



## Technical Processes Used to Develop the Colorado School Grades

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The Center for Education Policy Analysis (CEPA) at the Buechner Institute for Governance, School of Public Affairs, University of Colorado Denver has served as a technical advisor, data manager, and analyst for Colorado School Grades. This document outlines the procedures used in developing the grades that are contained in the report cards.

### BACKGROUND

Colorado's Education Accountability Act of 2009 (SB 09-163) overhauled the state's school accountability system by collapsing district and school accountability and accreditation programs into a single common system. The School Performance Framework (SPF) is the state's tool for describing the school's level of performance, triggering accountability measures, and providing feedback to schools on performance strengths and weaknesses. Schools receive points based on indicators as shown in Table 1 below. The points are weighted and summed for each indicator, and each school can be eligible for up to 100 points. The points that each school receives is the primary input to the state's School Performance Framework. The table below shows the percent of total points (which is equal to the weighting) for each indicator.

**TABLE 1: INDICATORS USED IN CDE'S SCHOOL PERFORMANCE FRAMEWORK AND THEIR RELATIVE WEIGHTS**

Indicator	Elementary/Middle School Percent of Total Points	High School Percent of Total Points
Academic Achievement	25%	15%
Academic Growth	50%	35%
Academic Growth Gaps	25%	15%
Post-Secondary and Workforce Readiness		35%
Total Score	100%	100%

Under SPF, based percentage of eligible points awarded, CDE assigns each school one of four school performance levels, which are, ranked from highest performing to lowest, *Performance*, *Improvement*, *Priority Improvement*, and *Turnaround*. Although the actual distribution of schools varies, the state's approach targeted the following distribution of schools (see Table 2).

**TABLE 2: STATE GOALS FOR DISTRIBUTION OF SCHOOL PERFORMANCE FRAMEWORK RATINGS**

<b>School Performance Plan Rating</b>	<b>Approximate Percentage of Schools in that Category</b>
Performance	60%
Improvement	25%
Priority Improvement	10%
Turnaround	5%

### **COLORADO SCHOOL GRADES**

Colorado School Grades is intended to provide parents, students, community members, and educators with clearer information on the performance level of their schools. To accomplish this, Colorado School Grades mirrors the state's school performance framework and uses the exact same inputs and weighting to replace the state-assigned performance levels with letter grades (A-F). With advice from an Advisory Committee, the goals of this portion of Colorado School Grades were to:

- Create a user-friendly tool that will facilitate parents' access to school performance data.
- Use familiar, "A through F" letter grades to provide parents with a clear indication of school performance.
- Improve parents' understanding of school performance by translating existing Colorado Department of Education (CDE) data into a more intuitive, easy-to-understand report card.
- Develop more rigorous cut points or dividing lines between grades to provide a more precise indication of school performance.
- Empower parents to make informed decisions so that they can more confidently navigate the open enrollment process and/or engage in improving their chosen school.

A key outcome of these goals is that the information used for overall school grades, achievement and growth grades, as well as trend arrows, comes directly from the information prepared by CDE. Colorado School Grades did not alter the inputs or weighting used in the SPF for determining the final grades. The data contained in the School Performance Framework were primarily manipulated to:

- Base grades on percentile rankings of SPF data
- Develop cut points to translate the total points awarded, school achievement (percent proficient and advanced) and school growth (median growth percentiles) to grades.
- Develop a methodology for calculating trend arrows.

Colorado School Grades determined the final information to be included in the report card and the format of the report card.

The remainder of this memo discusses input data for Colorado School Grades, key decisions made in developing the grades and procedures used for assigning grades and trend arrows.

