2021-22 Educator Growth Model Technical Report

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Technical Report

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Introduction

New York Education Law §3012-d(5) requires Annual Professional Performance Reviews (APPRs), resulting in a single overall rating that incorporated multiple measures of effectiveness, which may include measures of student growth. The overall rating is determined using a matrix table that combined a Student Performance category rating and an Observation/School Visit category rating. In the 2011-12 through 2014-15 school years, State-provided growth scores were required to be used as at least one of the student performance measures for New York State (NYS) teachers of Grades 4-8 English Language Arts (ELA) and mathematics, building principals covering those grade levels, and high school principals.

In December 2015, the Board of Regents established a 4-year transition period for APPRs, during which time State-provided growth scores were provided to educators for advisory purposes only. During the 2015-16 through 2018-19 school years, educators who had previously received State-provided growth scores (i.e., Grades 4-8 ELA and mathematics teachers and principals of schools that includes Grades 4-8 or all Grades 9-12) received two sets of scores and ratings: original scores and ratings and transition scores and ratings. The State provided growth score was excluded from the scores and ratings used to calculate the transition score and rating. Only the transition score and rating were permitted to be used for purposes of employment decisions, including tenure determinations and for purposes of proceedings under Education Law §3020-a and §3020-b and teacher and principal improvement plans and the individual's employment record.

On April 12, 2019, Education Law §3012-d was amended and eliminated the original requirement to use State-provided growth scores for NYS teachers of grades 4-8 ELA and mathematics, building principals covering those grade levels, and high school principals. The amended law now requires that all teachers and principals have a student learning objective (SLO) with a minimum growth target representing at least one year of expected student growth. For more information about New York State educator evaluations, please see the Department's website.

Due to the COVID-19 pandemic, New York State did not administer 2019-20 Grades 3-8 ELA and Math Assessments, Regents Examinations, or approved Regents Alternatives in Spring 2020. In Spring 2021, an abbreviated assessment for Grades 3-8 was administered which contained the first of the original two sessions. About 40% of students participated in the assessment. Additionally, the following administrations of the Regents and approved Regents

Alternatives were canceled: August 2020; January, June, and August 2021; and January 2022.[1] In order to allow high school students to meet graduation requirements, the Board of Regents adopted regulations that granted students exemptions from taking and passing Regents examinations if they passed the course culminating in a Regents examination. These exemptions–including exemptions granted to approved Regents examinations and approved Regents alternatives–have been incorporated into the growth model for 2022.

later.

This document describes the models used to measure student growth in New York State for the 2021-22 school year. In 2021-22, as in prior years, growth models were implemented in Grades 4-8 ELA and mathematics and for principals serving students in all of Grades 9-12. All models are based on assessing each student's change in performance between 2020-21 and 2021-22 on State assessments compared with students having similar characteristics.

The Regents Task Force on Teacher and Principal Effectiveness, made up of representatives from key stakeholder groups, including educators, educator unions, educator professional organizations, and other interested parties, gave input into development of APPR regulations and the design of the current State-provided growth scores. A list of the technical advisory committee members who developed the growth model are listed in Appendix B. Revisions to the State-provided growth model were implemented during the 2021-22 school year and were developed through extensive research completed by the growth vendor.

Content and Organization of this Report

The results presented in this report are based on 2021-22 and prior school years' data, with some comparisons to prior-year results. For the technical report describing models and full results for earlier years, visit the Archived Resources of NYSED Growth Measures Toolkits website.

This technical report contains four main sections:

- **Data.** Description of student growth measures, the data used to implement the student growth model, data processing rules, and relevant issues that arose during processing
- **Model.** Description of the statistical model

[1] The USDE denied the Department's request for a waiver from administering 2021 assessments. As a result, the following Regents examinations were administered in June 2021: Algebra I, Earth Science (written test only), ELA, and Living Environment. Due to the granted exemptions from taking the examinations, only small portion of students chose to take these Regents examinations. Additionally, the US History and Government Regents examination was cancelled for the June 2022 administration.

- **Reporting.** Description of reporting metrics and computation of effectiveness scores
- **Results.** Overview of key model results aimed at providing information on model quality and characteristics

Data

To measure student growth and attribute that growth to educators, at least two sources of data are required:

1. Student test scores that can be observed across time.
2. Information describing how students are linked to schools, teachers, and courses (i.e., identifying which teachers teach which students for which tested subjects and which school[s] those students attended).

In addition, New York State models also use other information about students and schools, such as student demographics. The following sections describe the data used for model estimation in New York in more detail, including some of the issues and challenges that arose and how they were handled.

Test Scores

New York's student growth models draw on test score data from statewide testing programs in Grades 3-8 in ELA and mathematics and Grade 8 Algebra I for the growth models for teachers, schools, and principals of students in Grades 4-8 and on Regents Exam scores and State-approved Regents alternatives for schools and principals of students in Grades 9-12. In Grades 4-8, models are estimated separately by grade and subject using scores from each grade (e.g., Grade 5 mathematics) as the outcome, with predictors as described in the following section. Scores from the State's test of English language proficiency (New York State English as a Second Language Achievement Test [NYSESLAT]) also are used as predictors in the growth models. These data are described further in the section that follows on English language learner (ELL) variables.

State Tests in ELA and Mathematics (Grades 3–8) and Algebra I

The New York State tests at the elementary and middle school grade levels are given in the spring and measure a range of knowledge and skills in ELA and mathematics.

The New York Grades 4-8 growth model includes up to three prior test scores in both ELA and mathematics to predict test scores in those subjects. If the immediate prior-year test score in the same subject was missing from the immediate prior grade, the student was not included in the growth measure for that subject.

The New York Grades 4-8 and Grade 8 Algebra I growth model uses prior test scores in both ELA and mathematics to predict test scores in those subjects. If the immediate prior-year test score in the same subject was missing from the immediate prior grade, the student was not included in the growth measure for that subject. Two examples of how students would not have growth scores computed for them are:

1. Students without a prior-year test score (e.g., a 6th grade student with a valid 6th grade ELA test score in 2021-22 did not have a valid ELA test score in 2020-21); or
2. Students with a prior-year test score for the same grade as the current year test score (e.g., a 6th grade student with a valid 6th grade ELA test score in 2021-22 had a 6th grade ELA test score in 2020-21).

For the other prior scores, missing data indicators were used. These missing indicator variables allow the model to include students who do not have the maximum possible test history and mean that the model results measure outcomes for students with and without the maximum possible assessment history. This approach was taken to include as many students as possible.

Due to the Coronavirus pandemic, 2019-20 State assessments were not administered. Therefore, the 2021-22 State-provided growth model was adjusted to allow the 2017-18 assessments to be used as the third prior year assessment. Moreover, given that an immediate prior year assessment in the same subject is required to generate a student growth score (SGP), and that participation in the 2020-21 grades 3-8 State assessments was about 40 percent, fewer SGPs were generated for the 2021-22 school year. Extensive analysis confirmed that growth results remain reliable despite lower test participation.

The specific tests used as predictors vary by grade and subject and are as follows:

Table 1. Pretests for student Inclusion by Model, Grades 4-8

		Current Year Assessment				
		Grade 4	Grade 5	Grade 6	Grade 7	Grade 8/ Algebra I
Prior Years Assessment Same Subject	Grade 3	REQUIRED	2020 DATA NOT AVAILABLE	USE IF AVAILABLE	USE DUE TO MISSING DATA	
	Grade 4		REQUIRED	2020 DATA NOT AVAILABLE	USE IF AVAILABLE	USE DUE TO MISSING DATA
	Grade 5			REQUIRED	2020 DATA NOT AVAILABLE	USE IF AVAILABLE
	Grade 6				REQUIRED	2020 DATA NOT AVAILABLE
	Grade 7					REQUIRED

In addition to test scores, the New York Grades 4-8 and Grade 8 Algebra I growth model also used the conditional standard errors of measurement (CSEMs) of those test scores. All

assessments contain some amount of measurement error, and the New York Grades 4-8 growth model accounts for this error (as described in more detail in the Model section of this report). The State's test vendor provides a table of CSEMs for each year's test scores.

Regents Exams

Beginning with the 2021-22 school year, the Grades 4-8 growth model will also generate growth results for Grade 8 students who took the June 2022 Algebra I Regents examination. These growth scores are generated using the same methodology in place for the Grades 4-8 ELA and math, where grade 8 students are required to have an immediate prior-year grade 7 test score in math.

One growth measure for Grades 9-12 schools and principals is the calculation of a mean growth percentile (MGP) based on student growth on the ELA or Algebra I Regents Exam, the most common subjects, compared with those of similar students.

Because Regents Exams are offered multiple times each year and students take Regents Exams at different points in their schooling, the Grades 9-12 New York MGP model included students and test scores using the following rules:

- Students who take the ELA or Algebra I Regents Exam prior to high school are **NOT** included in the MGP of a school or principal of Grades 9-12.
- Regents Exam scores from the following administrations were counted: August (except for Grade 9 students), January, and June of the current school year.
- Student scores were used until the students passed. (Scores are not included after students pass because we do not want to incentivize additional, unnecessary test taking.)
- If a student took a Regents Exam more than once during the school year, the higher test score was used.
- Students were included for up to eight years after first entering Grade 9, to give credit to principals and schools and principals that keep students beyond four years in high school to complete graduation requirements.

Another growth measure used for Grades 9-12 schools and principals is the Comparative Growth in Regents Exams Passed (GRE) model. Because a major graduation requirement is for students to pass four required Regents Exams and one additional Regents Exam or an approved alternative (a total of eight for Advanced Regents diplomas), this measure compares how much progress a school's students are making from one year to the next toward passing up to eight Regents Exams. A principal's or school's score on this measure reflects whether or not students

exceeded the average number of Regents Exams, Exemptions[2], and Alternatives passed each year by similar students statewide. Two reasons for not including students in a Grades 9-12 school's GRE measures are (1) a student lacking Grade 6, 7, or 8 State test scores or (2) having already passed the maximum number of Regents Exams used in this measure. For the adjusted model, any grade 6-8 test in either subject may be used as a pretest, as displayed in Table 2. For the unadjusted model, students must have at least one same-subject pretest to be included in the model.

