. In response to a request from the student's LEA the Director of Accountability Services provides a written statement of the decision to the LEA; any exception granted is limited to the testing period for the specific test(s) for which it was requested and does not carry forward to future test administrations, unless noted in the decision. In the rare case that a student was still administered an assessment, the score from the assessment was used.

## **Algebra I Scores in the Performance Composite**

Algebra I scores for current ninth graders who took Algebra I prior to grade 9 were included in the performance composite for the high school where they were currently enrolled. Algebra I scores of students in grades 6, 7, or 8 during the current school year were included in the K-8 performance composite of the middle school where they were currently enrolled. Algebra I scores of students currently enrolled in grade 10 in a senior high school (Grades 10-12) who took Algebra I while in earlier grades were included in the performance composite of the senior high school.

## **Confidence Interval Applied to the Performance Composite to Identify Low-Performing Schools**

The performance composite is the percent of students' scores at or above grade level (i.e., in Achievement Levels III or IV) on end-of-grade (and Computer Skills in grade 8 where applicable) and/or end-of-course tests. The performance composite is computed by adding all scores at or above Achievement Level III on each of the tests, and then dividing the sum by the total number of valid scores on the tests. If a school did not make expected growth *and* its performance composite was significantly less than 50, the school is given the status of low-performing.

The confidence interval is a way of taking into account the precision of the performance composite. By applying the confidence interval, the likelihood of incorrectly assigning a low-performing status to a school that does not deserve it is decreased while the likelihood of correctly assigning a status to schools is not hindered. The confidence interval itself will be narrow or wide depending on the size of the school and the variation of the student scores in the school. In general, the confidence interval is narrower when the number of students is larger, or the scores are more homogeneous; the confidence interval is wider when the number of students is smaller, or the scores are less homogeneous.

This means that a potentially low-performing school may have a performance composite that is considerably below 50% but when the confidence interval is applied (correcting for the precision of the performance composite), the school is not considered low-performing (because the confidence interval for that school is wide i.e., there is less confidence in the value of the performance composite). This situation would likely be true for a school that has few students or has wide variation in test scores. It is also possible for a school to have a performance composite that is fairly close to 50% and is considered low-performing because the confidence interval for that school is very narrow (i.e., there is high confidence in the performance composite). This situation would likely be true for a school that has a large number of students or students all have about the same test score.

As long as the value, 50, lies within or on the upper boundary of the confidence interval for an observed performance composite, then the performance composite is not significantly less than 50 and hence the school is not classified as low-performing.

## 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**

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

<b>2<sup>nd</sup> Edition Math 2005 Special Transition Conversion Used when Comparing with 3<sup>rd</sup> Edition</b>			
<b>Grade 3 Pretest</b>	2005	237.9	7.7
<b>Grade 3</b>	2005	253.1	7.0
<b>Grade 4</b>	2005	258.6	8.0
<b>Grade 5</b>	2005	262.0	9.6
<b>Grade 6</b>	2005	266.1	9.6
<b>Grade 7</b>	2005	268.8	11.0
<b>Grade 8</b>	2005	272.1	10.9
<b>3<sup>rd</sup> Edition Math 2006</b>			
<b>Grade 3 Pretest</b>	2006	329.7	11.35
<b>Grade 3</b>	2006	343.20	9.70
<b>Grade 4</b>	2006	348.90	9.46
<b>Grade 5</b>	2006	353.74	9.25
<b>Grade 6</b>	2006	354.91	9.70
<b>Grade 7</b>	2006	357.76	9.65
<b>Grade 8</b>	2006	359.15	9.21

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**

<b>EOC</b>	<b>Standard Setting Year</b>	<b>Mean</b>	<b>Standard Deviation</b>
<b>Algebra I</b>	1994	55.1	9.12
	2001	61.1	9.31
	2006	63.3	10.1
	2007	150.3	8.9
<b>Algebra II</b>	1997	58.5	10.26
	2001	63.8	9.90
	2007	150.2	9.3
<b>Biology</b>	1995	55.5	8.67
	2002	57.9	7.61
	2007	57.3	7.47
<b>Chemistry</b>	1997	56.8	8.53
	2002	60.0	8.16
<b>Civics and Economics</b>	2006	150.2	9.19
	2007	150.5	9.04
<b>English I</b>	2003	57.7	7.63
	2007	150.36	8.93
<b>Geometry</b>	2001	59.8	8.85
	2007	150.2	9.27

<b>Physics</b>	1997	56.5	8.65
	2002	60.7	9.24
<b>Physical Science</b>	1997	54.0	9.41
	2002	55.8	7.90
<b>U.S. History</b>	2006	150.0	9.14

