TECHNICAL GUIDE

Details on the Construction of the
California Charter Schools Association's
Academic Accountability Framework

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Updated November 2019

Purpose

This guide explains the components of CCSA's academic accountability framework. CCSA first developed an accountability framework in 2010 after an analysis of public data indicated there were large numbers of both high and low-achieving charter schools across the state. To promote high standards of achievement, CCSA developed an accountability framework to identify schools that struggled to support student learning.

Annually CCSA relies on three measures for evaluating student learning at schools, which are updated on an annual basis. For the 2019-2020 academic year the metrics are as follows: (1) Distance from Standard[1] (DFS), (2) Similar Students Rank (SSR), and (3) College/Career Indicator (CCI).

1. The DFS is a measure that compares a school's Smarter Balanced (SBAC)[2] scale scores by grade to the state standard for "met". In common terms, this means that the average student in the school scored that many scale score points above or below the SBAC "met standard" (or Level 3 in a scale of 1-4), which approximates achievement of grade level proficiency.[3]
2. The SSR uses publicly available grade-level data to estimate the achievement of schools after controlling for student demographic characteristics.
3. The CCI identifies the percent of a school's 12th grade class that are graduating and are considered by state-approved criteria to be "prepared" for college and/or career.

CCSA's academic accountability framework establishes a uniform set of criteria to focus authorizers' review of charters on academics. It is not intended to define the minimum acceptable standards of school quality, identify schools for closer review which have consistently fallen below certain member-supported thresholds of academic success. Schools falling below the framework's minimum threshold are asked to join CCSA in a comprehensive Multiple Measure Review (MMR). This review explores all publicly available data, as well as any documentation from the school showing positive outcomes for students. At the end of the MMR, CCSA may issue a Public Call for Non-Renewal (PCNR) for charter schools that do not meet the standards set by the framework. A more complete explanation of our MMR process can be found here.[4]

In the following sections, the rationale for CCSA's metrics are described along with their methodology, strengths, and limitations. In the development of these metrics, CCSA incorporated the feedback of many stakeholders to ensure each were valid and reliable tools for evaluating achievement. These stakeholders included leading national researchers, statisticians and policymakers, charter developers and leaders,

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[1] Distance from Standard (DFS) was originally a CCSA-developed metric called Average Point Difference (APD). For ease of understanding, DFS is the only term referenced throughout this document. However, there are times where CCSA's APD metric is used instead of DFS (whenever the latest DFS results are unavailable but the APD is).
[2] The Common Core aligned Smarter Balanced assessments are used by states in the Smarter Balanced Assessment Consortium (SBAC). These tests assess achievement in English Language Arts (ELA) and math and are one test included in the larger California Assessment of Student Performance and Progress (CAASPP) suite of assessments. For the purposes of this technical guide, which only uses the ELA/math assessment in our analyses, we will refer to the Smarter Balanced assessment as the commonly used "SBAC."
[3] For more information on interpreting scale scores and achievement levels, see https://www.smarterbalanced.org/wp-content/uploads/2015/08/Interpretation-and-Use-of-Scores.pdf
[4] http://www.ccsa.org/2016/09/multiple-measures-review-explanation.html

members of California Department of Education (CDE)'s Technical Design Group, and members of the state Advisory Commission on Charter Schools, as well as other state membership organizations. The development work was spearheaded by CCSA's Member Council, which consists of charter school leaders from across California.

Data Sources

CCSA's Academic Accountability Framework (AAF) relies on publicly available school testing, outcome, and demographic data provided by the CDE. For the 2020 AAF, CCSA used public data released between September of 2017 and December of 2019. School testing data is tracked using the Smarter Balanced assessment, administered in California since 2015 for students in 3rd through 8th and 11th grades in English Language Arts (ELA) and Math. Test-scores were publicly released at the grade-level for any group of students greater than or equal to 11.

The SBAC is a two-part test, consisting of (1) a computer adaptive test, and (2) a performance task.[5] Students' scores are reported as "scale scores," which represent each student's raw test score results converted to a vertical scale for ease of cross-grade comparison. The SBAC data file provides grade level scale scores and the percent of students scoring at each of four performance levels across subjects and subgroups. These cut points were set by SBAC and adopted by the California State Board of Education (SBE) for both ELA and Math. The four score achievement levels per grade are: (1) Not Met, (2) Nearly Met, (3) Met, and (4) Exceeds standards. Students with scale score results at or above the level for the met standard are considered proficient for their grade (levels 3 and 4).[6]

An additional source of data is the California School Dashboard, containing several datasets including academic and non-academic outcomes. Only data files pertaining to CCSA's Academic Accountability Framework (AAF), schools' Academic Indicators and CCI, are reviewed.

Academic Accountability Framework (AAF)

At the request of the CCSA's Member Council (MC), we conduct an annual review of all non-DASS charter schools serving a population of 30 or more test-taking students, regardless of the school's membership status. Any charter school failing to meet the standards set forth in the AAF described below are asked to participate in a Multiple Measure Review (MMR) in order to receive CCSA's renewal advocacy. Schools participating in the MMR process have an opportunity to share information about their school which is not publicly available, explaining their school's outcomes in further detail. The MMR process formed the basis of California's amended legal standards for the renewal of charters by authorizers. As added to section 47607 of the Education Code and effective July 1, 2020, authorizers must consider alternative metrics submitted by

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[5] http://caaspp.cde.ca.gov/sb2016/AboutCAASPP
[6] Performance levels are an approximation of proficiency and should not be interpreted as a precise scale score threshold (https://www.smarterbalanced.org/wp-content/uploads/2015/08/Interpretation-and-Use-of-Scores.pdf)

the school outside of the Dashboard when making renewal determinations, a process which CCSA calls a "second look" process.

For charter schools renewing after July 1st, 2020, CCSA's minimum academic threshold for renewal support is as follows:

- State Rank, using DFS, of 4 or higher (out of 10) in two of the past three years
- SSR of 4 or higher (out of 10) in two of the past three years
- CCI status of at least 45% in two of the past three years

    OR, if no secondary students:

- DFS change of +14 points in the past three years

Any renewing charter school falling below all three of these standards will be asked by CCSA to participate in an MMR, in order to receive active support from CCSA during the school's renewal.

State Rank and Distance from Standard (DFS)

The State Rank is a 1-10 decile ranking of all eligible public traditional and charter schools according to each school's average Distance from Standard (DFS), a metric defined in the Purpose section above.

State Rank Calculation

CCSA assigns all non-DASS schools with 30+ valid test-takers a 1-10 rank based on each school's overall DFS. A score of 1 corresponds to a DFS between 1st and 10th percentiles, while a score of 10 represents a DFS between the 91st and 100th percentile. The high and low schoolwide DFS at each State Rank are shown in Table 2.

DFS Growth

CCSA also calculates school-level change in DFS across years, or "DFS Growth." CCSA calculates both a 2- and 3-year comparison of the average student's DFS at a school. DFS Growth is calculated using the following formulas:

Table 2: State Rank Min/Max DFS

State Rank	Min DFS	Max DFS
1	-126.55	-75.75
2	-73.75	-60.15
3	-58.4	-46.75
4	-46.2	-36.4
5	-34.65	-24.05
6	-23.65	-11.25
7	-10.05	3.05
8	4.6	20.7
9	21.4	44.65
10	48.5	131.8

$$DFS_{\text{3-year growth}} = DFS_{2019} - DFS_{2017}$$

$$DFS_{\text{2-year growth}} = DFS_{2019} - DFS_{2018}$$

Applications and Limitations

The DFS measures every student's distance from the met standard. In a quick glance, the DFS tells us a story of a school's results on the California formative assessment. However, there are some limitations to the DFS:

- **A school-level average does not describe the variability in students' scores.** A school with a DFS of 0 tells us that the "average student" is meeting state standards, however, as only school-level data is available, we do not know how far above or below the met standard each individual student scored. Students may be doing better than the met standard on average in ELA but are below the met standard on average in Math. Additionally, there is no way to know if students are concentrated around the met standard or at extremes above and below proficient.
- **State testing is not conducted for all K-12 students.** Since only grades 3-8 and 11 are tested in the CAASPP, schools of certain grade spans will test a limited sub-section of their student body. High schools in particular will have academic achievement measured only through 11th grade test scores.
- **DFS "growth" is not a student-level measure.** Year-to-year changes in a school's DFS do not necessarily reflect the growth of students at the school, because it is not a direct cohort comparison. This is particularly true for schools serving 9-12th graders, where a new cohort participates in the CAASPP every year. Yearly changes in DFS are therefore not a true measure of student "growth" but are instead a comparison of current average student achievement and the prior year's average.
- **There are no demographic controls.** Research shows that there are significant achievement gaps between demographic groups on standardized tests.[7] However, the DFS measures students' average test results regardless of students' backgrounds. As a result of these ongoing achievement gaps in standardized test results, schools serving a mostly disadvantaged student population will often score lower on DFS than schools serving more privileged communities.