Table 2. Pretests for Student Inclusion by Model, Grades 9-12

Pretest Grade	Model					
	ELA MGP		Algebra I MGP		GRE	
	ELA Pre	Math Pre	Math Pre	ELA Pre	ELA Pre	Math Pre
Grade 8	Both	Both	Both	Both	Both	Both
Grade 7	Both	Adjusted Only	Both	Adjusted Only	Both	Both
Grade 6	Both	Adjusted Only	Both	Adjusted Only	Both	Both

As noted, Regents Exams are offered multiple times each year, and students take Regents Exams at different points in their schooling. In 2021-22, the GRE model included students and test scores using the following rules:

- Regents Exam scores from the following administrations were counted: August of prior year (2021), and January and June of current year (2022).
- Only count the first time a student passes a specific Regents Examination—including Regents exemptions—or a State-approved Regents alternative.
- Four required Regents Exams, plus a second social studies examination, and no more than three additional examinations, were counted. The scores for students who passed more than eight Regents Exams were NOT included in a principal's or school's results.
- Students must have had a valid prior score from Grade 6, 7, or 8 ELA or mathematics.
- The State's modified passing score rules for students with disabilities were used to determine passing for these students.[3]
- All students who met the minimum enrollment requirement (i.e., students who were enrolled on BEDS day and at the beginning of the June Regents administration) were

[2] Exemptions were granted to students who passed a Regents course but did not take the Regents examination due to the COVID-19-related cancellation of the Regents examinations.

[3] Modified passing score rules for students with disabilities state that students may pass the four required Regents exams with a score of 55-64. Students may also use a score of 65 or higher on one Regents Exam to compensate for a score of 45-54 on a Regents Exam other than ELA and math, unless a score of 65 or higher is to compensate for a score of 45-54 on a second math Regents exam. Students with disabilities may also graduate without passing Regents Exams based on their Superintendent's determination that they have met the academic requirements necessary to earn a Local Diploma. For the GRE model, these students do not pass any Regents exams.

included in determining a principal's or school's score whether or not they took a Regents Exam during the year.

- Students were included for up to eight years after first entering Grade 9, to acknowledge schools and principals that keep students beyond four years in high school to complete graduation requirements.
- Students who dropped out of school were counted in the school from which they dropped out until they would have reached their fourth year since entering Grade 9 or enrolled at another school, starting with those who dropped out in the 2018-19 school year.

Demographics

The results of growth models are used to measure the effects of educators on student learning gains, considering a student's prior achievement; however, some factors beyond an educator's control may impact student learning gains. For example, different learning trajectories often are statistically related to students living in poverty, beyond what would be expected based only on the student's prior achievement.

All educator growth measures used in New York State control for a student's academic history and other defined characteristics to compare similar students in the state.[4] The Board of Regents rules provide that three specific types of characteristics (ELL, disability, and poverty statuses) be included in the adjusted growth models that produce educator growth scores.

Both student and course- or school-level characteristics are included in adjusted growth measures. For instance, we account for whether a student is an English language learner, and we also account for the percentage of ELL students in a class (in Grades 4-8) or school (in Grades 9-12). This type of class- or school-level factor is intended to take peer effects into account, acknowledging that a student may have a different growth trajectory in a classroom or school with many ELL students compared with a classroom or school with few ELL students. Table 3 provides a complete list of the factors included in 2021-22, followed by additional descriptions of these variables.

Factors are the same for growth measures for teachers, schools, and principals serving students in Grades 4-8 as for schools and principals serving Grades 9-12, with a few additions or changes for the high school context (e.g., Grades 9-12 models also account for the number of Regents Exams a student had already passed). The New York State Education Department (NYSED or "the Department") reports unadjusted growth scores that include only prior achievement as predictor variables and adjusted growth scores including the list of approved predictor

[4] This comparison is done through a regression modeling approach; see the Model section of this report for details.

variables shown in Tables 1 and 2 (above). Unadjusted scores are reported for informational purposes to educators and are used for school accountability in Grades 4-8. In this report, results are shown for the adjusted model and the terms SGP (student growth percentile) and MGP (mean growth percentile) refer to adjusted versions of the measures (those that include all predictor variables) unless specifically identified as unadjusted.

Table 3. Other Variables Included in the Adjusted Model[5]

Variable[a]	Grades 4-8		Grades 9-12		
	Math	ELA	Regents ELA	Regents Algebra I	Comparative Growth in Regents Exams Passed
Additional Academic History Variables					
Retained in grade (student level)	X	X			
Mean prior score (aggregate level)[b, c]	X	X	X	X	X
Range around mean prior score (aggregate level)[b]	X	X			
New to school in non-articulation year (student level)[d]	X	X	X	X	X
Number of years since entering ninth grade (student level)[e]			X	X	See note **e**
Count of prior required Regents Exams passed (student level)			X	X	X
Students with Disabilities (SWD) Variables					
SWD status (student level)	X	X	X	X	X
SWD in gen. ed. classroom less than 40% of the time (student level)	X	X	X	X	X
Percentage of SWD (aggregate level)[c]	X	X	X	X	X
English Language Learner (ELL) Variables					
ELL status (student level)	X	X	X	X	X
Percentage of ELLs (aggregate level)[c]	X	X	X	X	X
NYSESLAT scores (student level)[f]	X	X	X	X	X

[5] Additional detail on the variables included in the adjusted model are in Appendix A.

Economically Disadvantaged (ED) Variables					
ED status (student level)	X	X	X	X	X
Percentage of ED (aggregate level)[c]	X	X	X	X	X

a: Table 3 does not display missing variable indicators.
b: For Grades 9-12 models, separate predictor variables are included for Common Core-aligned Grades 6-8 State assessments (2017-18 to present) and previous Common Core-aligned Grades 6-8 assessments (2012-13 through 2016-17).
c: Aggregate-level variables are computed at the class level for Grades 4-8 and at the school level for Grades 9-12.
d: For Grades 9-12 models, the articulation year is Grade 9. Students entering a school that serves Grades 9-12 in a year other than Grade 9 are considered "new to school."
e: GRE models are estimated separately by cohort (based on number of years since entering Grade 9) for five cohorts (1, 2, 3, 4, and 5+ years after Grade 9 entry).
f: Only scores from the Grade 7/8 form of the NYSESLAT are used in the Grades 9-12 models. Separate predictor variables are included where possible for NYSESLAT scale scores from different years because the scales have changed across time. As of 2021-22, three scales were represented: 2013-14 and earlier, 2015, and 2015-16 and later.
Note: See Appendix I for a complete list of predictor variables by grade and subject (including missing variable indicators) with model coefficients.

Attribution Data and Weighting

Student-level growth scores are attributed to educators based on records of educational links between educators and students. Several different data sources and procedures are used to (1) link students to teachers, schools, and principals, of Grades 4-8 and 9-12 and (2) determine the weighting of each student's score for teachers, as described in the sections that follow.

Attributing Students to Teachers of Grades 4-8

A critical element of growth analyses is the accurate identification of the courses students are taking in which they learn the content and skills covered on the tests used to measure their learning. Another critical element is identifying who is teaching those courses. A first step is to identify which courses are considered "relevant"—that is, courses in which instruction is provided that is aligned to the test being used to measure student growth. New York has developed a common set of course codes across the State, and these were used to identify courses as relevant for analysis. Appendix D provides a list of the item descriptions (grade and subject of relevant courses) used in analysis.[6]

[6] Beginning with the 2021-22 school year, the methodology used to link students to teachers was revised to use the following collections: Course Instructor Assignment, Student Class Entry Exit, and Student Attendance. See How Are Students Linked and Attributed on the NYSED growth measures toolkits page.

The methodology used to link students to teachers for the Grades 4-8 State-provided growth model for teachers consists of using three existing collections.

Students enrolled in relevant courses were attributed to the teacher(s) who was identified as a teacher of record for that course. Teachers' scores may reflect multiple classrooms of students in the same content area. For example, a Grade 7 mathematics teacher might provide instruction for several sections of Grade 7 mathematics. Students who were enrolled for less than 60% of a course's duration $\left(\frac{Enrollment\ Duration}{Course\ Duration} < 0.60\right)$ were not included in a teacher's MGP. Students with course enrollment of 60% or more were included in a teacher's MGP, and their SGPs were weighted based on the percentage of time the students were enrolled in and attended the course. $\left(\frac{Enrollment\ Duration}{Course\ Duration} \times \frac{Attendance\ Duration}{Enrollment\ Duration}\right)$ [7] SGPs for students who were in a teacher's course for longer periods of time and who attended the class more regularly counted more heavily in a teacher's MGP than those who were enrolled and attended for less time.

A teacher who works across schools within a district received one HEDI (Highly Effective, Effective, Developing, Ineffective) rating. However, teachers who work across districts received a separate rating for each district in which they had a sufficient number of student scores. For this purpose, New York City is treated as a single district.

Table 4 shows the attribution of students with at least two years of valid same-subject test results. Attribution means that a student is linked to that teacher and included in the calculation of that teacher's MGP. Note that students can have test scores in ELA, mathematics, and Algebra I, so the count of students with valid test data does not represent unique students, but rather student test scores. Note also that the attribution rate is not expected to be 100% because students may move within and across schools and teacher assignments also may change. Appendix C provides an overview of data processing for Grades 4-8 models, and Appendix G provides an overview of data processing for Grades 9-12 models.

[7] The course duration is calculated using teacher course linkages.[8] Details can be found in the *2018-19 Growth Model for Educator Evaluation Technical Report*, which is available on the NYSED growth measures toolkits page.

