

The ABCs of Public Education Academic Change for Schools 2007-08

ABCs Reporting Schedule for 2007-08

New test editions were introduced in 2007-08 for End-of Grade Reading (grades 3-8), Algebra II, Biology, Chemistry, Physical Science, and Physics. In April 2008 the State Board of Education (SBE) decided to remove these tests from ABCs calculations of academic change but to retain the results in the ABCs performance composites. The SBE subsequently instructed the Department of Public Instruction to prepare for release of ABCs academic change results at the August SBE meeting, and to release the remaining results involving performance composites at the November SBE meeting in conjunction with the schedule for scaling and setting standards on the new tests. This is the first time in the history of the ABCs that the growth results have been released prior to the performance composite results, and separate from the recognition categories that are based on the academic change in conjunction with the performance composites.

A Standardized Scale Model

Based on revisions first implemented in 2005-06 in response to G.S. 115C-105.35 Section 7.12¹, the ABCs currently uses a standardized scale, similar to *z*-scores², 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 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 Alg II than Alg I, which is a predictor for Alg 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	Actual c-score*
Reading 5	268.0	256.9	11.1	8.03	1.382
Reading 4	263.0	252.3	10.7	8.68	1.233
Reading 3	157.0	146.9	10.1	9.29	1.087
Math 5	271.0	260.0	11.0	9.62	1.143
Math 4	264.0	255.8	08.2	8.32	0.986
Math 3	267.0	250.6	16.4	7.75	2.116

**Full precision will be used in the actual calculations, although the values here are rounded for heuristic purposes. Test means and standard deviations for the standard setting year are approximate.*

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	Expected c-score
Reading 4	1.233	1.16	0.92	1.067
Reading 3	1.087			
Math 4	0.986	1.55	0.92	1.426
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.

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

EOG	Standard Setting Year	Mean	Standard Deviation
Reading (2 nd Edition)			
Grade 8	2003	263.9	9.05
Reading (3 rd Edition)			
Grade 8	2008	n/a	n/a
Mathematics (2 nd Edition)			
Grade 8	2005	221.1	10.90
Mathematics (3 rd Edition)			
Grade 8	2006	359.2	9.21

Table 2: Standard Setting Means and Standard Deviations for **End-Of-Course (EOC)** and Grade 8 EOG (used as pre-test for EOC):

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 which grade the EOC (posttest) was taken. Test means and standard deviations for the standard setting year are approximate.

EOC	Standard Setting Year	Mean	Standard Deviation
Algebra I	2001	61.10	9.31
Algebra I (special transition for use when companion to 2 nd 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 9th grade student at a local school. Sandra’s test scores are:

Course	Scale Score
Algebra I (1 st semester)	148
Geometry (2 nd semester)	148
English I (1 st 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 st 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 ¹	Academic Change	Met expected academic change?
-0.26	-1.10	0.82	-0.90	+0.64	Yes

¹Target 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.

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

English I c-score	Grade 8 Reading EOG c-score	Coefficient	Target Score¹	Academic Change	Met Expected Academic Change?
-0.49	-1.09	0.82	-.89	0.4	Yes

¹Target 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-score)*(SD, ss year) =(DSS) - (mean, ss year)
[(c-score)*(SD, ss year)] + (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, or 268.

U.S. History Prediction Formula for 2007-08

The SBE removed Biology from the ABCs growth calculations for 2007-08. In addition, the Biology test is a new edition in 2007-08. Because student results from the previous edition of the Biology EOC was the primary predictor for performance on the U.S. History EOC, the prediction equation for U.S. History was re-evaluated for 2007-08. After evaluating alternative predictors, it was found that the Civics/Economics EOC is an acceptable substitute for Biology in the prediction of U.S. History performance. Consequently, for the 2007-08 ABCs growth calculations, the Civics/Economics EOC is used alone if English I is not available. Two EOCs (Civics/Economics and English I) are used as predictors for U.S. History performance if both are available.

The U.S. History prediction formula will be re-evaluated for 2008-09 with the anticipation that Biology may return as the primary predictor if future analysis supports that decision.