Similar Students Rank (SSR)

CCSA has developed an additional method for understanding student test results that incorporates students' demographic backgrounds. The Similar Students Rank (SSR) is based on the CDE's School Characteristics Index (SCI), which was a calculated measure based on students' results in the state testing system that existed prior to Common Core. The SCI incorporated the demographics of the student body when reporting academic achievement, acknowledging associations between student demographics and test score performance. Since moving to the Common Core standards, the CDE has not updated this measure and instead provides all schools' test score results at the grade and subject level for all subgroups of 11 or more students. It was with this state history and available academic data that CCSA developed the Similar Students Rank (SSR).

The SSR strives to answer three questions:

1. Based on what we know about how academic performance varies by student demographics, what is the predicted performance for a school given its student body?
2. Is the school meeting or surpassing its predicted performance?
3. How does the school's comparative performance relative to its prediction align with other schools in the state?

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[7] Valerie E. Lee and David T. Burkam, "Inequality at the Starting Gate: Social Background Differences in Achievement as Children Begin School," (Washington, D.C.: Economic Policy Institute, 2002).

Academic researchers have sought to answer these questions in a number of ways and generally accept that a student-level model incorporating prior year test scores is the most effective way of measuring the value being added by schools to students' learning. For reasons of student privacy however, student-level data is not provided by the CDE. CCSA must instead rely on the CAASPP's grade-level SBAC data. CCSA partnered with Education Analytics to review the SSR model and investigate preferable approaches to measuring school level impact without having access to student-level scores. In the absence of student-level data, findings supported the recommendation for a demographically controlled regression model like the SSR as a considerably better academic predictor than a simple attainment model (i.e. percent proficient).[8]

The SSR is calculated from a series of multi-variate linear regression models using grade-level scale score data to predict each grade's academic achievement in both ELA and Math, while controlling for, or holding constant, the estimated association of student demographics with school performance. Evidence shows that when statistical models of academic achievement cannot incorporate student-level data, reliability of predictions can be increased by including demographic controls.[9] SSR models are run for each grade tested under the SBAC tests in both English Language Arts (ELA) and Math. The SSR's linear regression models control for student demographic variables associated with academic achievement, such as socioeconomic status and parents' education levels.[10]

While it is the responsibility of schools and districts to ensure the reporting of accurate data, voluntarily reported parent education level is an item that parents are often less likely to answer than other demographic questions. This leads to response rate differences that can present an issue for model reliability. To account for differences in the reporting of parent education data, two separate models are run for each combination of grade and subject: one including average parent education and one excluding this data. This process replicates the methodology used by the state to calculate the School Characteristics Index (SCI). A single year's SSR for all schools in California therefore incorporates the results from 28 individual regression models.

The paired models (with and without parent education) generate a prediction of average grade-level achievement, based on the unique characteristics of every school. These predicted scores are compared with each grades' actual achievement, calculating a "gap," the distance between the prediction and the actual average scores. These comparisons are averaged across grades for the entire school, and the schoolwide average gap size becomes the basis of the SSR. Like the State Rank measure, the SSR is a decile ranking from 1-10, with 1 representing schools with the bottom 10 percent of gaps between actual and predicted scores. Conversely, schools in SSR 10 have actual scale scores that are far above what was predicted given the school's demographics.

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[8] Michael Christian, Constanza Liborio, and Andrew Rice, (August 2016). "Measuring the Impacts of Schools Using Assessments in the Absence of Student-Level Data," Education Analytics, Madison, WI. Available at http://www.ccsa.org/christian_liborio_rice_16.pdf

[9] Dale Ballou, William Sanders, and Paul Write, "Controlling for Student Background in Value-Added Assessment of Teachers," (Journal of Educational and Behavioral Statistics, Vol 29, No 1, pp37-65, 2004)

[10] Jeanne Brooks-Gunn & Greg J Duncan, "The Effects of Poverty on Children," (The Future of Children CHILDREN AND POVERTY, Vol. 7, No. 2, 1997).

School Exclusion Criteria

The SSR includes all public charter and non-charter schools in California. However, there are several types of schools excluded from the SSR regressions. Each of these exclusions and the rationale for exclusion are described below. Refer to Table 3 for a breakdown of how many schools are affected by CCSA's exclusion criteria.

CCSA's School Exclusion list:

- Schools with no CAASPP: Schools that did not have enough CAASPP results to receive a DFS would also not be capable of receiving an SSR.
- Dashboard Alternative School Status (DASS) schools: The DASS school qualification replaced the state's previous Alternative School Accountability Model (ASAM) and refers to schools serving 70% or more special education or "high-risk" student or be a community day, continuation, opportunity, county community, county court, or other school that meets criteria set by the State Board of Education.[11] DASS status became active with the Fall 2018 State Dashboard, and DASS schools display the same basic statistics shown about all other public schools. For several reasons, DASS schools are excluded from the SSR: (1) the state holds DASS schools to modified accountability standards[12], (2) DASS students often test for grade-level content that is atypical for their age (ex. A 15-year old testing at the 3rd grade level), and (3) DASS students typically score hundreds of points lower than their peers.
- Schools with fewer than 30 valid student standardized test scores: Since test scores are unavailable for any grade with fewer than 11 test takers, schools of a very small size simply do not have the data available to be included in the SSR. In alignment with the federal Every Student Succeeds Act (ESSA) and to include as many schools as possible, the current SSR model only excludes those schools with fewer than 30 valid test takers with scores in both the past two years of testing.
- Schools with no prior year test scores: As a proxy for student mobility, CCSA calculates the difference in tested students between a school's overall CAASPP results and the modified number of included test-takers in a school's Dashboard Academic indicator results. This variable explained in further detail below, and is required for inclusion in the SSR.

In total, 17% of charters and 9% of non-charters are not included in the SSR.

TABLE 3: COUNTS OF SCHOOLS INCLUDED IN THE SSR REGRESSIONS

	Charters	Non-Charters
Total CA Schools with CAASPP	1223	8052
Exclude DASS Schools	1129	7556
Exclude fewer than 30 valid test-takers (2018 or 2019)	1110	7470
Total included in the SSR	1010	7436

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[11] http://www.cde.ca.gov/ta/ac/am/considerpart.asp
[12] https://www.cde.ca.gov/ta/ac/dass.asp

School-level, school type, and school size considerations

Three transformations of the data occur to prepare the final SSR calculation: (1) to account for the size of a school's population with respect to its contribution in the regression formulas, (2) to calculate schoolwide averages from each grade-level regression output, (3) to rank schools according to the difference between actual student results and what is predicted given the school's demographics.

- School size: Schools in California range in enrollment size from less than 30 to more than 4,500, and the average differences are notable when comparing charters (<400) to non-charters (>600). To control for these vast differences, school size was weighted in each of the models using the grade-level number of students who had valid test score results on the SBAC. Within each grade's model, the variable for valid test score results is weighted against all other schools' number of valid test scores, producing a weight coefficient ("weight term") for each school included. Each weight term is then rescaled so that the sum of the weight terms equals the total number of grade-level school test results being assessed in each model. These new rescaled weight terms are then used as weights in the regression models.
- Grade level averaged to school-level: The CDE provides SBAC results at the grade and subject level. This allows for predictions to be generated at the grade level, based on the academic results of that grade and the school's demographic characteristics. As will be explained below in the section on variables, a grade's scale score average result is the only variable that is regressed upon at the grade level. The results of each grade-level set of regressions are weighted and averaged with all the grades in a school.
- School type: After schoolwide averages are determined, the averages are sorted into decile ranks according to grade span, including 5,633 elementary, 1,324 middle, 1,226 high schools, and 295 K-12 schools (in 2019). Separate rankings are created for each grade span to account for the ways performance and student demography differ across these grade groupings.

