

# **The ABCs of Public Education Academic Change for Schools 2008-09**

*August 20, 2009*

## **ABCs Reporting for 2008-09**

No new test editions were introduced in 2008-09. Consequently, NCDPI returned to its traditional release schedule for accountability results. ABCs performance composites and ABCs calculations of academic change were reported at the August State Board of Education (SBE) meeting.

However, there were a few modifications to the ABCs effective for the 2008-09 accountability cycle. These included the following:

1. End of Grade (EOG) Science scores for grades 5 and 8 were included in the ABCs performance composites.
2. Retest scores (first retest only) for EOG reading, mathematics (grades 3-8) and science (grades 5 and 8) were incorporated in the calculation of ABCs performance composites. Students scoring in Achievement Level II were required to take a retest; students scoring in Achievement Level I could “opt in” to take the retest at their parents’ request. The higher of the two scores (original score or first retest score) was used in calculating the performance composite. As a result, 2008-09 ABCs performance composite results are not comparable to results for previous years.
3. The U.S. History formula for academic change was revised to use Civics and Economics as the primary predictor in conjunction with English I as the secondary predictor (when available). Biology was substituted as primary predictor when Civics and Economics was not available.
4. The College University Prep/College Tech Prep (CUP/CTP) component of academic change was enhanced to provide some additional credit to schools whose baseline was above 90% and whose percentage for the current year was also above 90%. (This was in response to an appeal of the growth standards made following the 2007-08 ABCs.)
5. The End-of-Course tests included in the calculation of ABCs academic change were modified to align with EOC tests required for the high school exit standards.

Additional details about the calculation of academic change are provided below. The examples are generic examples based on past implementations of the ABCs. See page 14 for the EOC courses used in growth for 2008-09.

## **A Standardized Scale Model**

Based on revisions first implemented in 2005-06 in response to G.S. 115C-105.35 Section 7.12, the ABCs currently uses a standardized scale, similar to  $z$ -scores<sup>1</sup>, to measure relative student performance. Under the current formulas, student scores are standardized and a student’s performance is considered as a point on the *c-scale* (change scale) relative to standard performance for that grade level in a standard setting year. A student’s developmental scale score is converted to a *c-scale* score.

In the first year of a test edition implementation (called the standard setting year), approximately half of the students in the state will score above “0” and half below. After the standard setting year, a student scoring above “0” on the *c-scale* is performing better than the average student in the standard setting year. Based on historical data, what is different about the *c-scale* from normative scales is that there is no reason why all students in the state cannot score above “0” in any year after the standard setting year. On the *c-scale*, if a student performs equally as well in two consecutive years, the *academic change* (AC) would be “0,” meaning for example that the student is performing equally as well in grade 5 as previously in grade 4 (“equally well” being relative to the grade level average in the standard setting year).

Using these formulas, schools that assist students to achieve as well in the current year as in the previous year have a change of “0” on the *c-scale*. If the school does not perform as well in the current year, the AC is negative, and if the school performs better, the AC is positive.

### **Growth Expectations (EOG)**

Under the current formulas, when a student’s scores are placed on the *c-scale* the individual student is expected to perform at least as well on the end-of-grade (EOG) assessment for the current year as she or he did, on average, during the previous two years. The current accountability model operationalizes “growth” as *academic change*. The *academic change* is based on an average of the previous two years’ assessments. If there is only one previous year’s EOG test data available, the expectation for change will be based on one previous assessment. Like the original formulas, the current formulas factor in an adjustment for regression to the mean (a student who performs above or below the mean score on one EOG will likely score closer to the mean on a subsequent EOG).

### **Population Factor (EOC)**

For certain EOC tests, a population factor is used to account for the differing populations of students who take the tests. Example: Many fewer students take Algebra II than Algebra I, which is a predictor for Algebra II.