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

**Table 3. N Counts for EOG Proposed Formulas**

	<b>Reading</b>	<b>Mathematics</b>
<b>Grade 3</b>	545,120	545,862
<b>Grade 4</b>	534,515	536,147
<b>Grade 5</b>	587,547	589,558
<b>Grade 6</b>	525,760	453,806
<b>Grade 7</b>	450,087	450,838
<b>Grade 8</b>	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**

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

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\***

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

<b>Original Formulas</b>		
	<b>Reading</b>	<b>Mathematics</b>
<b>Grade 3</b>	-0.15	-0.30
<b>Grade 4</b>	-0.03	-0.25
<b>Grade 5</b>	-0.30	-0.14
<b>Grade 6</b>	0.07	0.35
<b>Grade 7</b>	-0.15	0.06
<b>Grade 8</b>	-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.
- 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**

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

<sup>a</sup> denotes only one predictor used. <sup>b</sup> 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<sup>a</sup> is computed by multiplying the grade 8 Reading c-scale score by 0.8, whereas the predicted value for Biology<sup>b</sup> 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<sup>a</sup> is computed by multiplying the Algebra I c-scale score by 0.8, whereas the predicted value for Geometry<sup>b</sup> 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**

<b>Algebra I</b>	0.78
<b>Algebra II</b>	0.73
<b>Biology<sup>a</sup></b>	0.73
<b>Biology<sup>b</sup></b>	0.78
<b>Chemistry</b>	0.71
<b>English I</b>	0.79
<b>Geometry<sup>a</sup></b>	0.77
<b>Geometry<sup>b</sup></b>	0.83
<b>Physical Science</b>	0.73
<b>Physics</b>	0.77
<b>US History<sup>b</sup></b>	0.77
<b>Civics<sup>b</sup> and Economics<sup>b</sup></b>	0.83

**Original Formulas**

<b>Algebra I</b>	0.75
<b>Algebra II</b>	0.76
<b>Biology</b>	0.03
<b>Chemistry</b>	0.76
<b>English I</b>	0.80
<b>Geometry</b>	0.82
<b>Physical Science</b>	0.72
<b>Physics</b>	0.72
<b>US History<sup>a</sup></b>	0.75
<b>Civics<sup>a</sup> and Economics<sup>a</sup></b>	0.74

All numbers are Pearson's r.

<sup>a</sup> denotes only one predictor used.

<sup>b</sup> denotes two predictors used.

- In the proposed formulas, the computed c-scale score for each grade is correlated with the corresponding predicted value. The correlations for the proposed and the original formulas are comparable except as noted below. This suggests comparable prediction accuracy.
- Geometry<sup>a</sup> 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.
- 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		New Formulas	
Algebra I	0.06	Algebra I	-0.18
Algebra II	0.009	Algebra II	-0.28
Biology <sup>a</sup>	0.01	Biology	-0.63
Biology <sup>b</sup>	0.04	Chemistry	0.08
Chemistry	0.06	English I	-0.20
English I	-0.006	Geometry	-0.30
Geometry <sup>a</sup>	0.02	Physical Science	-0.40
Geometry <sup>b</sup>	0.09	Physics	-0.11
Physical Science	-0.11		
Physics	0.02		

All numbers are Pearson's r.

<sup>a</sup> denotes only one predictor used.

<sup>b</sup> denotes two predictors used.

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 <sup>a</sup>	0.685	1.370
Biology <sup>b</sup>	0.629	
Chemistry	0.734	0.681
English I	0.586	0.657
Geometry <sup>a</sup>	0.659	
Geometry <sup>b</sup>	0.596	0.630
Physical Science	0.634	1.083
Physics	0.922	1.284

<sup>a</sup> denotes only one predictor used. denotes two predictors used.

<sup>b</sup> denotes only one predictor used. 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**

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

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

**Mathematics**

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

<b>Original Formulas</b>					
	<b>Overall</b>	<b>Lower 10%</b>	<b>Lower 50%</b>	<b>Upper 50%</b>	<b>Upper 10%</b>
<b>Grade 3</b>	66.7	78.2	75.0	59.1	44.4
<b>Grade 4</b>	73.9	77.7	75.3	72.6	69.5
<b>Grade 5</b>	47.6	62.8	51.5	44.3	54.6
<b>Grade 6</b>	65.8	47.5	48.7	78.6	94.2
<b>Grade 7</b>	54.1	54.7	51.7	56.3	69.9
<b>Grade 8</b>	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.
- In most cases, the proposed formulas show a more equitable percent of students meeting and exceeding expectations across the range of student performance.
- 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**