Table 4. Grades 4-8 Teacher-Student Attribution Rates

Grade	Valid Student Records	Valid Student Records Attributed to at Least One Teacher	Attribution Rate
4	170,662	157,740	92%
5	168,306	156,209	93%
6	155,258	144,029	93%
7	141,776	130,981	92%
8	135,052	123,186	91%
Total	771,054	712,144	92%

Note: Student records are considered valid for the purposes of growth modeling when there are at least two years of valid assessment scores. Students can have as many as two valid records per year, one for ELA and one for mathematics.

In 2021-22, 92% of the 771,054 valid student records were linked to at least one teacher. In 2018-19, 89% of the 1,452,784 valid student records were attributed teachers. The attribution rate for 2021-22 is slightly higher in 2021-22, because the 2020-21 participation rate was 40 percent, which reduced the number of students included in the 2021-22 growth model.[8] Also note that students who took Regents Algebra I in Grade 8 now receive SGPs and can be attributed to students, representing a change from prior years.

Attributing Students to Schools of Grades 4-8

Students were attributed to schools and districts based on a continuous enrollment indicator found in the assessment score files. This variable describes whether a student was enrolled at the start and end of the year in a school or district (on BEDS day and at the beginning of the State test administration in the spring). Students who met this criterion were included in school-level MGPs. The same continuous enrollment indicator is used for institutional accountability purposes. Note that student results were not weighted by attendance in determining a school MGP and growth score. The policy rationale for not using attendance weighting for schools (although it is used for teachers) is that school leaders may have more influence on student attendance, and on the integrity of attendance data, than do teachers.

Because of the difference in data sources and indicators used to attribute students to teachers and schools, students can be linked to a school but not a teacher and, in rare cases, vice versa. Table 5 shows attribution rates for schools.

[8] Details can be found in the *2018-19 Growth Model for Educator Evaluation Technical Report*, which is available on the NYSED growth measures toolkits page.

Table 5. Grades 4-8 School-Student Attribution Rates

Grade	Valid Student Records	Valid Student Records Attributed to at Least One School	Attribution Rate
4	170,662	167,210	98%
5	168,306	164,933	98%
6	155,258	151,972	98%
7	141,776	139,002	98%
8	135,052	127,877	95%
Total	771,054	750,994	97%

Note: Student records are considered valid for the purposes of growth modeling when there are at least two consecutive years of valid assessment scores. Students can have as many as two valid records per year, one for ELA and one for mathematics.

The attribution rate at the school level in 2021-22 (97%) was one point lower than the attribution rate in 2018-19 (98%).[9] As with teacher attribution, note that Grade 8 Algebra I is included.

Attributing Students to Principals of Grades 4-8

New York's growth models make use of district-reported staff assignment data in growth model reporting. The use of this staff assignment data allows results to be reported for individual principals for the grade levels to which they are assigned or across multiple schools for which a principal was responsible. Students were attributed to principals based on the school-level continuous enrollment indicator found in the assessment score files (see previous section for more information on this variable). Students at each grade level in a school who met the continuous enrollment requirement were attributed to a principal if that principal was assigned to that grade level in the staff assignment file. As with schools, note that student results were not weighted by attendance in determining a principal MGP.

[9] Details can be found in the *2018-19 Growth Model for Educator Evaluation Technical Report*, which is available on the NYSED growth measures toolkits page.

Table 6. Grades 4-8 Principal-Student Attribution Rates

Grade	Valid Student Records	Valid Student Records Attributed to at Least One Principal	Attribution Rate
4	170,662	154,868	91%
5	168,306	152,255	90%
6	155,258	138,726	89%
7	141,776	125,661	89%
8	135,052	115,205	85%
Total	771,054	686,715	89%

Note: Student records are considered valid for the purposes of growth modeling when there are at least two consecutive years of valid assessment scores. Students can have as many as two valid records per year, one for ELA and one for mathematics.

The attribution rate at the principal level in 2021-22 (89%) was six percentage points lower than in 2018-19 (95%). As with schools, fewer student records overall were attributed to principals in 2021-22 than in 2018-19.[10]

Attributing Students to Schools and Principals of Grades 9-12

Students in Grades 9-12 were linked to schools and principals based on a continuous enrollment indicator created from a school enrollment file. Using school entry and exit dates, the indicator describes whether or not a student was enrolled at the start and end of the year in a school or district (on BEDS day and at the beginning of June Regents Exam administration). Students who were enrolled in a given school at these two points in time were attributed to that school and to any principals assigned to all of Grades 9-12 at that school (based on the staff assignment file). These rules are similar to those used for schools and principals of Grades 4-8, although the sources of data used to implement the rule are somewhat different.[11] Note also that scores are reported only for schools serving all of Grades 9-12.

Tables 7 and 8 show school and principal attribution rates for both the MGP and the GRE models, respectively. For the MGP models (based on ELA and Algebra I Regents Exams), students are included in the model if they had a current year score, had at least one valid Grade 6, 7, or 8 assessment in the same subject (ELA for ELA and mathematics for Algebra I), and had not passed that Regents Exam in a prior year. For the GRE model, students are included in the model when they had at least one valid Grade 6, 7, or 8 assessment in either

[10] Details can be found in the *2018-19 Growth Model for Educator Evaluation Technical Report*, which is available on the NYSED Growth Measures Toolkits page.
[11] For Grades 4-8, NYSED provided an indicator (the school _in flag) of student enrollment/attribution for schools. For Grades 9-12, Education Analytics calculated a similar variable directly from the enrollment file.

subject; were enrolled in Grades 9-12 for 1-8 years; had not passed eight Regents Exams, Exemptions, or Alternatives as of the end of the prior year; and were attributed to at least one school.[12]

Table 7. Grades 9-12 School-Student Attribution Rates

Model	Students Included in Analysis	Students Included in Analysis Attributed to Schools	Attribution Rate
ELA	128,553	121,080	94%
Algebra I	95,992	89,181	93%
GRE	506,497	506,497	100%
Total	731,042	716,758	98%

Table 8. Grades 9-12 Principal-Student Attribution Rates

Model	Students Included in Analysis	Students Included in Analysis Attributed to Principals	Attribution Rate
ELA	128,553	106,965	83%
Algebra I	95,992	78,006	81%
GRE	506,497	445,748	88%
Total	731,042	630,719	86%

Model

Two different types of models were used to produce growth measures in New York State. The first is the MGP model, which was implemented for Grades 4-8 using State assessments in ELA and mathematics and for Grades 9-12 using Regents Exams in ELA and Algebra I. To produce scores describing how well students are progressing toward passing graduation requirements, a second model was implemented for Grades 9-12. This model is referred to as the Growth in Regents, or GRE, model. These two models are described in detail in the sections that follow.

Mean Growth Percentile (MGP) Model

This section describes the statistical model used to measure student growth in New York between two points in time on a single subject of a State assessment. The section begins with a description of the statistical model used to form the comparison point against which students are measured—based on similar students—and then describes how SGPs are derived from the comparison point. In addition, this section describes how MGPs and all variance estimates are produced.

[12] Schools need to meet the following criteria to not be a transfer or portfolio or non-public school.

At the core of the New York State growth model is the production of an SGP. This statistic characterizes the student's current year score relative to other students with similar measured characteristics and prior test score histories. For example, an SGP equal to 75 denotes that the student's current year score is the same as or better than 75% of the students in the State with prior test score histories and other measured characteristics that are similar. It does **NOT** mean that the student's growth is better than that of 75% of all other students in the population.

One common approach to estimating SGPs is to use a quantile regression model (Betebenner, 2009). This approach models the current year score as a function of prior test scores and finds the SGP by comparing the current year score to the predicted values at various quantiles of the conditional distribution.

The methods described here do not rely on the quantile regression method for two reasons. First, the typical implementation of the quantile regression makes no correction for measurement variance in the predictor variables or the outcome variable. Ignoring the measurement variance in the predictor variables yields bias in the model coefficients (e.g., Wei and Carroll, 2009). Further complicating the issue, the measurement variance in the outcome variable also adds to the bias in a quantile regression (Hausman, 2001), an issue that does not occur with linear regression.

The model implemented for New York State is a linear regression model designed to account for measurement variance in the predictor variables, as well as the outcome variable, to yield unbiased estimates of the model coefficients. Subsequently, these model coefficients are used to form a predicted score, which is ultimately the basis for the SGP. Because the prediction is based on the observed score, it is necessary to account for measurement variance in the prediction as well. Hence, the model accounts for measurement variance in two steps: first in the model estimation and second in forming the prediction. The next section describes this model in detail.

Covariate Adjustment Model

The statistical model implemented as the MGP model is typically referred to as a *covariate adjustment model* (McCaffrey, Lockwood, Koretz, and Hamilton, 2004), as the current year observed score is conditioned on prior levels of student achievement as well as other possible covariates.