## **INPUT DATA FOR COLORADO SCHOOL GRADES**

### **Data Sources**

The primary source of data for the report card was the School Performance Flat File. While the remainder of this document describes the data that was used to calculate the 2010 school grades, the exact same process was used to update the 2011 school grades in December 2011. The file used for the 2010 grades was dated December 17, 2010, and downloaded from the CDE web site. Other sources of data include:

- CDE School Mailing Address File
- CDE Free and Reduced Lunch File
- CDE Enrollment by Race and Ethnicity File
- CDE Colorado ACT File
- Colorado Department of Higher Education (CDHE) High School Remediation File

All of the data in Colorado School Grades represents school performance for the prior school year with the exception of the graduation rate and remediation rate. The graduation rate represents school performance two years prior to the report card. For example, the enrollment, achievement (*i.e.*, ACT and CSAP scores), growth, and dropout rate data in the report card was from the 2009-10 school year. The graduation data in the 2010 report card, released during the 2010-2011 school year, is from the 2008-2009 school year.

Remediation data is released in February of the following school year, a few months after the December release of the School Performance Framework data. The remediation rate in the 2010 report card represents the 2009-10 school year. Given that the development of 2011 Colorado School Grades is tied to the release of the School Performance Framework data, the 2011 Colorado School Grades released in December 2011 contains the 2009-10 remediation data. This data will be updated when newer data is released.

### **Colorado School Performance Framework**

As shown in Table 1, the Colorado SPF uses three indicators for elementary and middle schools and four indicators for high schools to describe school performance and determine each final performance level. The achievement indicator uses data on the percent of students scoring proficient or advanced on the Colorado Student Assessment Program (CSAP) tests in reading, writing, mathematics, and science. The growth and growth gaps indicators compare school median growth percentiles for reading, mathematics, and writing with adequate growth percentiles, which measure the growth necessary for the average student to become proficient within three years or by 10<sup>th</sup> grade. The Post-Secondary and Workforce Readiness (PSWR) indicator is only applied to high schools. The PSWR indicator uses information on graduation rates, dropout rates, and average school performance on the Colorado ACT.

For each of these indicators there are multiple sub-indicators. The sub-indicators are ratings on a four level scale similar to the final ratings schools receive (1 is the lowest rating and 4 is the highest rating). These ratings allow easy identification of school performance on each indicator and sub-indicator and identification of areas of strength and areas in need of improvement. A school may not have ratings for all sub-indicators if the number of students participating in an indicator (*e.g.*, taking a particular test) is below the necessary level to protect individual student privacy. CDE determined the minimum count of students (sometimes called an N Count), which

ranges from 16 to 20 students, depending on the indicator. For the remediation data from CDHE, only schools are reported that have a minimum of 26 first time students attending Colorado higher education institutions with at least one needing remediation.

The state calculates two sets of indicators for each school. One data set is based on the most recent year of data (1-year), while the other data set is based on the most recent three years of data (3-year). The 3-year indicators allow calculation of indicators for schools with low enrollment by averaging scores across the years and smoothing out more random changes in scores. Schools are assigned an official grade and associated sub-indicators based on the higher of the 1-year or 3-year total scores.

Schools receive indicators according to the grade level served: elementary or middle school and high school. Rules for how schools are assigned to a grade level are detailed in the Performance Framework Overview document (a link is provided below). A school that serves multiple grade levels (*e.g.*, a kindergarten through 12<sup>th</sup> grade school) will have indicators assigned for each grade level served (*e.g.*, a school can have three sets of indicators reported). And under Colorado School Grades, a school can have three grades. Schools with multiple grade levels can (and most do) request to have the indicator data combined across grade levels.

Performance Framework Overview:

<http://www.cde.state.co.us/Accountability/Downloads/DPFSPFTechnicalGuideToCalculationsDetailed2011.pdf>

Technical Guide:

<http://www.schoolview.org/documents/SPFTechnicalGuide.pdf>

CDE developed and applied cut points to the total percentage of points each school received to determine school performance levels. These cut points were based on a grading curve so that in the first year of rating (2009-10), the large majority of schools (60%) were given the highest rating (performance plan). The proportion of schools assigned to the lowest two levels mirrored Federal guidance on the use of School Improvement Grants (SIG). CDE assigned 5 percent of schools to Turnaround status and assigned 10 percent to Priority Improvement Status. Districts were able to appeal those grades.