### **The Current Formula(s)**

*Academic change* is expressed as the difference between a student’s actual *c-scale* score for the current year and the student’s average of two (in most cases) previous assessments (EOGs and EOCs) with a correction for regression toward the mean. A positive *academic change* indicates a gain in academic achievement, while a negative *academic change* indicates a loss in academic achievement from the previous two years. The simplified formula to determine *academic change* is:

$$AC = CS_{c-scale} - (0.92 \times ATPA_{c-scale})$$

Where

- AC = academic change
- CS = current score
- ATPA = average of two previous assessment scores

A modification is made to the formula for determining *academic change* in grade 3 and for any instance when only one previous year's EOG score is available or only one previous year's EOC score is required. The formula, adjusted for one previous year's assessment score, is:

$$AC = CS_{c-scale} - (0.82 \times PA_{c-scale})$$

Where:

- AC = academic change
- CS = current score
- PA = previous assessment score

**A Sample Calculation for Determining Academic Change for Grades 3-8**

For our example, Jordan is a student in grade 5 in the 2003-04 school year. Jordan's test scores are:

	EOG Reading	EOG Math
Grade 5 (2003-04)	268	271
Grade 4 (2002-03)	263	264
Grade 3 (2001-02)	157*	267

\*Note that these data bridge two different reading test editions scored on differing scales.

Steps in the Calculation of Academic Change:

1. **Convert the developmental scale scores to *c-scale* scores:**
  - a. Subtract the state mean for the standard setting year from the developmental scale score
  - b. Divide by the standard deviation for the standard setting year.

Grade Level	Scale score	State mean	Difference	Standard deviation	<b>Actual c-score*</b>
Reading 5	268.0	256.9	11.1	8.03	<b>1.382</b>
Reading 4	263.0	252.3	10.7	8.68	<b>1.233</b>
Reading 3	157.0	146.9	10.1	9.29	<b>1.087</b>
Math 5	271.0	260.0	11.0	9.62	<b>1.143</b>
Math 4	264.0	255.8	08.2	8.32	<b>0.986</b>
Math 3	267.0	250.6	16.4	7.75	<b>2.116</b>

*\*Full precision will be used in the actual calculations, although the values here are rounded for heuristic purposes.*

2. **Compute the ATPAs (average of two previous assessment scores on the c-scale), for reading and mathematics, and adjust for regression to the mean to determine what is expected for Jordan at grade 5.**

Grade Level	c-scale	ATPA	Coefficient	<b>Expected</b>
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				<b>c-score</b>
Reading 4	1.233	1.16	0.92	<b>1.067</b>
Reading 3	1.087			
Math 4	0.986	1.55	0.92	<b>1.426</b>
Math 3	2.116			

3. **Subtract the expected c-scale score from the actual c-scale score (see step #1) to determine Jordan’s academic change.**

Grade Level	Actual c-score (from Step # 1)	Expected c-score (from Step #2)	Difference = Academic Change	Met Expected Academic Change?
Reading 5	1.382	1.067	+0.315	Yes
Math 5	1.143	1.426	-0.283	No

*(Caution: Due to the instability of a single student score, an individual Academic Change should be used with a margin of + or – 0.5. This caution notwithstanding, since 30 scores are used when calculating school level academic change, scores will be rounded to the 0.01 level for use in calculating c-ratios for schools.)*

### High School Example

#### **Sample Calculations for Determining Student Academic Change:**

As in 3-8, all scale scores will have to be converted to the change scale. Standard setting means and standard deviations for the relevant EOC and/or EOG tests will be needed, as for example in Tables 1 and 2.

Table 1: Standard Setting Means and Standard Deviations for End-Of-Grade (EOG):

*Note: Grade 8 EOG used as a pretest can be either first (100-scale) or second edition (200-scale), or third edition (300 scale) depending on which grade the EOC (posttest) was taken.*

EOG	Standard Setting Year	Mean	Standard Deviation
Reading (2 <sup>nd</sup> Edition)			
Grade 8	2003	263.9	9.05
Reading (3 <sup>rd</sup> Edition)			
Grade 8	2008	358.5	8.80
Mathematics (2 <sup>nd</sup> Edition)			
Grade 8	2005	272.1	10.90
Mathematics (3 <sup>rd</sup> Edition)			
Grade 8	2006	359.2	9.21

Table 2: Standard Setting Means and Standard Deviations for End-Of-Course (EOC):