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 2006-07.

$$School_AC = \frac{\sum AC}{EOC+EOG \text{ TotalCount}}$$

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 hypothetical 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
Total	67.7	782	425	357

Change in the percent of Graduates in the College Prep, College Tech Prep (CUPCTP) courses of study:
(will have to drop from growth after implementation of the core course of study)

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

- Obtain the following variables:
 - Gradyr1 = number of school graduates, year 1 (04-05)
 - Gradyr2 = number of school graduates, year 2 (05-06)
 - Gradyr3 = number of school graduates, year 3 (06-07)

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 (04-05)
- Cupctpyr2 number of graduates in the CUPCTP course of study, year 2 (05-06)
- Cupctpyr3 number of graduates in the CUPCTP course of study, year 3 (06-07)

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

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

Note: The baseline has been moderated from previous years to make the component easier to attain than in the original formulation because more schools have higher baselines than originally was the case.

The percent for the current year is:

$$cupctpyr3pct = Cupctpyr3/Gradyr3$$

The weighted CUPCTP component:

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

- 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	3.7

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.

- $baseline = \frac{DORateYr1 + DORateYr2}{2}$
- STD = 2.1 (State Standard Deviation for Dropout)
- Weighted Dropout Component: $DO = \frac{(baseline - DORateYr3)}{STD} * (\frac{1}{4} * ADM_{GR9-12})$
- The total number of scores for Dropout is weighted by:
 $\frac{1}{4} * \text{the best of the first two months } ADM_{GR9-12}$

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
¼*ADM _{GR 9-12}	166.75
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 = 20th day previous year's membership in grades 9-12, minus the initial enrollees in membership day 20 in grades 9-12, plus the 20th 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:

$$\text{School_Average_AC} = \frac{\text{School_AC} + \text{CUPCTP} + \text{DO}}{\text{Totalcount} + \text{Gradnumber} + (1/4 * \text{ADM}_{\text{GR}9-12})}$$

Example:

School AC	67.70
CUPCTP	3.70
DO	-63.50
Totalcount	782.00
Gradnumber	122.00
¼ * ADM _{GR 9-12}	166.75
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:

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

*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 $\frac{1}{4} * ADM_{GR9-12}$; therefore, an **increase** in dropout rate leads to $DO \leq 0$. By subtracting DO from the denominator, the C-ratio is decreased. On the other hand, a **decrease** in dropout rate leads to $DO \geq 0$; 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 ≥ 1.5

Example:

NumberACGreater0	425.00
NumberACLess0	357.00
CUPCTP	3.70
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 HSP-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 2007-08:

Expected performance in:

English I

Civics and Economics

U.S. History

Algebra I

Geometry

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 (if English is not available)

EOG Mathematics Grade 8

Algebra I

Algebra II, Biology, Chemistry, Physical Science and Physics were removed from ABCs Growth for 2007-08 based on SBE action in July 2008.

NOTES:

¹EVALUATE VALIDITY OF ABC ACCOUNTABILITY SYSTEM

SECTION 7.12.(a) G.S. 115C-105.35 reads as rewritten:

"§ 115C-105.35. Annual performance goals.

(a) The School-Based Management and Accountability Program shall (i) focus on student performance in the basics of reading, mathematics, and communications skills in elementary and middle schools, (ii) focus on student performance in courses required for graduation and on other measures required by the State Board in the high schools, and (iii) hold schools accountable for the educational growth of their students. To those ends, the State Board shall design and implement an accountability system that sets annual performance standards for each school in the State in order to measure the growth in performance of the students in each individual school. During the 2004-2005 school year and at least every five years thereafter, the State Board shall evaluate the accountability system and, if necessary, modify the testing standards to assure the testing standards continue to reasonably reflect the level of performance necessary to be successful at the next grade level or for more advanced study in the content area.

As part of this evaluation, the Board shall, where available, review the historical trend data on student academic performance on State tests. To the extent that the historical trend data suggest that the current standards for student performance may not be appropriate, the State Board shall adjust the standards to assure that they continue to reflect the State's high expectations for student performance.

(b) For purposes of this Article, the State Board shall include a "closing the achievement gap" component in its measurement of educational growth in student performance for each school. The "closing the achievement gap" component shall measure and compare the performance of each subgroup in a school's population to ensure that all subgroups as identified by the State Board are meeting State standards.

(c) The State Board shall consider incorporating into the School-Based Management and Accountability Program a character and civic education component which may include a requirement for student councils."

SECTION 7.12.(b) *The State Board shall complete its initial evaluation and any necessary modifications to the testing standards required under G.S. 115C-105.35, as rewritten by subsection (a) of this section, so that the modified standards are in effect no later than the 2005-2006 school year.*

²*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.*

³*In cases where middle school students are taking Algebra I, the previous year's EOG is used.*