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

## Mathematics

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

- 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**

<b>Proposed Formulas</b>		
	Total Number of Students	Percent of Minority Students
Academic Change	0.005	-0.32

<b>Original Formulas</b>		
	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**

<b>Proposed Formulas</b>			
	<b>Percent of Minority Students</b>		
	<b>Small Schools<sup>1</sup></b>	<b>Medium Schools<sup>2</sup></b>	<b>Large Schools<sup>3</sup></b>
<b>Academic Change</b>	-0.25	-0.37	-0.47

### Original Formulas

	Percent of Minority Students		
	Small Schools <sup>1</sup>	Medium Schools <sup>2</sup>	Large Schools <sup>3</sup>
<b>Expected Growth</b>	-0.16	-0.21	-0.34

School size range: 16 to 1,706

<sup>1</sup> Less than 200 students: 28.8%

<sup>2</sup> Between 200 and 400 students: 42.4%

<sup>3</sup> 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
<b>Met Academic Change</b>	89.6	82.6	63.2	41.3
Original Formulas				
	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
<b>Met Expected Growth</b>	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. 9 The percent of schools meeting expected growth declines over the quartiles as the percent of minority students in the school increases. 9 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**

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

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.

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**

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

<b>Mathematics</b>				
<b>Proposed Formulas</b>				
<b>Year</b>	<b>1st Quartile</b>	<b>2nd Quartile</b>	<b>3rd Quartile</b>	<b>4th Quartile</b>
<b>1999</b>	41.6	64.0	72.6	86.0
<b>2000</b>	32.3	53.7	73.5	85.7
<b>2001</b>	19.0	25.3	38.9	68.2
<b>2002</b>	33.5	59.3	72.7	88.0
<b>2003</b>	82.5	96.9	98.7	98.9
<b>2004</b>	58.3	82.2	92.2	98.0
<b>Original Formulas</b>				
<b>Year</b>	<b>1st Quartile</b>	<b>2nd Quartile</b>	<b>3rd Quartile</b>	<b>4th Quartile</b>
<b>2004</b>	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.
- The distribution of schools meeting or exceeding growth in Reading using the proposed formulas is uneven.
- 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.
- 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**

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

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

<b>Original Formulas</b>						
<b>Grade</b>	<b>1998-99</b>	<b>1999-00</b>	<b>2000-01</b>	<b>2001-02</b>	<b>2002-03</b>	<b>2003-04</b>
<b>3</b>	85.8	76.2	51.1	54.6	70.0	68.1
<b>4</b>	22.4	17.9	26.4	29.2	61.5	28.3
<b>5</b>	58.0	80.2	85.4	87.0	97.3	73.0
<b>6</b>	44.0	19.7	18.1	24.9	15.3	2.2
<b>7</b>	72.9	33.2	44.9	29.7	76.4	70.4
<b>8</b>	55.2	31.4	51.9	56.2	57.8	10.9

**Mathematics**

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

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

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.



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.

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**

	<b>2001-02</b>	<b>2002-03</b>	<b>2003-04</b>
<b>Algebra I</b>	59.4	56.3	52.7
<b>Algebra II</b>	24.6	26.8	15.4
<b>Biology</b>	52.1	18.2	12.8
<b>Chemistry</b>	14.4	18.9	24.2
<b>English I</b>	92.8	39.3	42.0
<b>Geometry</b>	20.3	16.3	13.1
<b>Physical Sciences</b>	50.2	52.6	62.3
<b>Physics</b>	1.3	1.6	0.7

**Original Formulas**

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

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**

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

<b>Original Formulas</b>						
	<b>2001-02</b>		<b>2002-03</b>		<b>2003-04</b>	
	<b>N</b>	<b>Percent</b>	<b>N</b>	<b>Percent</b>	<b>N</b>	<b>Percent</b>
<b>Met At Least Expected Growth</b>	1,642	74.8	2,092	94.3	1,676	75.1
<b>Met High Growth</b>	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.  
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. 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**

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

### Original Formulas

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

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.