EOC	Standard Setting Year	Mean	Standard Deviation
Algebra I	2001	61.10	9.31
Algebra I (special transition for use when companion to 2 <sup>nd</sup> Edition EOCs )	2006	63.30	10.10
Algebra I	2007	150.30	8.90
Algebra II	2001	63.80	9.90
Algebra II	2007	150.20	9.30
Biology	2002	57.90	7.61
Chemistry	2002	60.00	8.16
Civics and Economics	2006	150.90	9.40
English	2003	57.70	7.63
English	2007	150.36	8.93
Geometry	2001	59.80	8.85
Geometry	2007	150.20	9.27
U.S. History	2006	150.00	9.14

**Example:**

Sandra is a 9<sup>th</sup> grade student at a local school. Sandra’s test scores are:

Course	Scale Score
Algebra I (1 <sup>st</sup> semester)	148
Geometry (2 <sup>nd</sup> semester)	148
English I (1 <sup>st</sup> semester)	146
Grade 8 Math EOG	349
Grade 8 Reading EOG	254

Steps in the Calculation of Academic Change:

1. **Convert the developmental scale scores to Change Scale Scores (CS) (both the current year’s test and the predictors):**
  - a. Subtract the state mean for the standard setting year from the developmental scale score.
  - b. Divide by the standard deviation for the standard setting year

EOC Course	Scale Score	State Mean	Difference	Standard Deviation	Population Factor	Actual c-score*
Algebra I (1 <sup>st</sup> sem.)	148	150.28	-2.28	8.90		-0.26
Geometry	148	150.20	-2.20	9.27	0.21	-0.03
English I	146	150.36	-4.36	8.93		-0.49
Grade 8 Math EOG	349	359.15	-10.15	9.21		-1.10
Grade 8 Reading EOG	254	263.9	-9.9	9.05		-1.09

\*Full precision will be used in the actual calculations, although the values here are rounded for heuristic purposes

## 2. Compute the Academic Change (AC) for each of the End-of-Course Tests

### Algebra I:

The predictor is Grade 8 EOG Math.

$$\text{Alg I}_{AC} = \text{Alg I}_{c\text{-score}} - (.82 * (\text{Grade 8 EOG Math})_{c\text{-score}})$$

Algebra I c-score	Grade 8 Math EOG c-score	Coefficient	Target Score <sup>1</sup>	Academic Change	Met expected academic change?
-0.26	-1.10	0.82	-0.90	-0.30	Yes

<sup>1</sup>Target Score= Coefficient\* Predictor

### Geometry:

The predictor is Algebra I EOC. If Algebra I is not available, the AC will not be computed. The Algebra I EOC has to be administered at the latest during the semester preceding the administration of the Geometry EOC.

In our example, Algebra I is available:

$$\text{Geometry}_{AC} = \text{Geometry}_{c\text{-score}} - (.82 * \text{Alg I}_{c\text{-score}})$$

Geometry c-score	Algebra I c-score	Coefficient	Target Score	Academic Change	Met expected Academic change?
-0.03	-0.26	0.82	-0.21	0.18	Yes

Geometry c-score incorporates the population factor, 0.21, as follows:

$$\frac{CS - SM}{SD} + 0.21$$

Where:

- SD = standard deviation
- CS = current score
- SM = state mean

### **English I**

The predictor is Grade 8 EOG Reading.

$$\text{Eng I}_{AC} = \text{Eng I}_{c\text{-score}} - (.82 * (\text{Grade 8 EOG Reading})_{c\text{-score}})$$

<b>English I c-score</b>	<b>Grade 8 Reading EOG c-score</b>	<b>Coefficient</b>	<b>Target Score<sup>1</sup></b>	<b>Academic Change</b>	<b>Met Expected Academic Change?</b>
-0.49	-1.09	0.82	-.89	0.4	Yes

<sup>1</sup>Target Score = Coefficient \* Predictor

### **Additional Considerations**

#### **Calculation of c-scores**

The computation of the c-score is from the current year's Developmental scale score and statistics from the year the test was first implemented operationally (the test's "standard setting" year).