## **GOING FROM INDICATORS TO GRADES**

The report card schemes in other states were examined to inform Colorado School Grades and the development of the final grading scheme. Two conclusions were drawn from our examination of other state's schemes. First, there is no one common practice in grading curves used in school report cards. Second, generally the proportion of schools graded D or F is relatively small compared to schools rated C or above.

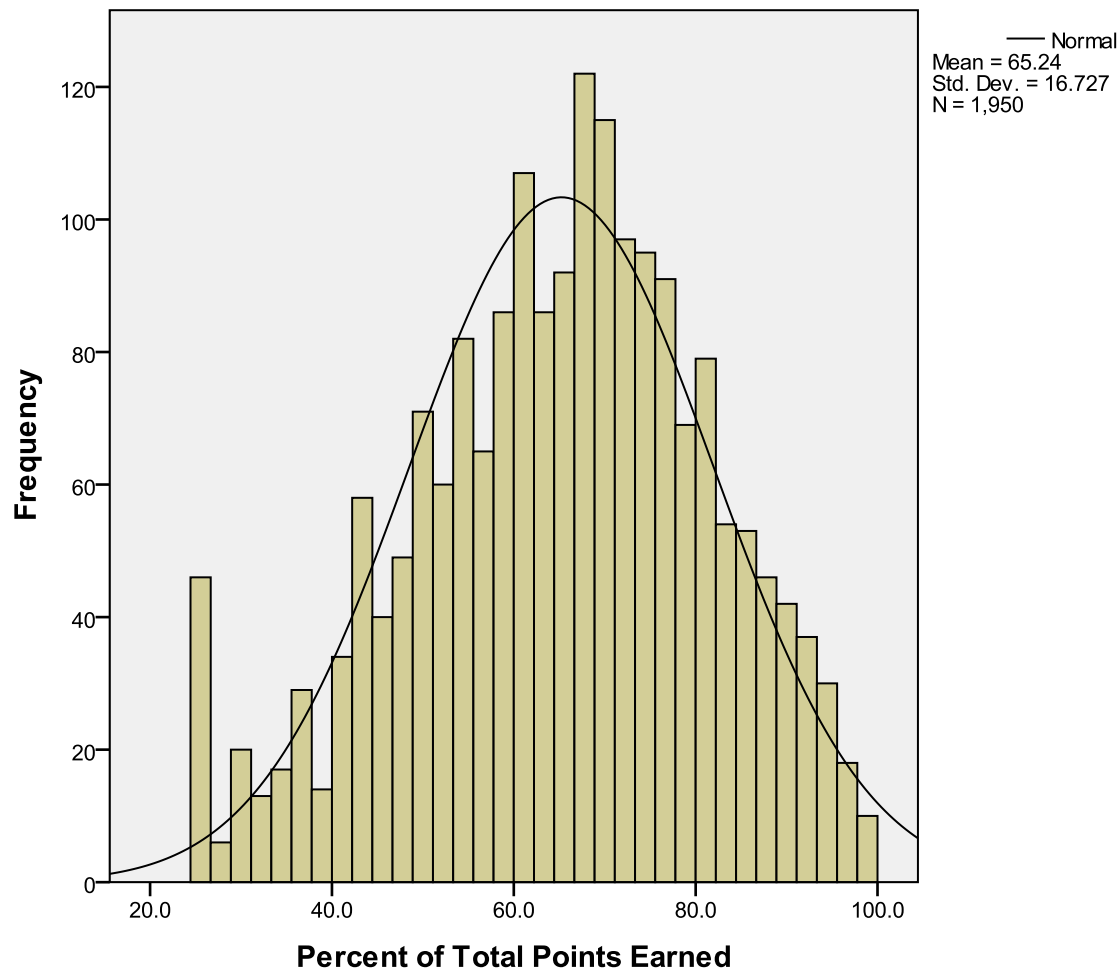
In our review of school grading procedures used in other states we also noted that grading curves used by states changed over time. Often changes in input measures meant that new curves had to be implemented to adequately differentiate between school performance levels.