Dependent Variable: Academic Performance (grade-level)

The SSR regression models measure the association between student demographic variables on students' achievement on the SBAC assessments. The CDE publicly provides scaled ELA and Math test results for all students in grades 3-8 and 11 for any demographic groups with 11 or more valid test results. The SSR regression models are calculated separately by grade and subject, with the grade-level average scale score results in ELA and Math functioning as the dependent variables.

Independent Variables (school-level)

In addition to providing students' overall grade level test score averages, the CDE includes the number of valid test-scores for students of several demographics. CCSA calculates demographic percentages at the school-level based on the number of valid test-takers identified in that particular subgroup divided by the school's total valid test-takers. In years past, this was done at the grade-level, but in 2018 the CDE began removing grade-level valid test-taker counts for subgroups that numbered less than 11. Most schools have fewer than 11 students in the majority of their subgroups at the grade level, and this resulted in many schools not receiving demographics. CCSA ultimately moved to school level test-taker demographic averages instead of grade-level to more accurately depict the demographics of school populations.

CCSA also includes one non-demographic independent variable which represents the mobility of students at a school within a school year. The actual proportion of mobile students at a school is not publicly available, so CCSA developed an alternative estimate of mobility by comparing the difference between total SBAC valid test-takers and the number of students ultimately included in a school's Dashboard Academic Indicators. This provides a measure of mobility because the CDE does not include students who spent less than a full school year in its Dashboard Indicator calculations, while a school's SBAC results do. CCSA calculates a weighted average of two prior years' mobility estimates, as seen in the formula below:

$$\text{Mobility estimate} = \frac{SBACvalid_{2019} * (SBACvalid_{2019} - AIvalid_{2019}) + SBACvalid_{2018} * (SBACvalid_{2018} - AIvalid_{2018})}{(SBACvalid_{2019} + SBACvalid_{2018})}$$

All the independent variables are included as both a linear and quadratic independent variable in the model because non-linear relationships were observed between scaled test score results and demographics. See Appendix II for an example scatterplot of demographics with scale scores and Table 4 for a list of school level correlations between the demographic variables in the model and average scale score results.

The SSR intentionally does not include variables describing school structure or administration, which are characteristics of the way a school chooses to operate (e.g., school calendar, class size, teacher credentialing, etc.). These operational freedoms distinguish charters from traditional public schools, and it is CCSA's intention to study the association between these choices on achievement through demographics-based regressions.

Independent Variables list

All relationships between the variables and CAASPP scale scores described below are statistically significant. Refer to Table 4 for the correlation coefficients and levels of significance.

- <u>% Socioeconomically Disadvantaged (SD):</u> The percentage of students in the school who are classified as Socioeconomically Disadvantaged (SD) by the CDE. SD Students include students eligible for the free and reduced priced meal program (FRPM), foster youth, homeless students, migrant students, and students for whom neither parent is a high school graduate.[13] Higher percentages of SD students are significantly negatively correlated with scale scores.
- <u>Average Parent Education Level:</u> The average highest level of educational attainment at a school for parents. These averages range from 1 to 5, where 1 = Not a high school graduate, 2 = High school graduate, 3 = Some college, 4 = College graduate, and 5 = At least some graduate school/post graduate training. Higher averages indicate the school serves students from families with higher education levels. As Table 4 shows, higher parent education levels are positively correlated with higher test scores. Of all the variables in the SSR models, parents' average education level and students' socioeconomic status have the strongest association with average test score results. They are also highly correlated with one another (see Appendix III).
- <u>% English Learners and Reclassified Fluent English Proficient</u>: The percentage of students in the school who are designated as English Learners (EL) or Reclassified Fluent English Proficient (RFEP) by the CDE.

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[13] http://www.cde.ca.gov/nr/ne/yr15/yr15rel69.asp

Traditional English learners are classified as students whose primary language is not English, and who have scored below proficient (as determined by state standards) on an initial English Language Assessment.[14] Local Educational Agencies determine subsequent proficiency standards for reclassifying a student as fluent English proficient (RFEP).[15] Higher levels of English Learners and RFEP students are significantly associated with lower scale scores.

- <u>% Students with Disabilities</u>: The percentage of students who receive special education services and have a valid disability code are also included as independent variables. Higher percentages of students with disabilities in a school are significantly correlated with lower test scores. However, the correlation coefficient is low compared to other variables in the model, indicating that this variable has less influence on average scale score than other variables.

- <u>% Students by Ethnicity</u>: The percentage of students in each of seven ethnic categories (see list below) are also entered in the regression models. Since the National Center for Educational Statistics first published a report in 1966 documenting disparities in educational opportunities for minorities in the US, researchers have acknowledged the existence of a persistent relationship between race with educational opportunities and academic outcomes.[16] The inclusion of racial percentages does not set different expectations for different students. Rather, it isolates those relationships to better identify the effect of the school's program. All seven of the following ethnic subgroups are significantly correlated with schools' average scale scores, with varying strengths and directions.
  - % African American or Black students (not of Hispanic origin)
  - % Asian students
  - % Hispanic students
  - % White students (not of Hispanic origin)
  - % Filipino students
  - % Multi-Racial students
  - % Other (student is not of any the above ethnicities)

- <u>% Mobility</u>: Also included is the percentage difference between the school's CAASPP reported total SBAC test-takers and the number of test-takers with scores on the school's Dashboard Academic Indicator. This serves as a proxy for the school's within-year retention rate, since the CDE's Academic Indicator count of valid test-takers excludes the test results of students who did not attend a school for the entire school year. This measure of student retention is an indicator of student stability/mobility. For this variable, higher percentages indicate higher retention levels. For example, an 8% rate indicates that 8% of SBAC test-takers were not enrolled at the school from Fall Census Day until SBAC testing. This is either the student's first year testing in California or the student arrived to the school after mid-October. Student mobility is negatively correlated with test score results, as higher mobility rates are associated with lower average test scores.

Table 4 provides the descriptive statistics for each independent variable for the 2018-19 school year, as well as the correlation coefficient for each variable's relationship with a school's average scale score. The

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[14] http://www.cde.ca.gov/ds/sd/cb/glossary.asp#el
[15] http://www.cde.ca.gov/ds/sd/cb/glossary.asp#fep
[16] James S Coleman et al, "Equality of Educational Opportunity," (National Center for Educational Statistics, 1966)

relationships seen here often shift once all these variables are put together in a regression model due to interactions between each independent variable. See Appendix III for a table showing how the variables correlate to one another.

TABLE 4: SSR INDEPENDENT VARIABLES AND CORRELATION WITH DEPENDENT

Variable	Mean	Standard Deviation	Min	Max	Correlation Coefficient
% Socioeconomically Disadvantaged	62%	0.28	0%	100%	-0.68
Average Parent Ed	2.90	0.80	1.00	5.00	0.74
% English Learners	18%	0.15	0%	99%	-0.37
% Students with Disabilities	12%	0.05	0%	100%	-0.24
% African American	5%	0.09	0%	94%	-0.24
% Asian	8%	0.14	0%	97%	0.48
% Hispanic	55%	0.29	0%	100%	-0.51
% White	24%	0.23	0%	98%	0.40
% Filipino	2%	0.04	0%	54%	0.18
% Multi-racial	4%	0.04	0%	40%	0.45
% Other	3%	0.04	0%	95%	-0.26
% Mobility	5%	0.06	0%	99%	-0.61

Predicted Scale Scores

CCSA runs two paired regression models per grade served predicting scale scores in both ELA and Math, one that includes parent education and a second predicted scale score from a model without parent education (see Appendix I for the output of each model). The predictions from both models are then combined to create one predicted scale score for each grade and subject combination. This computation consists of three steps:

1. Predicted Scale Score from Parent Ed. Model * percentage of Parent Ed. Question responses = Predicted Scale Score 1 (weighted by parent response)
2. Predicted Scale Score from Model without Parent Ed. * percentage that did not respond to the Parent Ed. Question = Predicted Scale Score 2 (weighted by non-parent response)
3. Predicted Scale Score 1 (weighted by parent response) + Predicted Scale Score 2 (weighted by non-response) = Grade/Subject Predicted Score

Gap Scores

After predicted scale scores are generated for every grade and subject, each grade's actual test score results in ELA and Math are compared to the predicted scores. The predicted scores are subtracted from each grade's actual average test score results in ELA and Math to create grade-level gap scores. Table 4 shows the scale score ranges for each grade achieved on the SBAC in 2019 and the minimum and maximum predictions created by the SSR models. Since the SBAC is a vertically aligned test, there is no floor or cap on the score students can receive, although the CDE does define the range of scores historically associated with each

grade by subject. As Table 5 shows, this caused some predicted scale scores to be below the "minimum" values observed by Smarter Balanced in California. There are no cases where the SSR predicted score for a grade exceeded the grade's maximum possible scale score.