Example 1:

If the student's performance on a particular test during the current year (the developmental scale score, or DSS) was 268 and if statewide performance during the test's "standard setting" year averaged 256.9 with a standard deviation of 8.03,

the c-score = [(DSS) - (mean, ss year)]/(standard deviation, ss year),

or

c-score=(268-256.9)/8.03. The c-score equals 1.382.

Example 2:

If the c-score is known, but not the developmental scale score. Start with the formula above:  
 c-score = [(DSS) - (mean, ss year)]/(standard deviation, ss year)

$$(c\text{-score}) * (SD, \text{ss year}) = (DSS) - (\text{mean, ss year})$$

$$[(c\text{-score}) * (SD, \text{ss year})] + (\text{mean, ss year}) = DSS$$

Using the above example,  
 $1.382 = (DSS - 256.9) / 8.03$   
 $1.382 * 8.03 = DSS - 256.9$   
 $11.09747 + 256.9 = DSS$   
 $267.997 = DSS, \text{ or } 268.$

### **U.S. History Prediction Formula for 2007-08 and 2008-09**

In 2007-08, the Biology EOC test was a new edition and so Biology was removed as a predictor for U.S. History for that year. Civics and Economics was used in its place for the 2007-08 ABCs calculations of academic change. Subsequently, the predictors for U.S. History were re-evaluated using the most recent data from the new Biology test. In these analyses, it was found that Civics and Economics proved to be a slightly better predictor, but that Biology was an acceptable substitute.

Consequently, for the 2008-09 ABCs growth calculations, the SBE approved the use of Civics and Economics in conjunction with English I as the primary and secondary predictors for U.S. History when both scores are available. Biology and English I are used as predictors if Civics and Economics is not available. Civics and Economics is used alone if English I is not available. Biology is used alone if neither Civics and Economics nor English I are available.

### **Sample Calculations for Determining School Academic Change:**

#### **Calculating Academic Change at the School-level**

For elementary schools with 30 or more scores, *academic change* at the school level is calculated using only those students who actually have the appropriate historic scores and scores for the current year. A mean *academic change* is computed for the school. A student with an EOG score in reading but not in math will contribute to the mean *academic change* for reading only. *Academic Change* for schools with fewer than 30 total scores will not be calculated. In the example provided above, to determine if Jordan's school met the expected *academic change*, Jordan's *academic changes* in reading and mathematics are averaged with all others for the school.

For high schools, other weighted components (change in the dropout rate, and change in the percent of students in the college/university prep or college tech prep courses of study) are included in the school's *academic change* composite. Performance expectations for students taking EOC tests in a current year are based on EOGs and EOCs from previous years, as indicated in the example later below.

#### **High Academic Change**

Only schools that meet the standard for expected growth (expected academic change) are eligible to meet the *high change* (growth) standard. *High change* will be calculated as a *c-ratio* (change ratio). This is the ratio of students in the school who have a "0" or greater *academic change* to those who have

an *academic change* that is less than “0.” To determine *high change*, divide the number of students with an *academic change* of “0.00” or greater by the number who have an *academic change* less than “0.” If the result is 1.50 or greater, and the school has met expected *academic change*, the school has met high growth. As directed by SBE policies, change in dropout rate will be multiplied by ¼ the ADM of the school and added to the denominator such that an increase in dropouts will have the same effect as more students not meeting the *academic change* target of “0.” Also, change in percent of students graduating in the College Tech Prep Curriculum and College University Prep Curriculum will be multiplied by the number of graduates and added to the numerator such that this change will appear as students who meet the standard.

**Step 1: High School Academic Change**

Once all of the student academic change scores are known, the school’s academic change score can be computed. Compute the academic change for the EOG and EOC tests for the school by adding the academic changes for all tests administered during the accountability year.

$$School\_AC = \frac{\sum AC}{EOC+EOG}$$

*TotalCount*

Count the number of Academic Change Scores computed = Total count

High School Example:

Below is a table containing academic change scores for each EOC in a school.