In its most general form, the model can be represented as follows:

$$y_{ti} = X_i\beta + \sum_{r=1}^{L} Y_{t-r,i}\gamma_{t-r} + e_i$$

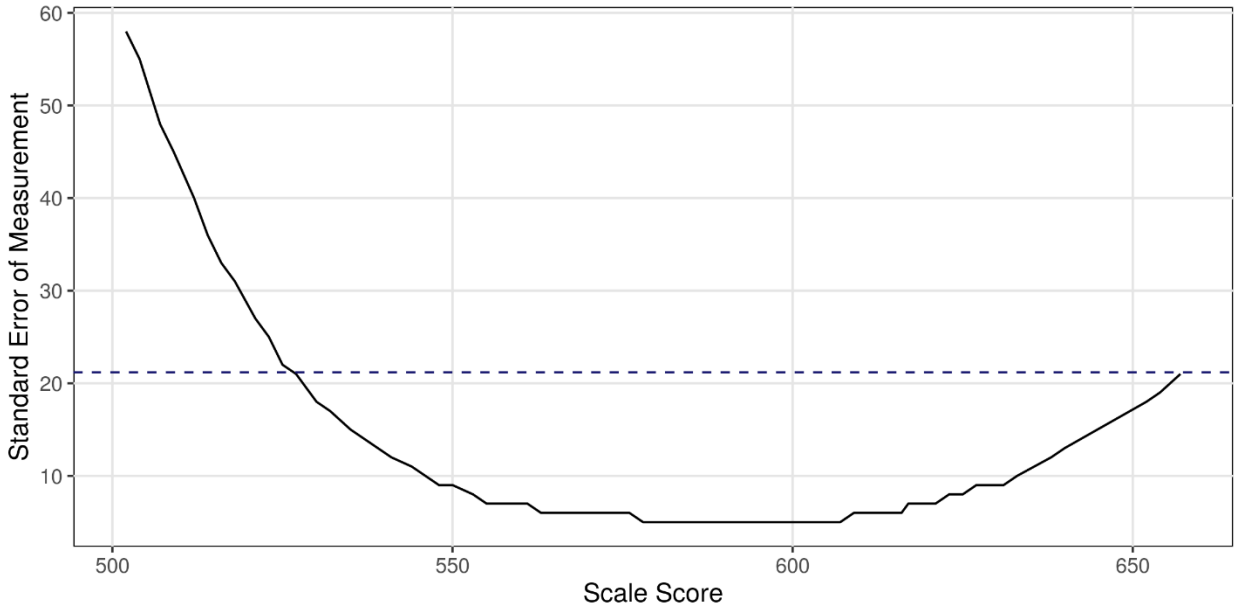
where y_{ti} is the observed score at time t for student i, X_i is the model matrix for the student- and school-level demographic variables, β is a vector of coefficients capturing the effect of any demographics included in the model, $\gamma_{t-r,i}$ is the observed lag score at time $t-r(r \in \{1,2,\dots,L\}$, and γ is the coefficient vector capturing the effects of lagged scores.

Accounting for Measurement Variance in the Predictor Variables

All test scores are measured with variance, and the magnitude of the variance varies across the range of test scores (heteroscedastic). The standard errors (variances) of measurement are referred to as *conditional standard errors of measurement* (CSEMs) because the variance of a score is heteroscedastic and depends on the score itself. Figure 1 shows a sample from the Grade 8 ELA test in New York and demonstrates the U-shaped nature of the CSEMs whereby error is higher at the extremes of the score distribution.

Due to the abbreviated test administered in 2020-21, the CSEMs reported by the test vendor were atypical. As such, the CSEMs were capped at a reasonable value which is the standard deviation of the 2020-21 test. All pretest and post-test CSEMs were capped in order to maintain consistency.

Figure 1 Conditional Standard Error of Measurement Plot (Grade 8 ELA, 2021-22)



Treating the observed scores as if they were the true scores introduces a bias in the regression, and this bias cannot be ignored within the context of a high-stakes accountability system (Greene, 2003). In test theory, the observed score is described as the sum of a true score plus

an independent variance component, $\mathrm{X} = \mathrm{X}^{*} + \mathrm{U}$, where U is a matrix of unobserved disturbances with the same dimensions as X.

Our estimator accounting for the error in the predictor variables is derived in a manner similar to that of Goldstein (1995). The estimator and a complete theoretical derivation are provided in Appendix E.

Specification for MGP Model for Grades 4-8 and Grades 9-12

The preceding section provides details on the general modeling approach and specifically how measurement variance is accounted for in the model. The exact specification for the New York Grades 4-8 model in 2021-22 is described as follows:

$$y_{gi} = \mu + \sum_{l=1}^{K} \beta_l y_{g-r,i} + \sum_{s=1}^{M} \tau_s m_{si} + \sum_{q=1}^{J} \gamma_q x_{qi} + \varepsilon_i$$

where y_{gi} is the current year test scale score for student i in grade g, μ is the intercept, β_l is the set of coefficients associated with the three prior test scores, τ_s is the set of coefficients associated with the missing variable indicators, γ_q is the set of coefficients associated with the student-level measured characteristics (which are described in Appendix A), and ε_i is the student residual.

For the MGP model used for Grades 9-12, scale scores from assessments taken before Grade 9 were used as predictors (not prior Regents Exam scores themselves, although the number of Regents Exams passed prior to the outcome year was used as a predictor). The form of the model is the same as shown previously, where y_{gi} is the Regents Exam scale score for student i in subject s, μ is the intercept, β_l is the set of coefficients associated with the Grades 6, 7, and 8 test scores and is estimated with an error-in-variables (EiV) approach[13], τ_s is the set of coefficients associated with the missing variable indicators, γ_q is the set of coefficients associated with the student-level measured characteristics (which are described in Appendix A), and ε_i is the student residual.

MGP models were implemented separately for each grade and subject. Two models were estimated. The "adjusted" model is the model as described previously. The "unadjusted" model is a special case of the adjusted model that does not contain any variables (such as the ELL status) except prior test scores and missing indicators for the two- and three-year-prior scores.

[13] EiV regression is a method to estimate consistent coefficients when variables are measured with error, such as assessment scores. EiV regression allows us to acknowledge and account for that error when estimating value added for teachers.

In all models, special procedures are used to adjust standard errors of measurement. These procedures are described in Appendix F.

Student Growth Percentiles

The previously described regression models yield unbiased estimates of the coefficients by accounting for the measurement error in observed scores. The resulting estimates are then used to form a student-level student growth percentile (SGP) statistic. For purposes of the growth model, a predicted value and its variance for each student are required to compute the SGPs as follows:

$$SGP_i = \Phi\left(\frac{y_i - \hat{y}_i}{\sqrt{\sigma^2_{yf,i}}}\right)$$

where y_i is the observed value of the outcome variable and $\hat{y}_i = w'^{\hat{\delta}}$ where w′ is the ιth row of the model matrix W, and the notation $\sigma^2_{y,f,i}$ is used to mean the variance of the predicted value of y for the ιth student.

Here, the regression is of the form

$$y = W\delta + \epsilon$$

where

$$\in \sim N(0, \sigma_e^2$$

For this case, the classic variance of a predictor is

$$\sigma^2_{yf,i} = [1 + w_i'(W'W)^{-1}w_i]\hat{\sigma}_e^2$$

where $\hat{\sigma}_e^2$ is the variance of the predictor. However, in this case, we make two refinements to acknowledge the effect of measurement error on the residual variance. The first is to use the actual variance on y_i, called σ^2_{yi}, rather than the population variance on y_i, called $\bar{\sigma}^2_{yi}$, which is already included in $\hat{\sigma}_e^2$. This is done by subtracting the population variance and adding back the individual variance. Thus, the variance on the predictor becomes

$$\sigma^2_{yf,i} = [1 + w_i'(W'W)^{-1}w_i]\left[\sigma_e^2 + \bar{\sigma}^2_{yi}\right] +$$

The second refinement is to replace the population variance in w_i, called $\sum$-, with the individual variance in w_i, called $\sum_i$. This replacement is done in the same way as with the variance in y_i, so the variance estimate is now

$$\sigma^2_{yf,i} = [1 + w_i'(W'W)^{-1}w_i]\left[\sigma_e^2 - \bar{\sigma}^2_{yi} - \delta'^{\bar{\Sigma}}\delta\right] + \sigma^2_{yi} + \delta'^{\Sigma_i}\delta$$

A predicted value for each student is used to compute the SGP. However, that prediction is based on the estimates of the fixed effects that were corrected for measurement variance but based on the observed score in the vector w.

Figure 2 illustrates how the SGPs are found from the previously described approach. The illustration considers only a single predictor variable, although the concept can be generalized to multiple predictor variables, as presented earlier. For each student, we find a predicted value conditional on his or her observed prior scores and the model coefficients. To illustrate the concept, assume we find the prediction and its variance but do not account for the measurement variance in the observed scores used to form that prediction. We would form a conditional distribution around the predicted value and find the portion of the normal distribution that falls below the student's observed score. This is equivalent to

$$SGP_i = \int_{-\infty}^{yi} f(x)dx$$

with $f(x) \sim N(\hat{y}_i, \sigma^2_{yfi})$, although this is readily accomplished using the cumulative normal distribution function, $\phi(\cdot)$.