## **Colorado School Grades Cut Points**

The grades for each school are derived directly from data provided by the Colorado School Performance Framework (SPF). As with the Colorado School Performance Framework, the input

data for the overall school grade is the percentage of points earned on the official plan (*i.e.*, final Indicator assigned by the state) for each school. The distribution of this variable is shown in Figure 1.

**FIGURE 1: DISTRIBUTION OF THE PERCENTAGE OF POINTS EARNED ON THE SCHOOL PERFORMANCE FRAMEWORK**



### School Grades

The first key decision in the Colorado School Grades process was whether to use a grading scheme that identified absolute levels of school performance which would allow all schools to be proficient if they reached a certain level of performance, or whether schools should be graded in comparison to other schools in the state (*i.e.* a norm referenced model). Colorado School Grades settled on the comparison or norm reference model for two reasons. First, the main input to the SPF is the Colorado Growth Model, which is norm-referenced in that it is built on relative measures that compare the academic growth of students across the state. Second, we found that other jurisdictions had to regularly adjust their standards-based cut scores as input measures to the system changed (such as new assessment tools). This allowed Colorado School Grades to keep indicators and weights consistent and develop a cut score methodology that can be maintained as the state develops new assessments or different input measures.

A second key decision in the Colorado School Grades process was to decide on the appropriate cut points for school grades. CEPA ran multiple simulations of how different cut points would affect the number of schools at each grade level and the characteristics of schools at each grade level. CEPA provided the Advisory Committee with information on how various grading schemes would impact a sample of schools that were familiar to the advisory committee. Table 3 shows the main simulations that were completed.

**TABLE 3: SIMULATIONS USED TO INFORM SCHOOL GRADE CUT POINTS**

<b>Grade</b>	<b>Simulations</b>			
	<b>Base</b>	<b>A-10</b>	<b>B-15</b>	<b>B-25</b>
<b>A</b>	60%	10%	10%	10%
<b>B</b>		50%	15%	25%
<b>C</b>	25%	25%	50%	50%
<b>D</b>	10%	10%	10%	10%
<b>F</b>	5%	5%	15%	5%

The final set of cut points used came from the B-25 simulation. Main factors in this decision was an attempt to mirror the state's grade cut points for the lower grades (i.e. *D* and *F*), and it was the opinion of the Advisory Committee that the top 10% appropriately captured the proportion of *A* schools in the state.

To calculate school grades, schools are first filtered into two categories to ensure that each school is compared only to a school of a similar grade level (i.e. elementary/middle schools and high schools). Schools are then filtered again to exclude schools with no CSAP data and schools with insufficient CSAP data.<sup>1</sup> Once the schools were filtered, they were assigned a percentile rank based on their total percentage points earned on the SPF. A school's percentile rank is a number between 1 and 100 representing the percent of schools that received a score less than or equal to the school in question. For example, if School A receives a percentile rank of 80, that means that 80 percent of schools received a score that is less than or equal to School A.

Once the schools are given percentile ranks, they are assigned a grade based on the grading curve shown in Table 4. Colorado School Grades selected the percentile range for each grade level, as identified in simulation B-25 above. Then, cut points were created to assign the top and bottom 20 percent of schools within a grade distribution to a plus or minus.

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<sup>1</sup> Insufficient CSAP data is the result of either low sample size that prevents scores from being released due to FERPA requirements, or the status of a school as an Alternative Education Campus.

