

# The ABCs of Public Education Academic Change for Schools 2011-12

August 2, 2012

## ABCs Reporting for 2011-12

ABCs performance composites and ABCs calculations of academic change were reported at the August 2, 2012 State Board of Education (SBE) meeting. No new test editions were introduced in 2011-12.

The ABCs five year cohort graduation rate (compared to a two-year baseline) replaced dropout rate. 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 End-of-Course Tests used in growth for 2011-12.

## 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).

### **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

## Calculations for Students

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

For example, Ramon is a student in grade 5 in the 2011-12 school year. Ramon's test scores are:

	EOG Reading	EOG Math
Grade 5 (2011-12)	353	358
Grade 4 (2010-11)	359	349
Grade 3 (2009-10)	347	343

#### 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 the difference 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	353	350.0	3.0	9.4	<b>.319</b>
Reading 4	359	345.2	13.8	10.1	<b>1.366</b>
Reading 3	347	338.6	8.4	11.9	<b>.706</b>
Math 5	358	353.7	4.3	9.2	<b>.467</b>
Math 4	349	348.9	.1	9.5	<b>.011</b>
Math 3	343	343.2	-.2	9.7	<b>-.021</b>

*\*Intermediate calculations are rounded to three decimal places. Previous year calculations are used in the final rounded form.*

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 Ramon at grade 5.**

Grade Level	c-scale	ATPA	Coefficient	<b>Expected c-score</b>
Reading 4	1.366	1.036	0.92	<b>.953</b>
Reading 3	.706			
Math 4	.011	-.01	0.92	<b>-.009</b>
Math 3	-.021			

3. Subtract the expected c-scale score from the actual c-scale score (see step #1) to determine Ramon'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	.319	.953	-.634	No
Math 5	.467	-.009	.476	Yes

*(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):

EOG	Standard Setting Year	Mean	Standard Deviation
Reading (3 <sup>rd</sup> Edition)			
Grade 8	2008	358.4	8.80
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	2007	151.0	10.10
Biology	2008	151.0	9.50
English I	2007	151.1	8.93

**Example:**

Nicole is a 9<sup>th</sup> grade student during the 2011-12 school year at a local school. Nicole’s test scores are:

Course	Scale Score
Algebra I	156
English I	154
Grade 8 Math EOG	357
Grade 8 Reading EOG	367

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 the difference by the standard deviation for the standard setting year

EOC Course	Scale Score	State Mean	Difference	Standard Deviation	Actual c-score*
Algebra I	156	151.0	5.0	10.10	.495
English I	154	151.1	2.9	8.93	.325
Grade 8 Math EOG	357	359.2	-2.2	9.21	-.239
Grade 8 Reading EOG	367	358.4	8.6	8.80	.977

*\*Intermediate calculations are rounded to three decimal places. Previous year calculations are used in the final rounded form.*

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?
.495	-.239	0.82	-.1960	.691	Yes

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

## English I

The predictor is Grade 8 EOG Reading.

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

English I c-score	Grade 8 Reading EOG c-score	Coefficient	Target Score <sup>1</sup>	Academic Change	Met Expected Academic Change?
.325	.977	0.82	.801	-.476	No

<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 (e.g., English I) during the current year (the developmental scale score, or DSS) was 154 and if statewide performance during the test's "standard setting" year averaged 151.1 with a standard deviation of 8.93,

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

or

c-score=(154-151.1)/8.93. The c-score equals .325.

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-score)\*(SD, ss year) =(DSS) - (mean, ss year)

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

Using the above example,

.325 = (DSS - 151.1)/8.93

.325\*8.93 = DSS - 151.1

2.90225 + 151.1 = DSS

154.00225 = DSS, or 154.

## Calculations for Schools

### Sample Calculations for Determining School *Academic Change* and *High 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 Ramon's school met the expected *academic change*, Ramon's *academic changes* in reading and mathematics are averaged with all others for the school.

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). 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. 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.

#### High Academic Change

For high schools, other weighted components (change in the graduation 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. One of the components for calculating school growth (expected and high) in previous years was changed so that the ABCs five-year cohort graduation rate (compared to a two-year baseline) replaced dropout rate. See pages 10-13 for more details on computing the calculations.

### High School Academic Change

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.

$$School\_AC = \sum_{EOC+EOG} AC$$

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	2.421	230	126	104
Biology	141.377	634	408	226
English I	144.526	673	442	231
<b>Total</b>	<b>288.324</b>	<b>1537</b>	<b>976</b>	<b>561</b>

### Change in the percent of Graduates in the College Prep, College Tech Prep (CPCTP) courses of study:

To compute the change in the percent of graduates in CPCTP courses of study:

Obtain the following variables:

Gradsyr1 = number of school graduates, year 1

Gradsyr2 = number of school graduates, year 2

Gradsyr3 = number of school graduates, year 3 (current year)



Sample with actual school data:

Year	Number of Graduates	Graduates in CPCTP	Cpctp % Cpctp/gradsyr	Baseline % = (yr1+ yr2)/2
Year 1	587	543	92.5%	93.2%
Year 2	583	547	93.8%	
Year 3	582 (Gradnumber)	531	91.2%	