Figure 2. Sample Growth Percentile from Model

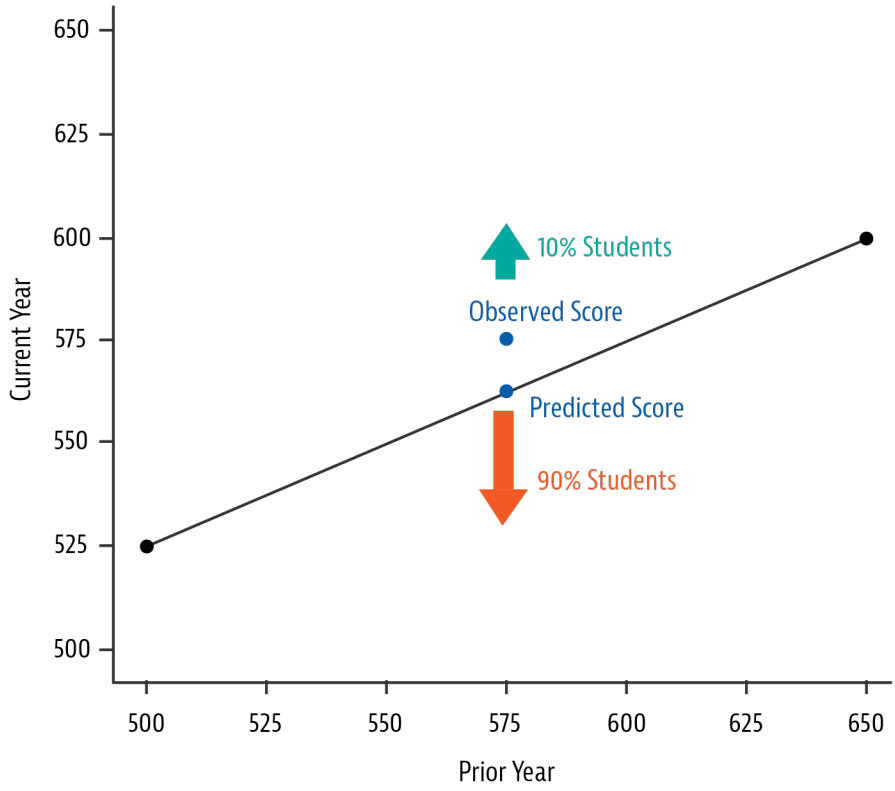
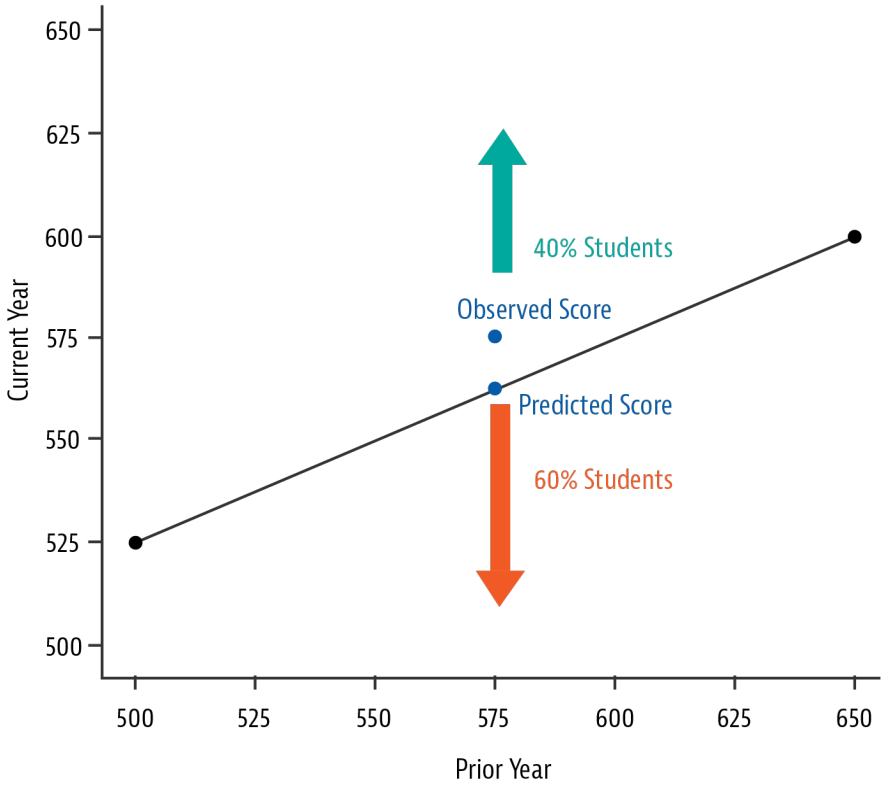


Figure 3 illustrates the same hypothetical student shown in Figure 2. Note that the observed score and predicted value are exactly the same. However, the prediction variance is larger than in Figure 2. As a result, when we integrate over the normal from $-\infty$ to y_i, the SGP is 60, not 90 as in the previous example. This difference occurs because the conditional density curve has become more spread out, reflecting less precision in the prediction.

Figure 3. Sample Growth Percentile from Model



Mean Growth Percentiles

Once SGPs are estimated for each student, group-level (e.g., teacher-level) statistics can be formed that characterize the typical performance of students within a group. New York's growth model Technical Advisory Committee recommended using a mean SGP for educator scores. Hence, group-level statistics are expressed as the mean SGP within a group. This statistic is referred to as the *MGP*.

For each aggregate unit j ($j \in \{1,2, \dots, J\}$), such as a class or course, the statistic of interest is a summary measure of growth for students within this group. Within group j, there are $\{SGP_{j(1)}, SGP_{j(2)}, \dots, SGP_{j(N)}\}$. That is, there is an observed SGP for each student within group j.

Then the MGP for unit j is produced as the simple mean

$$\theta_j = mean\left(SGP_{j(i)}\right)$$

for Grades 4-8 and Grades 9-12 schools and principals, and as the weighted mean for Grades 4-8 teachers,

$$\theta_j = \frac{1}{\sum w_{j(i)}} \sum w_{j(i)} SGP_{j(i)}$$

where $w_{j(i)}$ is a weight for student i in teacher j's class or course based on the student's enrollment and attendance.

As with all statistics, the MGP is an estimate, and it has a variance term. The following measures of variance are produced for the MGP.

The analytic standard error of the unweighted MGP (schools and principals) is computed within unit j as

$$se\left(\theta_j\right) = \frac{sd\left(SGP_{ij}\right)}{\sqrt{N_j}}$$

and in the weighted case (teachers) as

$$se\left(\theta_j\right) = \frac{sd\left(SGP_{ij}\right)}{\sqrt{\frac{\left(\sum w_s\right)^2}{\sum w_s^2}}}$$

where $sd\left(SGP_{ij}\right)$ is the sample standard deviation of the SGPs in group j, and N_j is the number of students in group j.

Combining Student Growth Percentiles across Grades and Subjects

Many teachers, schools, and principals serve students from different grades with results from different tested subjects. For evaluation purposes, there is a need to aggregate these SGPs and form summary measures.

Because the SGPs are expressed as percentiles, they are free from scale-specific inferences and can be combined. For any aggregate-level statistics to be provided (in this case, MGPs), all SGPs of relevant students are pooled and the average of the pooled SGPs is found. In the case of Grades 4-8 teachers, the average is a weighted average, as described earlier. Variances of these MGPs are found using the same methods described previously. More detail on reported scores can be found in the Reporting section.

Comparative Growth in Regents Exams Passed

For the GRE model, the outcome of interest is the number of Regents Exams that a student passes for the first time in the outcome or current year (in this case, 2021-22). Educators whose students pass more Regents Exams in a year than similar students will have higher scores on this metric than those of other educators. For this model, Regents Exams in the four required subjects, plus a second social studies examination, and up to three additional Regents Exams (for a total possible of eight Regents Exams for each student) were counted as outcomes. Once a student had passed eight Regents Exams, he or she was excluded from the model.

Because the outcome can take on only positive integer values and is bounded by a minimum (a student can never pass fewer than zero Regents Exams in a year) and a maximum (a student can never have more than eight Regents Exams passed in a year), an ordered logit model is implemented. The model is fit separately for each cohort of students (students who entered ninth grade 1 year ago, 2 years ago, and so on) for Years 1, 2, 3, and 4. Students who entered Grade 9 more than 4 years ago are aggregated into a single fifth run. The linear part of the model is

$$\eta_i = X_i\beta^c$$

where X includes the variables named in the definition of similar students as well as an intercept term, η is the latent variable that dictates the number of Regents Exams a student passes, β is the fitted parameters for the variables in X, the superscript c is used to indicate that the β coefficients depend on the cohort, and the subscript i is used to indicate that η and X are specific to an individual student.

From this, the logistic function and a series of cut points are used to map η to the outcome space, generating an estimated fraction of the time that zero through eight Regents Exams were passed by similar students. The fraction of similar students passing a particular number of Regents Exams is then given by

$$Pr(\delta_i = k|X_i\beta^c) = \frac{1}{1 + exp(-\lambda_{k+1} + X_i\beta^g)} - \frac{1}{1 + exp(-\lambda_k + X_i\beta^g)}$$

where δ is the number of Regents Exams passed this year, and the λ_k are fitted cut points[14] between having passed $k-1$ and k Regents Exams.

This set of nine values is then collapsed into the average number of Regents Exams similar students passed this year using

[14] These sometimes are called intercepts.

$$\hat{y}_t = \sum_{k=0}^{8} \Pr(\delta_i = k|X_i\beta^c) \cdot min(8 - N_{i,yy-1,k})$$

where $\hat{y}$ is the estimated number of Regents Exams passed by similar students, and $N_{i,yy-1}$is the number of Regents Exams passed at the initiation of this school year. In the previous equation, the first term represents the probability of a similar student having passed k Regents Exams this year, and the second term often multiplies that probability by k. A $\min$ function also is included in the second term that imposes a ceiling on the number of Regents Exams passed this year, acknowledging that the total number passed this year plus the number that had been passed at the beginning of this year ($N_{i,yy-1}$) cannot exceed eight.

Finally, values of $\hat{y}$ that are larger than two are set to two because to meet a projection larger than two Regents Exams per year, students would have to complete the eight Regents Exams counted in this model on a schedule faster than eight Regents Exams in 4 years. Because NYSED did not wish to encourage unnecessary Regents Exam taking, this cap on projected Regents Exams was applied.

Using this approach, each student has an actual number of Regents Exams that he or she passed (y_i), and a number passed by similar students ($\hat{y}_i$); the latter is subtracted from the former to find a student-level GRE:

$$GRE_i = y_i - \hat{y}_i$$

A principal's or school's score is then the mean GRE (or MGRE) for students attributed to that school or principal:

$$MGRE = \frac{1}{n}\sum_{i=1}^{n} GRE_i$$

The standard error is found by taking the sample standard deviation of the students GREs. Thus, the variance estimate is

$$Var(MGRE) = \frac{1}{(n-1)n}\sum_{i=1}^{n}[GRE - MGRE]^2$$

and the standard error is the square root of that quantity. Confidence intervals are formed from the variances and point estimates in the same way they were for MGPs.

Reporting

Results of the New York growth models are reported to districts in a series of data files.

Reporting for Teachers, Schools, and principals of Grades 4-8

The main reporting metrics generated for teachers, schools, and principals of Grades 4-8 were as follows:

- **Number of Student Scores.** The number of SGPs included in an MGP.
- **Unadjusted MGP (Principal or School).** The mean of the SGPs for students attributed to the principal or school based on similar prior achievement scores only, without taking into consideration ELL, disability, economic disadvantage, or other student characteristics.
- **Unadjusted MGP (Teacher).** The weighted mean of the SGPs for students who are linked to a teacher based on similar prior achievement scores only, without taking into consideration ELL, disability, economic disadvantage, or other student characteristics. The weighted mean was calculated based on the amount of time students were enrolled in and attended a course with a teacher.
- **Adjusted MGP (Principal or School).** The mean of the SGPs for students attributed to the principal or school, based on similar prior achievement scores, *including* consideration of ELL, disability, economic disadvantage, and other student characteristics. This MGP is used to determine a principal's or school's State-provided growth score and growth rating.
- **Adjusted MGP (Teacher).** Adjusted MGP is the weighted mean of the SGPs for students linked to a teacher, based on similar prior achievement scores, *including* consideration of ELL, disability, economic disadvantage, and other student characteristics. This MGP is used to determine a teacher's State-provided growth score and growth rating.
- **Lower Limit and Upper Limit. Lowest and** highest possible MGP for a 95% confidence range.
- **Growth Rating.** Growth rating describes the educator's HEDI rating on the State provided growth subcomponent.
- **Growth Score.** A growth score of 0-20 points is assigned to each educator based on his or her overall MGP within each growth rating category using the scoring bands for implementation of Education Law §3012-d.