TABLE 5: SCALE SCORE RANGES OF TEST-TAKERS, MODEL PREDICTIONS, AND GAPS

ELA grade	Observed Scale Score Ranges		Gap score Ranges	
	Min	Max	Min	Max
3	2279	2564	-100	100
4	2276	2598	-150	107
5	2300	2640	-158	101
6	2364	2659	-184	115
7	2363	2710	-133	113
8	2361	2737	-129	124
11	2373	2747	-261	103
Math	Observed Scale Score Ranges		Gap score Ranges	
	Min	Max	Min	Max
3	2253	2571	-128	129
4	2308	2612	-139	110
5	2303	2646	-162	130
6	2334	2689	-273	124
7	2326	2721	-164	206
8	2327	2766	-180	147
11	2350	2785	-272	130

Each grade and subject's gap score is expressed as a negative or positive value because it tells us whether each grade's actual test score results are above or below their predicted test results. A gap score of 0 indicates that, on average, the students of that grade are exactly meeting their predicted test results in that subject, while all values above 0 indicate over-achievement and all negative values indicate under-achievement. The ELA and Math gap scores are then averaged for each grade to create a single gap score at each grade level.

Schoolwide Averages

The gap scores for every grade at a school are then weighted by the total number of test takers in that grade. Each of these weighted gap scores are then aggregated into a single schoolwide average gap score.

$$\text{Schoolwide Average Gap Score} = \frac{(\text{Test}-\text{Takers}_k \times \text{Gap Score}_k) + \cdots + (\text{Test}-\text{Takers}_{12} \times \text{Gap Score}_{12})}{\text{Total Valid Test}-\text{takers}}$$

Gap scores represent the difference between our model's prediction of a school's possible achievement compared with the school's actual achievement. Therefore, there is no linear relationship between gap scores and actual test-score results. Schools that have very different actual test results could have the same average gap score. Illustrated in Table 6, School A and School B have the same average gap scores for 4th grade. However, the actual 4th grade scale score of School A is much higher than that of School B. These differences are a result of the particular demographics at each school. School A's demographics are associated with higher scale scores statewide, and so the regression models generated a higher predicted score. School B's predicted scores are equally high above its actual average achievement as School A, but because of School B's particular demographics, its predicted scores are not as high as School A's. The table to the left also provides an example of two schools (Schools C and D) that have the same actual fourth grade scale scores, but different predicted scores, and thus very different gap scores. This is possible because the predictions rely on student demographic variables, which differ even though the schools have the same scale scores. As these examples show, predictions and gap scores vary on a school-by-school basis.

Table 6: Example Schools' 4th Grade Average CAASPP and Gap Score

Example Schools	Actual Scale Scores	Predicted Score	Gap Score
School A	2445	2503	-58
School B	2365	2423	-58
School C	2473	2484	-11
School D	2473	2495	-22

Letting Go of Error

For those who have followed CCSA's accountability framework closely over the years, our demographically-controlled metric may look very different from how it looked in the past. Before 2018, CCSA calculated a Similar Students Measure (SSM) instead of the SSR explained above. Just like the currently used SSR, the SSM evaluated schoolwide Gap scores. Instead of comparing schools' gap scores to all other schools in the state, the SSM compared a school's gap to our uncertainty in the school's predicted values. Every school had some error in its gap score, typically +/-20 points, which represented our uncertainty about the exact gap between the school's actual CAASPP results and its predicted results. For schools with gaps that were far beyond our *forecast error*, we assigned ratings of being *Above* or *Below* prediction. The exact categories assigned to schools under SSM are listed in Figure 1 below.

Figure 1: Similar Student Measure Categories by Degree of Error

Far Below Prediction	Below Prediction	Within Predicted	Above Prediction	Far Above Prediction
<2 Forecast Errors	<1 Forecast Error	Within 1 FE	>1 Forecast Error	>2 Forecast Errors

For the reasons detailed below, CCSA moved away from the SSM, starting with the 2018 CAASPP results:

- **Lack of differentiation.** In 2018, 79% of schools were considered Within their predicted results. This meant that those schools' actual average score and their prediction were within a forecast error of one another. For those schools, the SSM couldn't offer any further comparative power.

- **CCSA's movement-wide evaluations were conducted with ranks.** Since the first year in which CCSA calculated the SSM, the SSR was also being created and used to evaluate the organization's progress on quality. Every year, despite using the SSM for accountability purposes, the organization simultaneously published reports on the SSR and evaluated organizational goals according to progress on SSR.
- **Streamlining the accountability system.** Prior to 2018, schools' CAASPP results were evaluated using ranking while schools' performance given demographics was evaluated differently. Using SSR instead of SSM aligned schools' overall CAASPP results with their predicted results given demographics.

Calculating SSR

For the reasons detailed above, CCSA transitioned away from a demographic-controlled measure incorporating error starting in the 2017-18 school year. Instead, CCSA began using the Similar Students Rank (SSR) to determine schools' status relative to the demographics of students being served. The SSR is a numbering of the "Shape of the U" (featured below), which CCSA has been publishing since 2011. The "Shape of the U" shows the statewide distribution of schools according to their state test results given the student demographics those schools serve. This distribution ranks schools according to their schoolwide weighted gap score. A school with a very high positive gap score is placed on the right side of this distribution. Such a school had average CAASPP scores much higher than predicted given the school's demographics. Conversely, a school with a very negative Gap score is placed on the left side of the distribution and has CAASPP results far below what is predicted given the school's demographics. See Table 8 for the Gap score ranges by Similar Students Rank and grade span.

Table 8: Similar Student Ranks with Min and Max Gap Scores, by Gradespan, 2019

	Elementary		Middle		High		K-12	
Rank	Min Gap	Max Gap	Min Gap	Max Gap	Min Gap	Max Gap	Min Gap	Max Gap
1	-144.2	-20.8	-95.3	-25.8	-95.9	-29.9	-124.7	-35.2
2	-20.8	-12.4	-25.8	-18.3	-29.9	-20.3	-35.1	-25.1
3	-12.4	-6.9	-18.1	-12.1	-20.0	-13.8	-24.2	-17.6
4	-6.9	-2.0	-12.1	-7.2	-13.8	-7.5	-17.4	-12.0
5	-2.0	2.5	-7.2	-2.8	-7.4	-1.3	-11.8	-5.8
6	2.5	7.1	-2.8	1.8	-1.3	4.1	-5.6	0.8
7	7.1	11.8	1.8	6.6	4.1	10.1	0.9	8.9
8	11.9	17.5	6.6	12.6	10.1	18.2	9.2	15.9
9	17.5	26.2	12.7	21.8	18.2	29.4	16.2	29.7
10	26.2	93.9	21.8	71.7	29.6	93.4	30.4	71.5

SSR Limitations

CCSA recommends the SSR as an additional tool in the identification of underperforming charters but does not recommend it as the sole tool for evaluating schools. As with all measures, there are limitations, some of which are described below.

- The SSR regression models reach high levels of validity and have been found to be reliable, but regression predictions are still just estimates of relationships between variables. There is an inherent level of imprecision in any statistical measure, which are exacerbated when test results are aggregated to the grade-level. Additionally, any grade with fewer than 11 test-takers has its students' scores redacted, thus getting excluded from the model entirely.