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

Cpctpyr1 number of graduates in the CPCTP course of study, year 1

Cpctpyr2 number of graduates in the CPCTP course of study, year 2

Cpctpyr3 number of graduates in the CPCTP course of study, year 3 (current year)

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

$$\frac{(Cpctpyr1/Gradsyr1) + (Cpctpyr2/Gradsyr2)}{2}$$

$$\frac{(543/587) + (547/583)}{2}$$

$$\frac{(92.5) + (93.8)}{2}$$

**Baseline = 93.15**

The CPCTP component is:

$$CPCTP = \frac{(cpctpyr3pct - Baseline + a)}{STD} * Gradnumber$$

- The total number of students for CPCTP is the **gradnumber** (which is the same as gradsyr3)
- STD=10.0 (State Standard Deviation for CPCTP)

Note: A modification to the CPCTP component was approved by the SBE effective 2008-09 to give additional credit to schools that have baselines above 90% and whose current year's CPCTP percentage is also above 90%. The adjustment, a, is given by the formula:

$$a = \left( \frac{baseline - 90}{10} \right) * (0.1) \text{ whenever the baseline is greater than or equal to 90. When the}$$

baseline is less than 90, then a=0. This provides additional credit of up to 0.1 points for the CPCTP component for schools with consistently high participation in CPCTP, with the amount of extra credit being prorated based on how far above 90 the baseline is.

$$a = \left( \frac{93.15 - 90}{10} \right) * (0.1) \quad a = .0315$$

Using the example from above to calculate the CPCTP Component:

Note: Full precision is carried throughout intermediate calculations; the final result is rounded to the nearest tenth.

cpctpyr1pct	92.5%
cpctpyr2pct	93.8%
cpctpyr3pct	91.2%
baseline	93.2%
a	.0315
STD	10.0
gradnumber	582
CPCTP	110.340

$$CPCTP = \frac{(91.2 - 93.2 + .0315)}{10} * 582 = 110.340$$

**Change in 5-Year Cohort Graduation Rate (CGR) over 3 years:**

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

- Baseline =  $\frac{CGR5 \text{ Yr1} + CGR5 \text{ Yr2}}{2}$
- STD = 6.4 (State Standard Deviation for CGR5)
- **CGR5 Component:**  $CGR5 = \frac{(CGR5 \text{ Yr3} - \text{baseline})}{STD} \times \left( \frac{1}{4} \times ADM \right)$

*Note: The total number of scores for CGR5 is weighted by a fourth of the school's 9-12 ADM*

$$\frac{1}{4} * ADM \text{ (in grades 9 through 12)}$$

Actual school example:

CGR5 Yr1	88.4
CGR5 Yr 2	85.1
CGR5 Yr 3	87.0
Baseline	86.75
STD	6.4
Total ADM	2604
CGR5 component	25.4296875

CGR5 Component:

$$\begin{aligned} \text{CGR5} &= \frac{(86.75 - 87.0)}{6.4} * \left(\frac{1}{4} * 651\right) \\ &= \frac{(-.25)}{6.4} * (651) \\ &= 0.0390625 * (651) \\ &= 25.4296875 \end{aligned}$$

**Computing the Average 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 CPCTP component and the CGR5 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 CPCTP and the total number of scores for CGR.

High School Average Academic Change:

$$\text{School\_Average\_AC} = \frac{(\text{School\_AC}) + \text{CPCTP} + \text{CGR5}}{\text{Totalcount} + \text{Gradnumber} + (1/4 * \text{ADM})}$$

Example:

School AC	288
CPCTP	110.340
CGR5	25.429675
Totalcount (in growth ncount)	1537
Gradnumber (gradsyr3)	582
¼ ADM	651
School Average AC	0.152

$$\begin{aligned} \text{School\_Average\_AC} &= \frac{288 + 110.340 + 25.429675}{1537 + 582 + 651} \\ &= 0.152 \end{aligned}$$

**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 .152 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**

Example:

NumberACGreater0	976
NumberACLess0	561
CPCTP	110.340
CGR5	25.429675
C-Ratio	2.028

#### C-Ratio for HS:

$$C - Ratio = \frac{NumberACGreater0 + CPCTP}{NumberACLess0 - CGR5}$$

$$C - Ratio = \frac{976 + 110.340}{561 - 25.429675} = 2.028$$

Note: If the c-ratio denominator is less than 1 (or negative), then use 1 as the denominator instead. If the C-RATIO denominator is less than 1 (or negative), then denominator is set to 1. This prevents the possibility of division by zero or a negative ratio.

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

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

The school met both criteria. Since their c-ratio rounds to greater than 1.5, it met High Growth.

### **Alternative Schools Local Options Calculations**

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 2011-12:**

**Expected performance in:**

**Based on previous performance in:**

Algebra I

EOG Mathematics Grade 8

Biology

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

English I

EOG Reading Grade 8

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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.*