EOC	Total Academic Change	Number of Students in Course	Number of Students that Met	Number of Students that did not meet
Algebra I	53.1	100	80	20
Algebra II	-7.6	76	33	43
Biology	10.2	146	79	67
Chemistry	0.9	50	27	23
English I	39.6	165	111	54
Geometry	-16.5	90	34	56
Physics	-5.9	10	1	9
Physical Science	-6.1	145	60	85
<b>Total</b>	<b>67.7</b>	<b>782</b>	<b>425</b>	<b>357</b>

**Change in the percent of Graduates in the College Prep, College Tech Prep (CUPCTP) courses of study:**

To compute the change in the percent of graduates in CUPCTP courses of study.

- Obtain the following variables:
  - Gradyr1 = number of school graduates, year 1
  - Gradyr2 = number of school graduates, year 2
  - Gradyr3 = number of school graduates, year 3 (current year)

*Note: The students who are in the Occupational course of study are not included in those counts.*

- Cupctpyr1 number of graduates in the CUPCTP course of study, year 1
- Cupctpyr2 number of graduates in the CUPCTP course of study, year 2
- Cupctpyr3 number of graduates in the CUPCTP course of study, year 3 (current year)

- The baseline is the average of the first two years' percentages:

$$\frac{(Cupctpyr1/Gradyr1) + (Cupctpyr2/Gradyr2)}{2}$$

The percent for the current year is:

$$cupctpyr3pct = Cupctpyr3/Gradyr3$$

The unweighted CUPCTP component is:

$$CUPCTP = cupctpyr3pct - Baseline + a$$

*Note: Based on an appeal of the growth standards following the 2007-08 ABCs, a modification to the CUPCTP component was approved by the SBE for 2008-09 to give additional credit to schools that have baselines above 90% and whose current year's CUPCTP percentage is also above 90%. The adjustment, a, is given by the formula:  $a = \left(\frac{baseline - 90}{10}\right) * (0.1)$  whenever the baseline is greater than or equal to 90. When the baseline is less than 90, then  $a=0$ . This provides additional credit of up to 0.1 points for the CUPCTP component for schools with consistently high participation in CUPCTP, with the amount of extra credit being prorated based on how far above 90 the baseline is.*

The weighted CUPCTP component:

$$CUPCTP = \frac{(cupctpyr3pct - Baseline + a)}{STD} * Gradnumber$$

- The total number of students for CUPCTP is the **Gradnumber** (which is the same as Gradyr3)
- STD=10.0 (State Standard Deviation for CUPCTP)

Example:

Cupctpyr1pct	78.7%
cupctpyr2pct	73.9%
cupctpyr3pct	76.7%
baseline	76.3%
STD	10.0
gradnumber	122
CUPCTP	4.88

**Change in dropout rate over 3 years:**

*Note: the dropout data lags a year as it is collected in October*

To compute the change in your school's dropout rate over the past 3 years.

- $\text{baseline} = \frac{\text{DORateYr1} + \text{DORateYr2}}{2}$
- $\text{STD} = 2.1$  (State Standard Deviation for Dropout)
- Weighted Dropout Component:  $\text{DO} = \frac{(\text{baseline} - \text{DORateYr3})}{\text{STD}} * \left(\frac{1}{4} * \text{ADM}\right)$
- The total number of scores for Dropout is weighted by:  
 $\frac{1}{4} * \text{the best of the first two months ADM}$

*The "best of the first two months" as defined by the School Business NCDPI Information Analysis and Reporting.*

Example:

DORateYr1	5.7
DORateYr2	5.3
DORateYr3	6.3
Baseline	5.5
STD	2.1
ADM	667
DO	-63.5

Note:

**ABCs dropout numerator** = The total number of dropouts in grades 9-12, minus the total number of expulsions in grades 9-12, minus the total number of long term suspensions in grades 9-12, minus the total number of students incarcerated in an Adult Facility in grades 9-12.

**ABCs dropout membership** = 20<sup>th</sup> day previous year's membership in grades 9-12, minus the initial enrollees in membership day 20 in grades 9-12, plus the 20<sup>th</sup> day current year's membership in grades 9-12, divided by 2.