**TABLE 4: GRADING CURVE USED IN COLORADO SCHOOL GRADES**

<b>Percentile Rank</b>	<b>Grade</b>
98 to 100	A+
92 to 98	A
90 to 92	A-
85 to 90	B+
70 to 85	B
65 to 70	B-
55 to 65	C+
25 to 55	C
15 to 25	C-
13 to 15	D+
7 to 13	D
5 to 7	D-
5 and below	F

Finally, in line with procedures used in the SPF, school grades were adjusted downward by 1/3 letter grade (from an A to an A-, for example) if a school did not meet the 95 percent participation requirement for CSAP testing.

Colorado School Grades used the same procedure in assigning grades to student achievement and student growth grades. Overall student achievement and growth grades are based on weighted averages of subject level data.<sup>2</sup> The 1/3 letter grade penalty for not meeting the 95 percent participation requirement was not applied to the growth grades since these scores are based on two years of test taking.

### **School Rankings**

To assign school rankings, schools are first filtered into the elementary/middle school and high school categories. Each school is assigned a rank based on the total number of percentage points earned on the SPF out of a possible 100. The ranking is based on the number of schools that receive a score higher than the school in question. To illustrate, if School A receives a ranking of 5, that means that four schools received a higher number of total percentage points on the SPF, so School A is in fifth place.

If two or more schools receive the same number of total percentage points on the SPF, those schools are assigned to the highest equal rank. For instance, if three schools are tied for second place, they are given a rank of 2, and the school with the next lowest score after the tied schools is given a rank of 5. This method of handling tied scores allows for the greatest ease of interpretation. For instance, in the above example the three tied schools are all given a rank of 2 because there is only one school that received a higher number of total percentage points on the SPF. Similarly, the next school is given a rank of 5 because there are four schools that received a higher number of total percentage points (*i.e.*, the first place school and the three schools tied for second place).

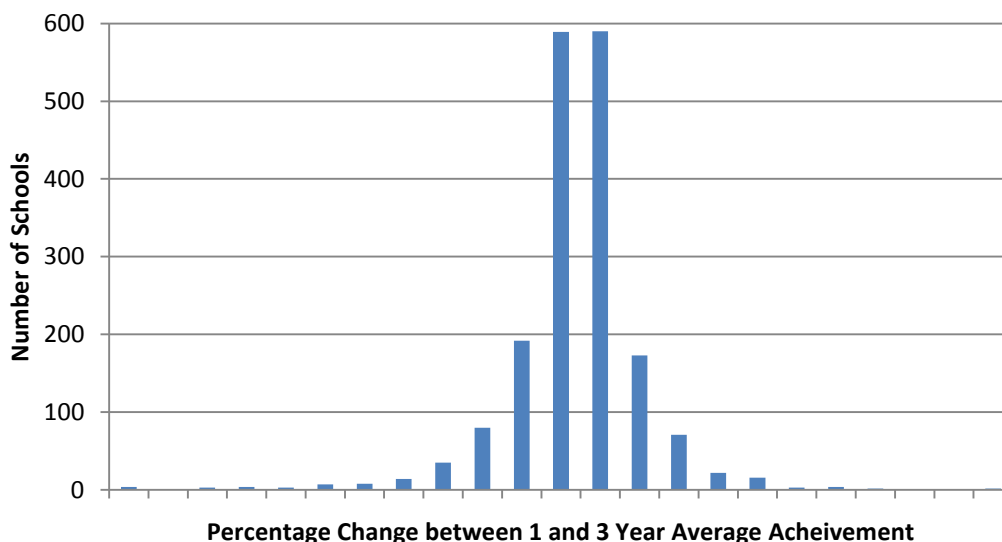
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<sup>2</sup> Growth grades are not provided for science. The SPF does not measure growth on the science CSAP because this portion of the test is not administered in two consecutive grade levels, which is needed to calculate growth scores.

### Trend Arrows

The trend arrows are based on the percentage change from the 1-year to 3-year average (calculated by dividing the 1-year scores by the 3-year scores). There are three arrows. The overall arrow is based on total points awarded. The achievement and growth arrows are based on weighted averages of the percent proficient and median growth percentile, respectively. The changes are generally small, and the distributions of this percentage change are normally shaped but have a high proportion of schools in the center of the distribution. The histogram in Figure 2 below provides an example illustration of the distribution. This particular figure shows the distribution of changes in achievement scores.