MGPs disaggregated by grade and subject also are provided. Districts also are provided with student roster files. These files show which students were included in a teacher's MGP along with information about each student, such as whether the student has a disability or is identified as an ELL.

Reporting for Grades 9-12

The main reporting metrics generated for schools and principals of Grades 9-12 are as follows:

- **Number of Student Scores (for MGP Measure) or Students (for GRE Measure).** These numbers refer to the SGPs included in an MGP or the number of students included in the GRE score.
- **Unadjusted Measure.** This measure is based on student growth and accounts for prior achievement scores *only,* without taking into consideration ELL, disability, economic disadvantage, or other student characteristics.
- **Adjusted Measure.** This measure is based on student growth and is adjusted for prior achievement scores and ELL, disability, economic disadvantage, and other characteristics at the student and school levels.
- **Lower Limit and Upper Limit. Lowest and** highest possible measure (MGP or GRE) score for a 95% confidence range.
- **Growth Rating.** Growth rating describes the educator's performance category (HEDI) for each individual measure (MGP or GRE) and overall for Grades 9-12. The overall growth rating is used in a principal's or school's evaluation on the State-provided growth subcomponent.
- **Growth Score.** A growth score of 0-20 points is assigned to each principal and school (for each MGP or GRE measure and overall) within each growth rating category using the scoring bands for implementation of Education Law §3012-d.

As with Grades 4-8 measures, districts also are provided with student-level files that show which students were included in the growth measures, along with information about each student.

Minimum Sample Sizes for Reporting

Minimum sample size requirements for reporting MGPs and growth ratings were determined to balance statistical reliability and availability of educator growth scores. On one hand, setting no (or a low) minimum sample size will result in the greatest number of educators receiving information; on the other hand, the quality of the information they receive may be reduced. A minimum threshold of 16 student scores for the MGP measure or 16 students for the GRE measure was implemented. Educator scores on any measure at any level based on fewer than 16 student scores (or 16 students for the GRE measure) were not reported.

After applying this rule, the rate of teachers, schools, and principals with reported results is shown for Grades 4-8 in Table 9 and for Grades 9-12 in Table 10. The percentage of teachers, schools, and principals receiving results in 2018-19 compared to 2021-22 are summarized

below. There was a large decrease in the number of teachers who met sample size requirements due to the availability of 2020-21 pretests. This decrease is smaller for 4-8 schools and principals because more students are attributed to them. The impact of the 2021 pretest did not impact the grades 9-12 models.

Table 9. Grades 4-8 Reporting Rates

Reporting Level	Number With At Least One Student Attributed	Number Meeting the Minimum Sample Size Requirement	Percentage Meeting the Minimum Sample Size Requirement
Teachers	43,776	23,909	55%
Principals	3,449	3,209	93%
Schools	3,770	3,402	90%

Table 10. Grades 9-12 Reporting Rates

Reporting Level	Number With At Least One Student Attributed	Number Meeting the Minimum Sample Size Requirement	Percentage Meeting the Minimum Sample Size Requirement
Principals	1,309	1,262	96%
Schools	1,503	1,345	89%

Table 11. Grades 4-8 and 9-12 Reporting Rates for 2018-19 and 2021-21

Grade Range	Reporting Level	Reporting Rates	
		2018-19	2021-22
4-8	Teacher	79%	55%
	Principal	98%	93%
	School	95%	90%
9-12	Principal	96%	96%
	School	90%	89%

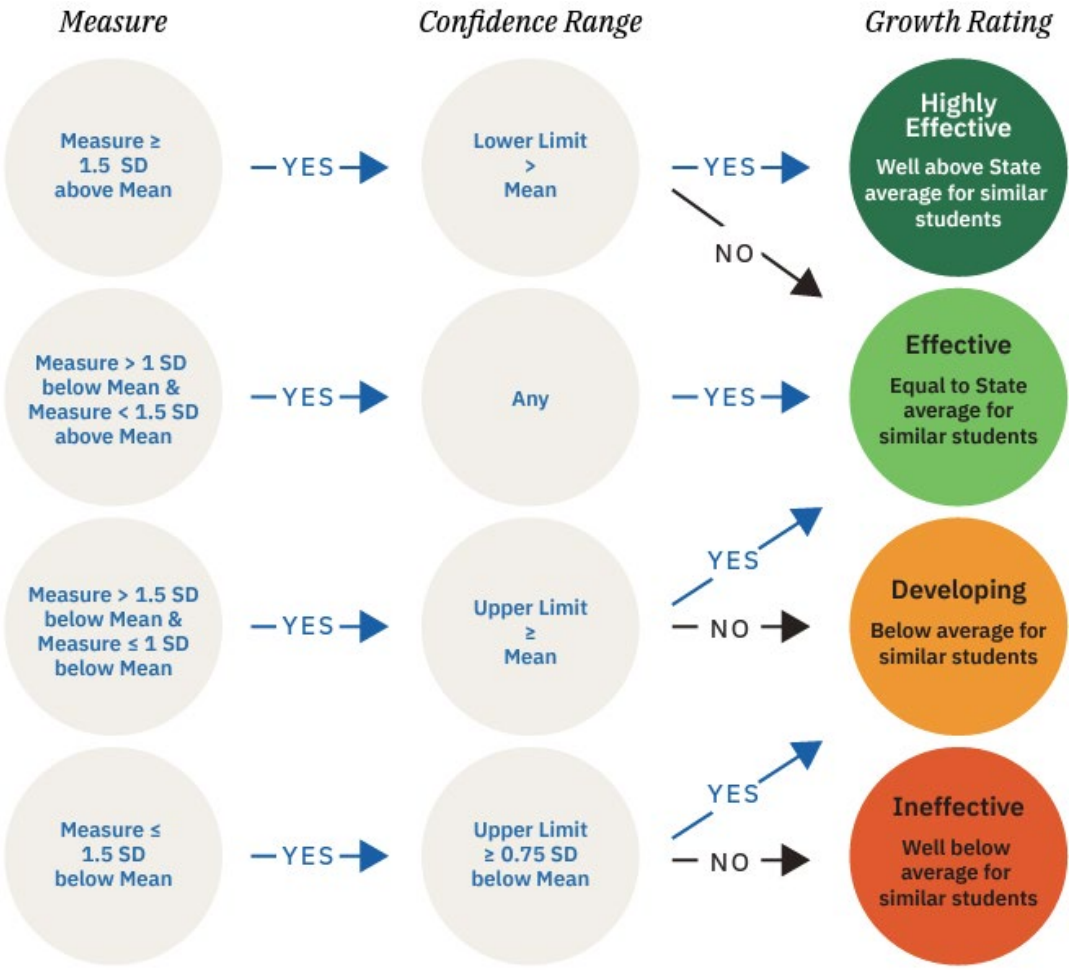
Performance Categories

To determine an educator's growth rating (HEDI category) and growth points (0-20), NYSED has developed a set of general rules that describe how similar or different a score on each measure is from the State average. The general rules used to obtain growth ratings are shown in Figure 4. Specific values used to determine growth ratings are shown in Appendix H.

Within each growth rating category, points are then assigned so that educators are approximately uniformly distributed at each HEDI point value (with higher MGPs or GRE results earning more points than lower MGPs or GRE results in that category). Growth scores are

assigned using the scoring bands for implementation of Education Law §3012-d. Additional detail about the assignment of HEDI point values also can be found in Appendix H.

Figure 4. Determining Growth Ratings



Values are rounded to the nearest 0.5 for MGP for schools and principals, to the nearest whole number for teachers, and to the 0.01 level for GRE measures for schools and principals.

For teachers, schools, and principals of Grades 4-8, the overall adjusted MGP (i.e., the MGP that combines information across all applicable grade levels and subjects) and upper and lower limit MGPs were used to determine growth ratings. To determine the growth rating for a principal or school of Grades 9-12, a growth rating and score for both types of metrics—the MGP measure and the GRE measure—is first found using the process shown in Figure 4.

Growth scores for each Grades 9-12 measure are then averaged together and weighted by the number of students in each measure to find an overall Grades 9-12 growth rating and score.

To determine a final State-provided growth subcomponent rating for schools and principals that serve Grades 4-8 as well as Grades 9-12, growth ratings and scores for Grades 4-8 and Grades 9-12 are computed separately and then combined. The Grades 4-8 growth rating is determined using the process shown in Figure 4, and an overall Grades 9-12 growth rating and score is determined as described previously. An overall growth subcomponent rating that includes results for both Grades 4-8 and Grades 9-12 is then computed by averaging Grades 4-8 and Grades 9-12 growth scores by the number of students in each measure and finding the final rating.

Additional details can be found in the resources for educators on the NYSED Growth Measures Toolkits page and in Appendix H.

Results

Results from Growth Models for Grades 4-8

This section provides an overview of the results of 2021-22 growth model estimation. Some comparisons to earlier year growth model results also are included. A pseudo *R*-squared statistic and summary statistics characterizing the SGPs, MGPs, and their precision provide an overview of model fit.

This section focuses on teacher-level and school-level results; additional information on principal-level results is in Appendix J.