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
<b>Grade 3*</b>	-0.39	-0.41
<b>Grade 4</b>	-0.20	-0.18
<b>Grade 5</b>	-0.36	-0.19
<b>Grade 6</b>	-0.16	-0.23
<b>Grade 7</b>	-0.13	-0.13
<b>Grade 8</b>	-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)**

	<b>Reading</b>	<b>Mathematics</b>
<b>Grade 3*</b>	-0.39	-0.41
<b>Grade 4</b>	-0.17	-0.14
<b>Grade 5</b>	-0.32	-0.19
<b>Grade 6</b>	-0.05	-0.19
<b>Grade 7</b>	-0.20	-0.10
<b>Grade 8</b>	-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\***

<b>Proposed Formulas</b>		
	<b>Reading</b>	<b>Mathematics</b>
<b>Grade 3</b>	-0.13	-0.13
<b>Grade 4</b>	-0.04	-0.02
<b>Grade 5</b>	-0.19	-0.003
<b>Grade 6</b>	0.01	-0.04
<b>Grade 7</b>	0.04	0.06
<b>Grade 8</b>	-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\***

	<b>Reading</b>	<b>Mathematics</b>
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

\*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.

### Scale Score Ranges

Subject/Grade	Level I	Level II	Level III	Level IV
Reading PT3	213-223	224-232	233-244	245-264
3	216-229	230-239	240-249	250-272
4	223-235	236-243	244-254	255-275
5	228-238	239-246	247-258	259-277
6	228-241	242-251	252-263	264-283
7	228-242	243-251	252-263	264-287
8	231-243	244-253	254-265	266-290

#### Achievement Level Descriptions:

**Level I:** Students performing at this level do not have sufficient mastery of knowledge and skills in this subject area to be successful at the next grade level.

**Level II:** Students performing at this level demonstrate inconsistent mastery of knowledge and skills in this subject area and are minimally prepared to be successful at the next grade level.

**Level III:** Students performing at this level consistently demonstrate mastery of grade level subject matter and skills and are well prepared for the next grade level.

**Level IV:** Students performing at this level consistently perform in a superior manner clearly beyond that required to be proficient at grade level work.

#### End-Of-Course (EOC) Achievement Levels (July 2004)

Description	Level I	Level II	Level III	Level IV
Algebra I	31-44	45-54	55-65	66-96
Algebra II	33-45	46-57	58-68	69-102
Biology	28-46	47-54	55-64	65-85
Chemistry	31-47	48-55	56-64	65-90
Civics and Economics	>139-139	140-149	150-159	160-<160
English I	28-42	43-51	52-60	61-82
Geometry	32-45	46-56	57-66	67-93
Physics	23-42	43-51	52-62	63-91
Physical Science	30-43	44-53	54-63	64-86

US History	>139 - 139	140-149	150-159	160- <160
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**2005-06 and 2006-07  
Achievement Level Ranges for North Carolina  
End-of-Course Tests**

<b>Test</b>	<b>Level I</b>	<b>Level II</b>	<b>Level III</b>	<b>Level IV</b>
<b>Algebra I</b>	Less than or equal to 44	45-54	55-65	Greater than or equal to 66
<b>Algebra I (Interim for 2006-07)</b>	Less than or equal to 139	140-147	148-157	Greater than or equal to 158
<b>English I</b>	Less than or equal to 42	43-51	52-60	Greater than or equal to 61
<b>English I (Interim for 2006-07)</b>	Less than or equal to 137	138-145	146-156	Greater than or equal to 157
<b>Biology</b>	Less than or equal to 46	47-54	55-64	Greater than or equal to 65
<b>U.S. History (Interim for 2005-06)</b>	Less than or equal to 139	140-149	150-159	Greater than or equal to 160
<b>U.S. History (for 2006-07 and beyond)</b>	Less than or equal to 139	140-148	149-159	Greater than or equal to 160
<b>Civics and Economics (Interim for 2005-06)</b>	Less than or equal to 139	140-148	149-158	Greater than or equal to 159
<b>Civics and Economics (for 2006-07 and beyond)</b>	Less than or equal to 140	141-147	148-159	Greater than or equal to 160
<b>Algebra II</b>	Less than or equal to 45	46-57	58-68	Greater than or equal to 69
<b>Algebra II (Interim for 2006-07)</b>	Less than or equal to 138	139-146	147-157	Greater than or equal to 158
<b>Chemistry</b>	Less than or equal to 47	48-55	56-64	Greater than or equal to 65
<b>Geometry</b>	Less than or equal to 45	46-56	57-66	Greater than or equal to 67
<b>Geometry (Interim for 2006-07)</b>	Less than or equal 138	139-147	148-157	Greater than or equal to 158
<b>Physics</b>	Less than or equal to 42	43-51	52-62	Greater than or equal to 63
<b>Physical Science</b>	Less than or equal to 43	44-53	54-63	Greater than or equal to 64