**Figure 2: Distribution of the 1 – Year to 3 – Year Changes in Average Achievement Scores**



The final arrows are based on a  $\frac{1}{2}$  standard deviation difference from the mean change: the change in up arrow schools is  $\frac{1}{2}$  a standard deviation or greater from the mean and the change in down arrow schools is  $\frac{1}{2}$  a standard deviation or more less than the mean change. Table 5 shows the mean change between the 1- and 3-year plans, standard deviation, and number of schools that fall into each category.

**TABLE 5: DESCRIPTION OF TREND ARROW CALCULATIONS DATA**

	Change in Total Percent of Points Awarded	Change in Achievement	Change in Growth
Mean	1.02	0.99	0.97
Standard Deviation	0.16	0.09	0.19
	Count	Count	Count
Up Arrows	385	371	422
Flat Arrows	1086	1186	993
Down Arrows	350	231	477



### Deciding Whether to Grade All Schools that Have Data

Schools that were not eligible for the total 100 points (due to small numbers of students) are clustered at either relatively high or low rankings, with few ranked in the middle. Table 6 below illustrates this issue using the absolute ranking of schools. Note that the ranking of high schools ranges from 1 (the best) to 412 (the worst) and the ranking of elementary/ middle schools (MS) ranges from 1 (the best) to 1525 (the worst). You can see the highest and lowest ranked high schools are eligible for only 35 points. Among the Elementary/MS some of the highest ranked and nearly lowest ranked schools are eligible for only 25 points.

**TABLE 6: RANKINGS OF SCHOOLS RELATIVE TO POINTS ELIGIBLE**

Points Eligible	Grade Level Served by the School	Number of schools	Mean Rank	Lowest Rank (i.e. highest performing school)	Highest rank (i.e. lowest performing school)
25	Elementary/ MS	28	838.1	1	1519
35	High School	18	263.8	1	412
50	Elementary/ MS	2	155.0	155	155
	High School	26	333.0	11	397
65	Elementary/ MS	3	905.0	647	1034
	High School	5	253.6	154	318
75	Elementary/ MS	41	690.9	1	1508
85	Elementary/ MS	4	205.5	43	391
	High School	12	217.6	6	397
100	Elementary/ MS	1453	766.6	1	1525
	High School	358	196.7	3	397

Because of this problem, schools that do not have 100 points are not given a final grade, nor are they given a final ranking. This ensures that schools are graded on multiple measures. Other data, as available, are presented in the report card. For the 2010 data, a total of 1453 elementary/middle schools and 358 high schools received grades.

### College and Career Ready by Subject

The school report card provides information on whether the average graduate is prepared for college based on the Colorado ACT scores. The ACT data by subject is not reported in the School Performance Framework. This data is taken from the CDE web site.

The ACT indicates whether or not the average student is college or career ready in a particular subject. The ACT has set benchmark scores that represent the level of achievement required for students to have a 50 percent chance of obtaining a B or higher, or about a 75 percent chance of obtaining a C or higher in corresponding credit-bearing first-year college courses. The ACT College Readiness Benchmarks are shown in Table 7.

**TABLE 7: CUT POINTS USED FOR COLLEGE AND CAREER READY INDICATORS BY SUBJECT**

<b>Colorado ACT Subject-Area Test</b>	<b>ACT Benchmark Score</b>
English	18
Reading	21
Mathematics	22
Science	24

Schools received a “Yes” on their report card under “Is the average student at this school ready for college or career based on ACT scores?” if the average score is equal to or greater than the ACT Benchmark score. CDE does not report ACT scores for all schools. No data is reported for schools with less than 15 test scores. In 2010, Colorado ACT data was reported for 333 high schools.

The report card also contains information on school remediation rates. This data is produced by and downloaded from the Colorado Department of Higher Education.