- The regression models are grade-level calculations, but the percentage of continuously enrolled students is included as a school-level independent variable. Therefore, a school may have grade-specific within-year changes in enrollment that are not being accounted for in the regressions.

- With the CAASPP, only grades 3-8 and 11 are tested, so the academic achievement of some schools is being measured based on a small segment of the total students at the school. Schools serving grades 9-12 will have both SSR and DFS calculated using the test results of just 11th graders. Since high schools are unduly affected by the limited number of grades being tested, a school's College and Career Indicator is also considered in CCSA's Accountability Framework.

- Not-continuously enrolled students are included in testing data. In prior years, CCSA's measures were based on the state-provided Academic Performance Index (API) data fie which only reported test scores for students continuously enrolled from fall to spring. The SBAC scale score data now includes all students at a school regardless of their enrollment date. This could affect average scale scores, and therefore SSR predictions, in ways we are unable to quantify with school-level data. Mobility is included in the SSR modeling in an attempt to account for this limitation.

- In prior years, student retention rates were included in the state-provided Academic Performance Index (API) data file, however, retention is no longer included in the SBAC data set and not made publicly available. To estimate mobility with publicly available information, CCSA instead estimates mobility by determining the difference in total valid scores between the SBAC and the Dashboard Academic Indicators.

- Because non-charters comprise most of the schools being assessed, those schools' performance and variable relationships are driving the regression models.

- The SSR is only one measure of school performance, and it is a relative measure. That being the case, this measure cannot and should not stand alone as the only assessment of a school's performance or as the arbitrator of a school's future. This is particularly the case for schools that either have a specific research-based program such as Waldorf or Montessori (where the curriculum is designed to culminate in high performance at higher grade levels and therefore may not be evident in earlier grade levels), or that have a high percentage of students with a disability or other special needs, but are not a special education school. These metrics were designed to serve as a trigger for further review and a deeper assessment of a school's effectiveness, not as the only point upon which to make those decisions.

- While CCSA's Multiple Measure Review provides additional nuance to the academic information publicly available to charters facing renewal, longitudinally linked, individual student data would be the ideal source for most appropriately assessing a school's performance. Because the SSR is calculated with aggregate grade level data, it approximates value-added modeling. True value-added modeling requires individual student data connected to the schools and educators instructing those students.

SSR as an Accountability Tool

Given that the SSR was primarily developed to inform renewal review processes, charter schools that have been in operation fewer than 4 years are excluded from the application of SSR as an accountability tool, though they are still included in the SSR model.

As an accountability tool, we recommend that the SSR be combined with measures of actual test results (DFS) and growth over time to identify schools that are demonstrating patterns of under-performance relative to predicted performance, as well as low performance on absolute measures. The contribution of the SSR to a school's picture of achievement is that the SSR adds the ability to identify schools that consistently fail to meet minimum predicted test scores controlling for their student populations. For more information on how the SSR plays a part in CCSA's Accountability Framework and the CCSA Minimum Criteria for Renewal, see our website at ccsa.org/accountability.

College/Career Indicator (CCI)

Schools serving secondary students are seeing students to the end of their mandatory education and are expected to have prepared students adequately for their transition into adulthood. To that end, The CDE began reporting the College/Career Indicator on the School Dashboard for all schools with 30 or more students in a 4-year graduation cohort in December of 2017. A school's CCI status is a percentage between 1 and 100, representing the proportion of total students in a matriculating cohort that are graduating and considered "prepared" for college or career based on standards agreed upon by the State Board of Education. In 2019, there were 384 charter and 1,182 non-charter schools with a CCI status.

College/Career Readiness Pathways

The State Board of Education considered several avenues by which a student can be considered "prepared" for college and career, and as of the 2018 school year voted to include all of the follow "pathways" to college and career preparedness:

- CTE Pathway Completion
- Grade 11 Smarter Balanced Summative Assessments in ELA and Mathematics
- Advanced Placement (AP) Exams
- International Baccalaureate (IB) Exams
- College Credit Course (formerly called Dual Enrollment)
- a-g Completion
- State Seal of Biliteracy
- Leadership/Military Science

Each pathway has its own set of requirements by which a student will be considered prepared, but even if a school has students completing several pathways to achieve preparedness, all of them will be included in the same status calculation as "prepared" for college and/or career.

Appendix I: SSM Scale Score Prediction Regressions

Grade 3 Scale Score Prediction Regressions

	ELA		Math	
	w/ Parent Ed	w/out Parent Ed	w/ Parent Ed	w/out Parent Ed
Continuous Enrollment	-2.784	-3.247	-2.410	-2.752
	(34.22)**	(39.04)**	(30.68)**	(34.88)**
Continuous Enrollment^2	0.025	0.028	0.024	0.027
	(52.14)**	(58.23)**	(51.74)**	(57.59)**
% SpEd	42.587	34.422	22.045	14.012
	(22.15)**	(17.48)**	(12.05)**	(7.48)**
% Low-Income	-59.615	-103.880	-55.943	-97.744
	(65.03)**	(157.60)**	(64.10)**	(156.15)**
% English Learner	-42.113	-45.584	-34.583	-37.373
	(59.66)**	(63.70)**	(51.50)**	(54.97)**
% Reclassified EFP	-19.685	-31.223	-4.654	-16.240
	(18.22)**	(28.56)**	(4.51)**	(15.57)**
% African American	-67.563	-68.933	-73.795	-74.168
	(65.82)**	(65.72)**	(75.61)**	(74.42)**
% Asian American	32.574	42.925	40.275	50.522
	(31.51)**	(41.00)**	(40.99)**	(50.79)**
% Latino	-5.481	-27.913	-17.024	-39.111
	(4.09)**	(21.25)**	(13.43)**	(31.47)**
% Other	-12.693	-15.652	-24.930	-27.496
	(9.10)**	(10.99)**	(18.85)**	(20.37)**
Avg Parent Ed	7.966		6.734	
	(15.51)**		(13.76)**	
% SpEd^2	-316.223	-306.546	-300.130	-290.585
	(44.02)**	(41.63)**	(43.67)**	(41.28)**
% Low-Income^2	15.186	24.619	21.548	30.468
	(20.74)**	(42.23)**	(30.89)**	(55.01)**
% EL^2	11.352	0.766	20.810	10.749
	(13.81)**	(0.94)	(26.61)**	(13.84)**
% RFEP^2	133.956	122.560	122.036	112.242
	(42.92)**	(38.42)**	(40.59)**	(36.55)**
% African American^2	37.616	30.141	49.865	42.029
	(24.81)**	(19.54)**	(34.60)**	(28.67)**
% Asian American^2	-27.056	-31.681	-25.702	-30.988
	(26.10)**	(30.44)**	(26.15)**	(31.45)**
% Latino^2	-2.555	7.974	0.686	11.317
	(3.23)**	(10.40)**	(0.92)	(15.57)**
% White^2	-23.188	-29.158	-25.735	-31.335
	(25.55)**	(31.77)**	(29.88)**	(35.98)**
% Other^2	-19.373	-33.267	8.875	-4.039
	(7.12)**	(11.97)**	(3.42)**	(1.53)
Avg Parent Ed^2	1.934		1.960	
	(22.11)**		(23.53)**	
_cons	2,464.693	2,554.797	2,450.456	2,529.785
	(681.59)**	(705.30)**	(701.55)**	(736.49)**
R^2	0.76	0.75	0.75	0.73
N	447,943	453,133	449,861	455,293