Model Fit Statistics for Grades 4-8

The *R*-square value is a statistic commonly used to describe the goodness-of-fit for a regression model. Because the model implemented here is an EiV model, not least squares regression, we refer to this as a *pseudo R*-square. (See page 27 for more information on the EiV model.) Table 12 presents the pseudo *R*-square values for each grade and subject, computed as the squared correlation between the fitted values and the outcome variable.

Table 12. Grades 4-8 Pseudo R-Squared Values by Grade and Subject

Subject	Grade	Unadjusted Model	Adjusted Model
ELA	4	0.54	0.52
	5	0.52	0.49
	6	0.62	0.60
	7	0.63	0.60
	8	0.62	0.59
Mathematics	4	0.60	0.57
	5	0.60	0.58
	6	0.68	0.66
	7	0.67	0.65
	8	0.60	0.56
Algebra I	8	0.65	0.56

Student Growth Percentiles for Grades 4-8

SGPs describe a student's current year score relative to those of other students in the data with similar prior academic histories and other measured characteristics. A student's SGP should not be expected to be higher or lower based on his or her prior-year score. Table 13 shows the correlation between the prior-year scale score and SGP for each grade and subject. These correlations are usually negative as a result of using the EiV approach to account for measurement variance in the prior-year scale score; the correlation need not be zero. Squaring these values gives the percentage of variation in SGPs explained by prior-year scores for any grade and subject. Although prior-year test scores are generally good predictors of current year test scores, the prior-year test score is a poor predictor of current year SGPs. Based on data from Table 13, prior-year test scores explain about 5% to 20% of the variation in Adjusted SGPs. This is higher than in past years and is likely a side effect of lower pretest reliabilities in 2020-21, which will magnify the effect attributed above to EiV. Because SGPs are intended to allow students to show low or high growth no matter their prior performance, this result is as expected.

Table 13. Grades 4-8 Correlation Between Adjusted SGP and Prior-Year Scale Score

Grade	ELA	Mathematics
4	-0.346	-0.337
5	-0.450	-0.330
6	-0.244	-0.241
7	-0.244	-0.316
8	-0.291	-0.266

Mean Growth Percentiles for Grades 4-8

As described earlier in this report, teachers' MGPs are aggregate educator-level statistics, computed as the weighted mean of SGPs for all students associated with a teacher or as the mean for principals or schools. In this section, we provide descriptive statistics on overall (combined) MGPs.

For teachers with results for students in both ELA and mathematics, the combined MGP is an average of SGPs for both subjects. For teachers who provide instruction in only one subject, their overall (combined) MGP is the same as their subject-specific MGP.

Figure 5 is a histogram of the teacher MGPs in ELA and mathematics for the adjusted model (including demographics). In all grades, the results are approximately normally distributed.

Figure 5. Grades 4-8 Distribution of Teacher MGPs by Grade: ELA and Mathematics

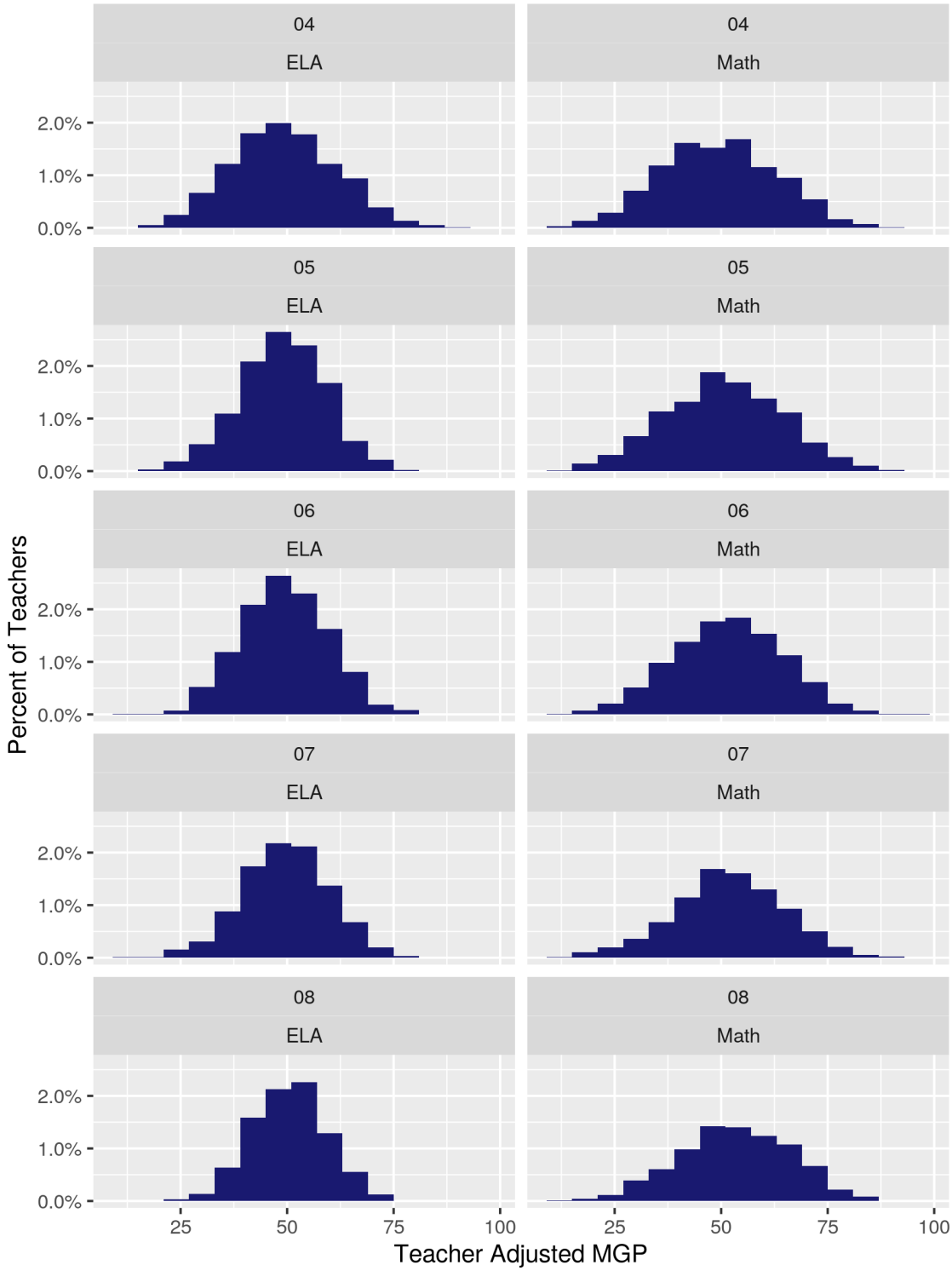
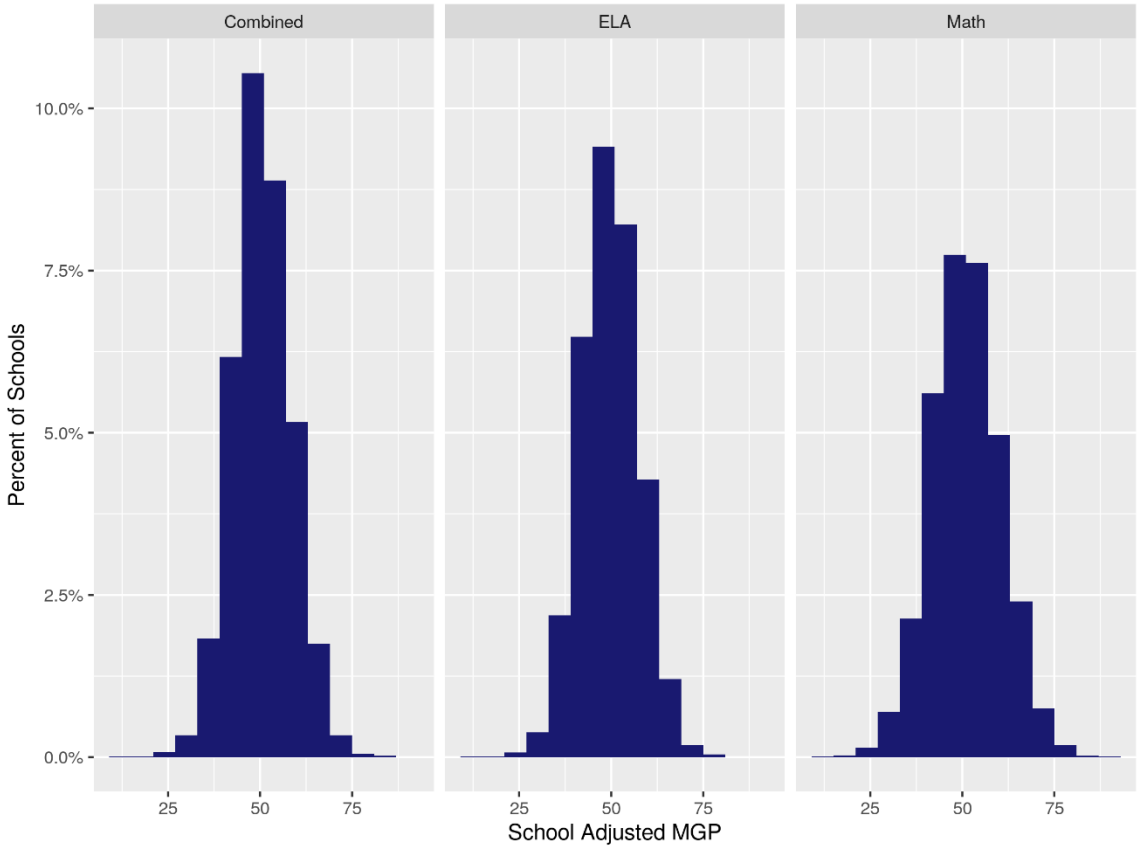


Figure 6 shows that for schools, the results are less widely distributed than for teachers.