**ABCs dropout rate** =  $\frac{100 * \text{ABCs dropout numerator}}{\text{ABCs dropout membership} + \text{ABCs dropout numerator}}$

**Computing the Academic change for a school:**

The Average Academic Change for the School is computed by adding the Academic change for EOG and EOC tests, the Weighted CUPCTP Component and the Weighted Dropout Component and dividing by the sum of the total number of Academic Changes computed for EOG and EOC tests, the total number of scores for CUPCTP and the total number of scores for Dropout.

High School Average Academic Change:

$$\text{School\_Average\_AC} = \frac{\text{School\_AC} + \text{CUPCTP} + \text{DO}}{\text{Totalcount} + \text{Gradnumber} + (1/4 * \text{ADM})}$$

Example:

School_AC	67.70
CUPCTP	4.88
DO	-63.50
Totalcount	782.00
Gradnumber	122.00
ADM	667
School_Average_AC	0.01

**Determining if the School met expected growth.**

If the Average School Academic Change is greater or equal to 0, then the school is said to have **Met Expected Growth**.

If the Average School Academic Change is less than 0, then the school is said to have **Not Met Expected Growth**

Example:

Since the school's Average Academic Change 0.01 was greater than 0, the school has met expected growth.

**Computing the C-Ratio in order to determine if the School met High Growth**

- Count the number of Academic Change Scores that are greater or equal to 0  
= **NumberACGreater0**
- Count the number of Academic Change Scores that are less than 0  
= **NumberACLess0**

C-Ratio:

$$C - \text{Ratio} = \frac{\text{NumberACGreater0} + \text{CUPCTP}}{\text{NumberACLess0} - \text{DO}}$$

*Note: DO is computed by subtracting the current year dropout rate from the baseline, dividing by the state standard deviation for dropout and multiplying by  $\frac{1}{4} * \text{ADM}$ ; therefore, an **increase** in dropout rate leads to  $\text{DO} \leq 0$ . By subtracting DO from the denominator, the C-ratio is decreased. On the other hand, a **decrease** in dropout rate leads to  $\text{DO} \geq 0$ ; by subtracting DO from the denominator; the C-Ratio is increased. Therefore, a decrease in dropout rate helps the school toward making High Growth.*

Two conditions are needed for a school to **Meet High Growth**

- The school must **Meet Expected Growth**
- C-Ratio  $\geq 1.5$

Example:

NumberACGreater0	425.00
NumberACLess0	357.00
CUPCTP	4.88
DO	-63.50
C-Ratio	1.02

The school has only met one criterion. Since their c-ratio is less than 1.5, it did not meet High Growth.

## Change in Competency Passing Rate Removed from Growth

Based on SBE action in April 2008, the change in competency passing rate was removed from ABCs growth calculations effective for the 2007-08 school year because the competency requirement was no longer applicable in light of the new high school exit standards. Because competency passing rate was one of the two required test-based components used for growth in alternative schools that serve high school grades (SBE policy GCS-C-013), a modification was necessary to the procedures for calculating growth for such alternative schools. To accommodate the removal of the competency passing rate from growth, the remaining test-based component (change in EOC test results for schools with grades 9-12 only; or, change in EOC and EOG test results in schools with a combination of high school and lower grades) was doubled for inclusion in the growth composite. This is comparable to the procedure prescribed in the policy for schools with grade 8 or lower.

### **EOC Predictors for 2008-09:**

#### **Expected performance in:**

English I

Civics and Economics

U.S. History

Algebra I

Biology

#### **Based on previous performance in:**

EOG Reading Grade 8

Biology (previous edition) and English I, if available, or English I (if previous edition Biology is not available)

Civics and Economics, and English I, if available; or Civics and Economics alone (if English I is not available); Biology may be substituted for Civics and Economics when the latter is not available

EOG Mathematics Grade 8

EOG Reading Grade 8 and English I, if available, or

EOG Reading Grade 8 (if English I is not available)

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### **NOTES:**

<sup>1</sup>*A z-score is a standardized score showing how far and in what direction a test score deviates from the mean, or average, of the distribution. The z-score is especially useful in comparing standings of test scores from differing measures that have different scales or standards.*