* $p<0.05$; ** $p<0.01$

Grade 4 Scale Score Prediction Regressions

	ELA		Math	
	w/ Parent Ed	w/out Parent Ed	w/ Parent Ed	w/out Parent Ed
Continuous Enrollment	-3.927	-4.585	-3.118	-3.420
	(46.07)**	(52.27)**	(41.63)**	(44.85)**
Continuous Enrollment^2	0.032	0.037	0.028	0.030
	(64.00)**	(71.23)**	(63.73)**	(67.76)**
% SpEd	36.178	32.598	-14.362	-18.743
	(18.80)**	(16.43)**	(8.31)**	(10.58)**
% Low-Income	-68.160	-120.472	-61.475	-109.325
	(73.23)**	(174.93)**	(74.09)**	(178.26)**
% English Learner	-48.548	-53.415	-36.140	-39.493
	(64.32)**	(69.13)**	(53.52)**	(57.36)**
% Reclassified EFP	6.013	3.643	14.665	13.395
	(5.85)**	(3.45)**	(15.77)**	(14.08)**
% African American	-58.232	-57.667	-62.623	-62.570
	(56.47)**	(54.24)**	(67.67)**	(65.93)**
% Asian American	21.633	35.494	31.518	42.815
	(20.81)**	(33.33)**	(33.85)**	(45.12)**
% Latino	4.311	-16.255	-23.624	-44.001
	(3.26)**	(12.30)**	(20.00)**	(37.49)**
% Other	-11.113	-11.491	-21.606	-24.495
	(8.50)**	(8.54)**	(18.50)**	(20.48)**
Avg Parent Ed	9.103		3.127	
	(17.78)**		(6.90)**	
% SpEd^2	-294.068	-299.321	-127.363	-127.259
	(42.48)**	(41.91)**	(20.38)**	(19.84)**
% Low-Income^2	16.792	28.004	19.042	31.892
	(22.58)**	(46.18)**	(28.76)**	(59.09)**
% EL^2	18.677	5.591	23.320	13.278
	(19.50)**	(5.81)**	(27.25)**	(15.49)**
% RFEP^2	69.687	42.263	58.301	36.510
	(30.24)**	(17.82)**	(27.66)**	(16.92)**
% African American^2	20.277	13.356	18.487	11.730
	(13.55)**	(8.68)**	(13.74)**	(8.52)**
% Asian American^2	-6.838	-16.543	-6.520	-16.609
	(6.82)**	(16.17)**	(7.26)**	(18.25)**
% Latino^2	-9.204	0.339	0.904	10.888
	(11.76)**	(0.44)	(1.29)	(15.80)**
% White^2	-20.453	-25.586	-24.774	-30.792
	(22.62)**	(27.69)**	(30.60)**	(37.41)**
% Other^2	-20.646	-34.072	-12.434	-22.217
	(8.86)**	(14.17)**	(5.97)**	(10.39)**
Avg Parent Ed^2	2.173		2.494	
	(25.03)**		(32.48)**	
_cons	2,544.591	2,651.039	2,529.281	2,603.868
	(671.71)**	(694.91)**	(759.70)**	(785.95)**
R^2	0.78	0.77	0.79	0.78
N	466,057	468,502	468,010	470,514

* $p<0.05$; ** $p<0.01$

Grade 5 Scale Score Prediction Regressions

	ELA		Math	
	w/ Parent Ed	w/out Parent Ed	w/ Parent Ed	w/out Parent Ed
Continuous Enrollment	-3.887	-4.507	-3.850	-4.609
	(48.28)**	(54.08)**	(47.16)**	(54.87)**
Continuous Enrollment^2	0.031	0.036	0.032	0.037
	(65.78)**	(72.78)**	(66.70)**	(75.24)**
% SpEd	13.107	1.634	-6.624	-16.870
	(6.54)**	(0.78)	(3.25)**	(7.99)**
% Low-Income	-51.963	-116.886	-55.290	-126.320
	(55.29)**	(173.44)**	(58.17)**	(186.59)**
% English Learner	-51.456	-63.036	-35.774	-48.059
	(62.30)**	(73.96)**	(42.89)**	(55.97)**
% Reclassified EFP	26.511	30.003	38.622	42.295
	(27.35)**	(29.73)**	(39.14)**	(41.38)**
% African American	-61.374	-62.298	-73.257	-74.627
	(60.28)**	(58.74)**	(71.34)**	(70.11)**
% Asian American	21.499	39.796	20.389	36.440
	(20.84)**	(37.32)**	(19.61)**	(34.06)**
% Latino	-6.232	-22.553	-34.606	-54.718
	(4.87)**	(17.35)**	(26.84)**	(42.06)**
% Other	-10.608	-8.872	-24.368	-24.437
	(8.04)**	(6.47)**	(18.36)**	(17.80)**
Avg Parent Ed	9.636		1.693	
	(18.48)**		(3.23)**	
% SpEd^2	-251.712	-231.891	-157.119	-141.863
	(35.27)**	(31.25)**	(21.41)**	(18.68)**
% Low-Income^2	7.857	24.958	15.859	39.132
	(10.52)**	(41.75)**	(21.06)**	(65.18)**
% EL^2	25.962	16.263	25.778	20.974
	(21.87)**	(13.43)**	(21.56)**	(17.21)**
% RFEP^2	6.708	-27.856	-0.382	-32.652
	(3.95)**	(15.85)**	(0.22)	(18.20)**
% African American^2	21.228	21.088	19.851	18.220
	(14.58)**	(13.93)**	(13.50)**	(11.98)**
% Asian American^2	-9.180	-23.390	3.932	-8.768
	(9.37)**	(23.07)**	(3.97)**	(8.60)**
% Latino^2	-0.985	5.382	3.431	12.461
	(1.29)	(7.03)**	(4.46)**	(16.22)**
% White^2	-24.701	-27.370	-28.084	-32.407
	(28.09)**	(30.13)**	(31.71)**	(35.60)**
% Other^2	-13.186	-25.063	2.369	-9.234
	(5.59)**	(10.19)**	(0.99)	(3.73)**
Avg Parent Ed^2	2.668		3.846	
	(30.21)**		(43.25)**	
_cons	2,578.317	2,692.072	2,578.457	2,689.370
	(719.55)**	(744.08)**	(709.41)**	(737.23)**
R^2	0.79	0.77	0.80	0.78
N	456,924	459,278	458,571	461,091

* $p<0.05$; ** $p<0.01$

Grade 6 Scale Score Prediction Regressions

	ELA		Math	
	w/ Parent Ed	w/out Parent Ed	w/ Parent Ed	w/out Parent Ed
Continuous Enrollment	-2.485	-3.247	-1.933	-2.787
	(33.11)**	(41.74)**	(23.90)**	(33.01)**
Continuous Enrollment^2	0.023	0.028	0.021	0.027
	(50.42)**	(60.70)**	(43.96)**	(54.36)**
% SpEd	-64.161	-70.453	-114.196	-122.687
	(32.88)**	(34.74)**	(55.50)**	(56.96)**
% Low-Income	-43.799	-111.051	-47.202	-134.145
	(41.84)**	(156.10)**	(42.66)**	(177.83)**
% English Learner	-79.748	-100.467	-101.831	-122.786
	(83.10)**	(102.04)**	(101.19)**	(118.05)**
% Reclassified EFP	12.595	18.751	10.227	17.199
	(12.30)**	(17.62)**	(9.43)**	(15.15)**
% African American	-65.036	-60.688	-79.710	-75.975
	(62.20)**	(55.82)**	(72.41)**	(65.87)**
% Asian American	68.198	88.449	79.274	101.094
	(64.60)**	(81.23)**	(71.57)**	(87.77)**
% Latino	53.187	36.323	37.268	9.989
	(39.81)**	(26.92)**	(26.59)**	(7.01)**
% Other	-18.679	-26.503	-24.307	-38.370
	(14.46)**	(19.87)**	(17.92)**	(27.18)**
Avg Parent Ed	16.000		10.575	
	(28.44)**		(17.93)**	
% SpEd^2	-1.028	-15.393	150.788	136.056
	(0.15)	(2.15)*	(20.66)**	(17.79)**
% Low-Income^2	3.684	20.377	10.905	37.335
	(4.52)**	(32.27)**	(12.70)**	(55.79)**
% EL^2	81.523	79.502	122.079	118.189
	(52.57)**	(49.83)**	(75.66)**	(70.65)**
% RFEP^2	28.257	-15.633	48.283	-0.350
	(17.22)**	(9.28)**	(27.64)**	(0.19)
% African American^2	49.497	39.562	48.520	35.490
	(30.69)**	(23.61)**	(28.48)**	(19.90)**
% Asian American^2	-32.553	-44.533	-19.106	-34.872
	(31.70)**	(41.92)**	(17.74)**	(31.08)**
% Latino^2	-34.441	-27.250	-34.946	-21.739
	(43.18)**	(34.15)**	(41.68)**	(25.74)**
% White^2	0.494	-1.719	-4.620	-10.864
	(0.54)	(1.81)	(4.76)**	(10.80)**
% Other^2	24.147	32.149	21.905	34.607
	(11.99)**	(15.36)**	(10.34)**	(15.59)**
Avg Parent Ed^2	1.985		3.596	
	(20.44)**		(35.18)**	
_cons	2,510.279	2,642.659	2,473.442	2,620.746
	(753.73)**	(790.33)**	(689.13)**	(721.51)**
R^2	0.78	0.76	0.82	0.80
N	452,401	454,700	453,815	456,284

* $p<0.05$; ** $p<0.01$

Grade 7 Scale Score Prediction Regressions

	ELA		Math	
	w/ Parent Ed	w/out Parent Ed	w/ Parent Ed	w/out Parent Ed
Continuous Enrollment	-4.785	-5.379	-4.467	-5.080
	(84.11)**	(91.23)**	(75.31)**	(82.39)**
Continuous Enrollment^2	0.037	0.041	0.038	0.042
	(104.87)**	(113.66)**	(102.75)**	(111.18)**
% SpEd	-100.148	-110.248	-106.231	-115.129
	(47.34)**	(49.92)**	(48.54)**	(50.21)**
% Low-Income	-41.147	-102.647	-47.190	-125.765
	(42.28)**	(155.73)**	(46.85)**	(183.22)**
% English Learner	-86.709	-115.011	-96.543	-125.524
	(91.66)**	(118.03)**	(99.05)**	(124.77)**
% Reclassified EFP	-19.603	-10.333	-9.146	0.316
	(20.14)**	(10.16)**	(9.02)**	(0.30)
% African American	-73.288	-73.682	-93.168	-94.049
	(76.59)**	(73.60)**	(93.81)**	(90.18)**
% Asian American	40.121	60.393	41.767	60.684
	(40.95)**	(59.54)**	(41.24)**	(57.63)**
% Latino	24.405	17.218	-6.178	-22.503
	(19.82)**	(13.76)**	(4.86)**	(17.36)**
% Other	-22.986	-17.816	-12.220	-11.621
	(19.25)**	(14.34)**	(9.91)**	(9.02)**
Avg Parent Ed	23.307		14.133	
	(43.62)**		(25.76)**	
% SpEd^2	93.394	112.303	124.096	136.827
	(11.16)**	(12.85)**	(14.21)**	(14.94)**
% Low-Income^2	-0.299	13.142	6.360	30.923
	(0.38)	(21.83)**	(7.86)**	(49.38)**
% EL^2	83.584	97.387	118.268	133.966
	(47.58)**	(53.45)**	(66.16)**	(72.01)**
% RFEP^2	64.075	22.189	81.290	39.128
	(46.23)**	(15.50)**	(56.02)**	(26.01)**
% African American^2	39.322	43.020	31.776	31.855
	(27.49)**	(28.80)**	(21.29)**	(20.35)**
% Asian American^2	-0.785	-13.461	27.758	14.403
	(0.82)	(13.51)**	(28.02)**	(13.92)**
% Latino^2	-24.765	-23.907	-21.880	-15.611
	(33.53)**	(32.12)**	(28.64)**	(20.20)**
% White^2	-17.521	-16.224	-20.453	-23.229
	(20.50)**	(18.35)**	(23.15)**	(25.32)**
% Other^2	-4.509	-14.470	-32.506	-41.486
	(2.26)*	(6.93)**	(15.75)**	(19.14)**
Avg Parent Ed^2	0.576		2.446	
	(6.35)**		(26.22)**	
_cons	2,636.312	2,763.016	2,605.174	2,731.864
	(1,060.24)**	(1,125.40)**	(1,004.51)**	(1,064.04)**
R^2	0.83	0.82	0.87	0.86
N	449,990	451,340	451,290	452,663

* $p<0.05$; ** $p<0.01$

Grade 8 Scale Score Prediction Regressions

	ELA		Math	
	w/ Parent Ed	w/out Parent Ed	w/ Parent Ed	w/out Parent Ed
Continuous Enrollment	-3.907	-4.559	-4.778	-5.439
	(71.33)**	(80.23)**	(68.95)**	(75.70)**
Continuous Enrollment^2	0.032	0.037	0.042	0.047
	(92.74)**	(103.62)**	(98.16)**	(106.30)**
% SpEd	-153.288	-160.095	-151.684	-167.886
	(62.04)**	(62.35)**	(50.03)**	(53.28)**
% Low-Income	-42.806	-98.401	-43.335	-131.358
	(43.11)**	(143.32)**	(35.57)**	(155.63)**
% English Learner	-104.666	-128.154	-111.309	-133.763
	(103.36)**	(123.76)**	(89.09)**	(104.97)**
% Reclassified EFP	-7.441	0.482	13.265	19.545
	(7.80)**	(0.49)	(11.23)**	(15.93)**
% African American	-70.193	-73.859	-95.304	-101.213
	(71.42)**	(72.18)**	(78.68)**	(80.26)**
% Asian American	47.405	67.076	61.157	80.140
	(47.42)**	(65.05)**	(49.82)**	(63.27)**
% Latino	30.872	17.274	-11.654	-43.071
	(24.30)**	(13.50)**	(7.48)**	(27.46)**
% Other	-14.359	-12.989	-18.863	-25.894
	(11.81)**	(10.35)**	(12.67)**	(16.83)**
Avg Parent Ed	25.880		13.590	
	(47.78)**		(20.57)**	
% SpEd^2	300.074	293.321	300.901	325.237
	(28.51)**	(26.80)**	(23.14)**	(24.06)**
% Low-Income^2	4.774	15.841	4.062	34.091
	(5.94)**	(25.31)**	(4.13)**	(44.29)**
% EL^2	123.027	126.388	164.103	163.753
	(59.94)**	(59.76)**	(65.50)**	(63.48)**
% RFEP^2	38.336	-1.194	36.743	-3.984
	(30.36)**	(0.93)	(23.40)**	(2.49)*
% African American^2	49.875	57.568	42.529	46.975
	(33.60)**	(37.34)**	(23.07)**	(24.53)**
% Asian American^2	-5.112	-17.263	23.472	10.003
	(5.13)**	(16.70)**	(19.18)**	(7.88)**
% Latino^2	-24.206	-18.781	-7.264	8.891
	(31.67)**	(24.56)**	(7.74)**	(9.47)**
% White^2	-12.176	-12.231	-8.989	-16.742
	(13.98)**	(13.68)**	(8.41)**	(15.25)**
% Other^2	11.622	3.522	-2.010	-8.867
	(5.59)**	(1.63)	(0.79)	(3.33)**
Avg Parent Ed^2	0.007		2.988	
	(0.07)		(26.57)**	
_cons	2,610.528	2,740.124	2,599.854	2,739.814
	(1,086.10)**	(1,164.45)**	(856.66)**	(921.73)**
R^2	0.80	0.79	0.83	0.82
N	441,712	443,206	442,791	444,322

* $p<0.05$; ** $p<0.01$

Grade 11 Scale Score Prediction Regressions

|	ELA		Math	
	w/ Parent Ed	w/out Parent Ed	w/ Parent Ed	w/out Parent Ed
Continuous Enrollment	-2.137	-2.204	-2.474	-2.392
	(59.68)**	(60.58)**	(69.80)**	(64.62)**
Continuous Enrollment^2	0.022	0.023	0.028	0.027
	(90.87)**	(93.52)**	(114.16)**	(109.02)**
% SpEd	-154.084	-157.789	-162.542	-185.910
	(43.86)**	(44.17)**	(47.14)**	(51.61)**
% Low-Income	-51.013	-92.983	-69.225	-178.430
	(45.40)**	(114.48)**	(62.99)**	(217.92)**
% English Learner	-249.796	-267.078	-210.648	-228.460
	(167.89)**	(177.25)**	(146.18)**	(152.37)**
% Reclassified EFP	-19.616	-18.988	52.183	49.053
	(17.50)**	(16.64)**	(47.37)**	(42.59)**
% African American	-95.715	-88.151	-94.699	-90.886
	(76.56)**	(69.55)**	(77.35)**	(71.28)**
% Asian American	55.254	74.666	68.014	87.576
	(45.39)**	(60.99)**	(57.08)**	(71.13)**
% Latino	36.417	14.291	-6.631	-72.541
	(23.27)**	(9.49)**	(4.33)**	(47.94)**
% Other	80.264	72.099	88.912	56.616
	(50.11)**	(44.89)**	(56.60)**	(34.99)**
Avg Parent Ed	18.359		-22.751	
	(25.20)**		(31.88)**	
% SpEd^2	289.857	284.553	238.996	314.189
	(17.02)**	(16.43)**	(14.22)**	(17.89)**
% Low-Income^2	17.999	23.646	30.443	83.656
	(17.85)**	(30.51)**	(30.82)**	(107.01)**
% EL^2	276.830	290.145	237.980	249.382
	(74.84)**	(77.01)**	(67.55)**	(67.64)**
% RFEP^2	63.761	43.163	-27.465	-43.875
	(44.05)**	(29.73)**	(19.27)**	(29.90)**
% African American^2	80.041	66.975	54.025	26.441
	(42.57)**	(35.05)**	(29.33)**	(13.75)**
% Asian American^2	10.553	-9.542	44.279	12.512
	(8.74)**	(7.83)**	(37.55)**	(10.23)**
% Latino^2	-6.753	6.520	9.462	50.611
	(7.21)**	(7.30)**	(10.30)**	(56.27)**
% White^2	-4.551	-8.787	-10.893	-33.730
	(4.20)**	(8.17)**	(10.28)**	(31.21)**
% Other^2	-161.643	-154.660	-208.299	-186.032
	(46.92)**	(44.08)**	(61.44)**	(52.45)**
Avg Parent Ed^2	0.351		8.654	
	(2.96)**		(74.66)**	
_cons	2,585.608	2,670.995	2,592.759	2,667.225
	(1,481.50)**	(1,821.72)**	(1,506.27)**	(1,793.33)**
R^2	0.73	0.72	0.85	0.83
N	389,771	389,771	388,777	388,777

* $p<0.05$; ** $p<0.01$

Appendix II: Example Graphical Relationship Between Demographics and Scale Scores

Test scores by % Low-Income (4th Grade)

Spring 2016 CAASPP Results
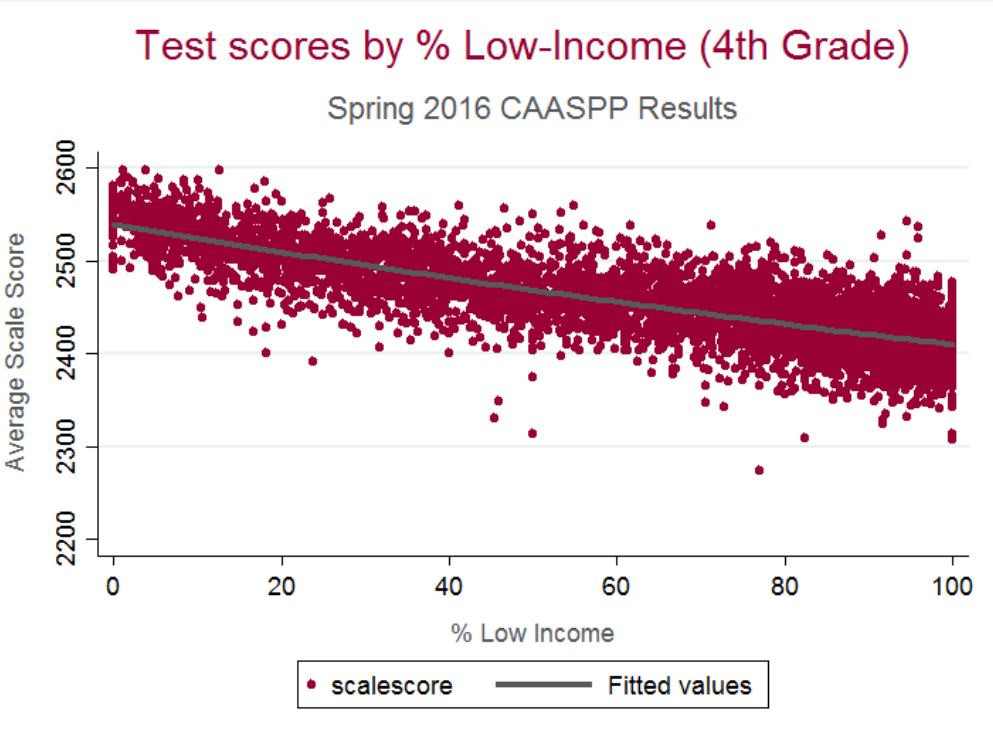
Test scores by % English Learner (4th Grade)

Spring 2016 CAASPP Results
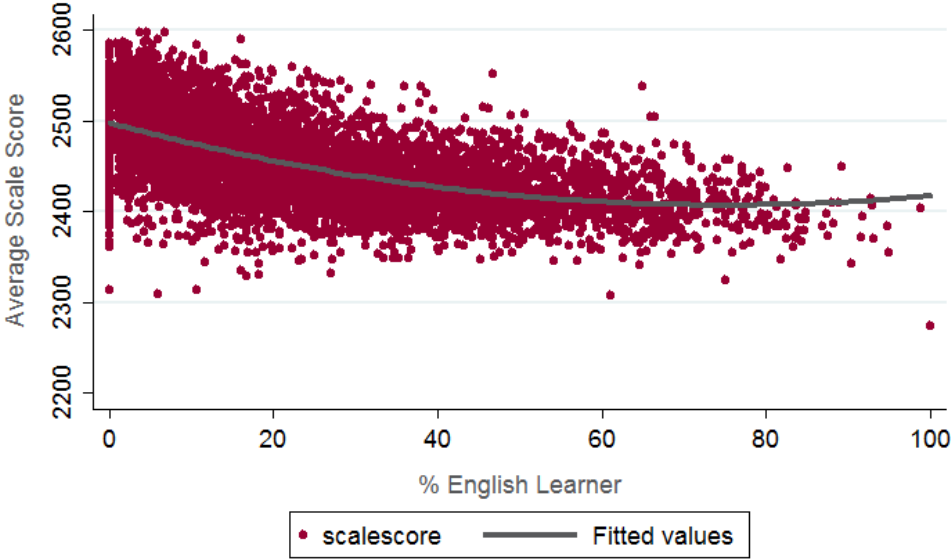
Appendix III: Demographic Independent Variables Correlation Table

	cbmob	avg_ed	p_el	p_rfep	p_di	p_sd	p_aa	p_as	p_la	p_wh	p_other
cbmob	100%										
avg_ed	23%***	100%									
p_el	3%***	-62%***	100%								
p_rfep	2%**	-52%***	19%***	100%							
p_di	-5%***	-9%***	7%***	-12%***	100%						
p_sd	0%***	-92%***	61%***	46%***	11%***	100%					
p_aa	-16%***	-11%***	-8%***	-9%***	9%***	19%***	100%				
p_as	1%***	41%***	-11%***	7%***	-14%***	-38%***	-7%***	100%			
p_la	-7%***	-81%***	65%***	55%***	3%***	79%***	-11%***	-43%***	100%		
p_wh	5%***	68%***	-60%***	-58%***	0%	-71%***	-25%***	-5%***	-77%***	100%	
p_other	5%***	39%***	-30%***	-28%***	-1%	-36%***	3%***	19%***	-51%***	20%**	100%

*** = $p<.01$, ** = $p<.05$, * = $p<.1$

Variable key

School Level

- Cbmob: Percent continuously enrolled students

Grade Level

- Avg_ed: Average parents' education
- p_el: Percent English Learners
- p_rfep: Percent Reclassified Fluent English Proficient
- p_di: Percent Students with Disabilities
- p_sd: Percent Socioeconomically Disadvantaged
- p_aa: Percent African American
- p_as: Percent Asian American
- p_la: Percent Latino
- p_wh: Percent White
- p_other: Percent Other