Figure 6. Grades 4-8 Distribution of School MGPS



Precision of the MGPs for Grades 4-8

The caterpillar plot in Figure 7 is a random sample of 100 teacher MGPs taken from the 2021-22 data. The MGPs are sorted from lowest to highest, with the corresponding 95% confidence range showing the lower and upper limits of the MGP. Figure 8 shows the same type of plot for schools (where larger underlying samples indicate substantially less variation in the MGP and the error bars are narrower). These figures provide a sample of the distribution of MGPs and a typical confidence range.

Figure 7. Grades 4-8 Overall MGP with 95% Confidence Interval Based on a Random Sample of 100 Teachers

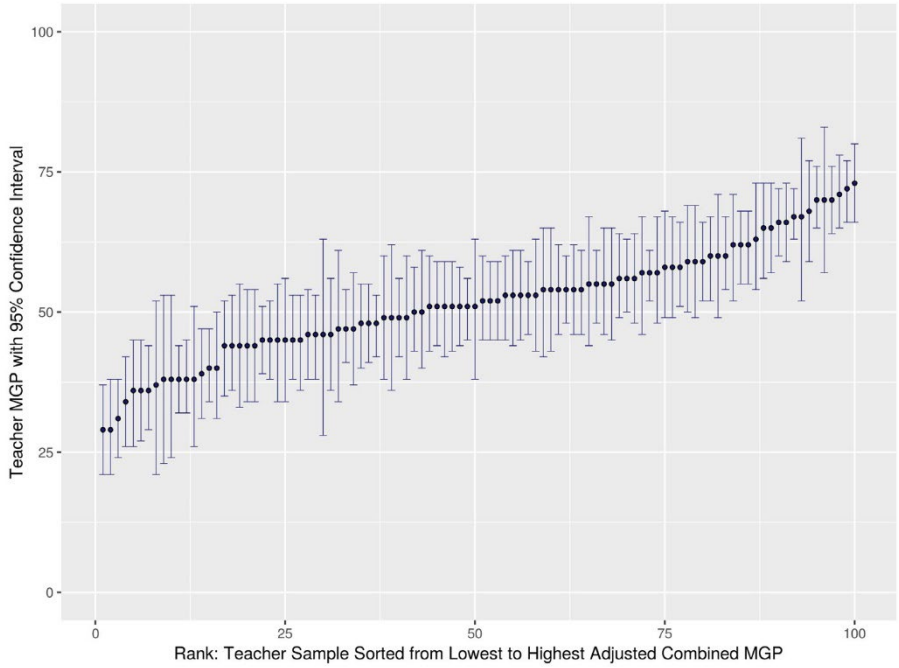


Figure 8. Grades 4-8 Overall MGP with 95% Confidence Interval Based on a Random Sample of 100 Schools

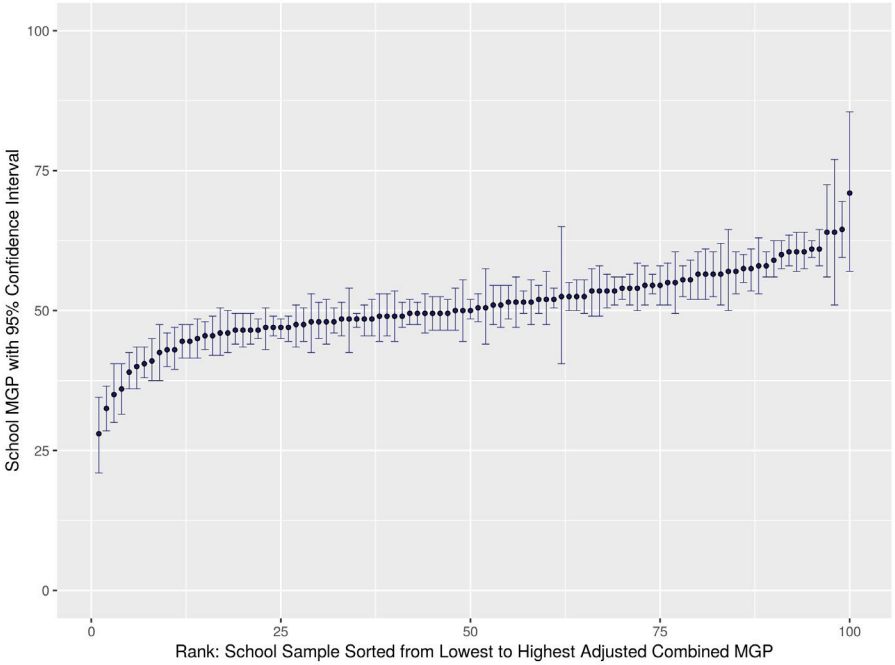


Figure 7 and Figure 8 (above) provide a means to gauge visually the precision of MGPs. However, it also may be useful to examine a reliability statistic to assess the precision of the teacher-level MGPs, specified here as ρ:

$$\rho = 1 - \left(\frac{\bar{\sigma}}{sd(\hat{\theta}_j)}\right)^2$$

where σ- is the weighted mean standard error of the MGP (weighted by number of SGPs), and $sd(\hat{\theta}_j)$ is the weighted standard deviation between teacher MGPs (also weighted by number of SGPs). In theory, the highest possible value is one, which would represent complete precision in the measure. When the ratio is zero, the variation in MGPs is explained entirely by sampling variation. Larger values of ρ are associated with more precisely measured MGPs.

Table 14 provides the weighted mean standard errors, the weighted standard deviations, and the values of weighted ρ for the adjusted model by grade and subject using the number of SGPs as weights. The values of the ratio (ρ) quantify imprecision in the estimates. In all grades, the statistics are closer to one than zero, indicating that the differentiation between teachers and schools seen in the measures is not largely related to measurement variance.

Table 14. Grades 4-8 Weighted Mean Standard Errors, Standard Deviation, and Value of ρ by Grade and Subject for Teacher and Schools, Weighted by Number of SGPs

Subject	Grade	Weighted Mean Standard Error	Weighted Standard Deviation	Weighted Reliability Statistic (ρ)
ELA (Teacher)	4	5.518	12.023	0.779
	5	5.403	9.817	0.681
	6	4.626	9.767	0.760
	7	4.315	9.613	0.785
	8	4.449	9.613	0.785
Mathematics (Teacher)	4	5.375	13.467	0.832
	5	5.014	13.563	0.854
	6	4.407	12.534	0.867
	7	4.258	12.427	0.875
	8	4.141	12.674	0.884
All (Schools)	All	1.707	6.732	0.921

Table 15 provides the share of educators whose MGPs are significantly above or below the State mean for that educator type, using the 95% confidence intervals. In all cases, the percentage exceeding the mean is larger than what would be expected by chance alone,

indicating the model distinguishes between schools and teachers (2.5% of schools or teachers would be expected to be above and below the mean by chance alone).

Table 15. Grades 4-8 Percentage of Educator MGPs Above or Below Mean at the 95% Confidence Level

Level	Below Mean		Above Mean	
	N	%	N	%
Teacher	4,549	19%	4,813	20%
School	968	28%	921	27%

Impact Data Results for Grades 4-8

Table 16 provides the correlations of the combined-subject MGP (or for teachers with only one subject, their single-subject MGP) with five classroom or course characteristics: the three predictor variables at the individual student level that NYSED's regulations permit for inclusion in the model and that were selected after discussion with New York's Task Force and other stakeholders—ELL, students with disabilities, and poverty (economic disadvantage); the mean prior ELA score; and the mean prior mathematics score of the students.[15] Correlations are presented for adjusted MGPs.[15]

Table 16. Grades 4-8 Teacher MGP Correlations with Class or Course Characteristics

School Characteristics	Correlation
ELL students in class or course	0.035
Students with disabilities in class or course	0.088
Economically disadvantaged students in class or course	0.079
Mean prior ELA Z-score	-0.065
Mean prior mathematics Z-score	-0.069

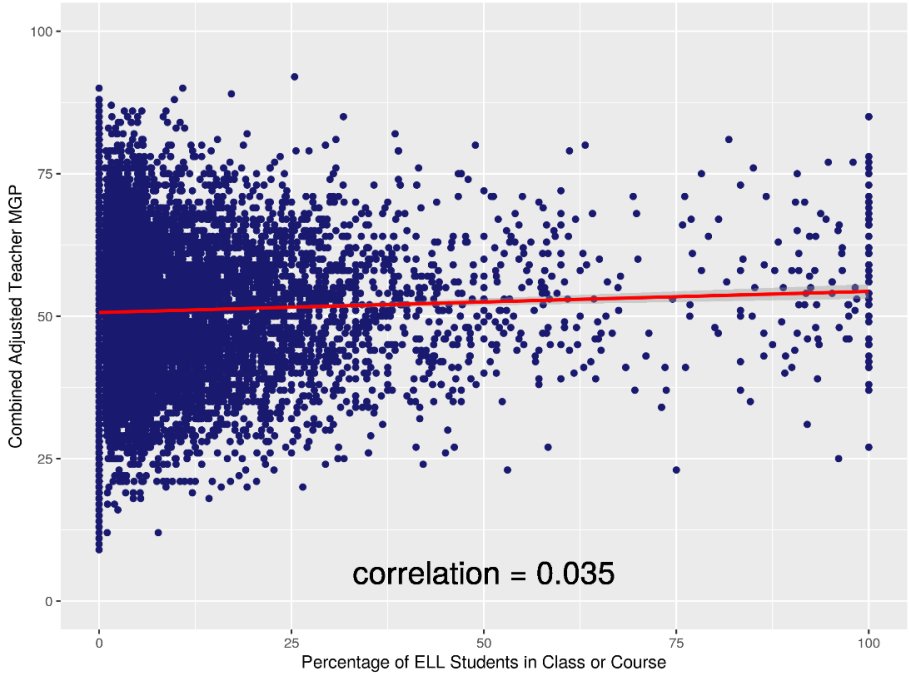
Large correlations between MGP and classroom, course, or school characteristics would indicate systematic relationships between scores and the types of students who teachers and schools serve. A value of 0.10 or less indicates that 1% or less of the variance in MGPs can be

[15] For prior scores, the *Z*-score of the scale score is used instead of the actual scale score because many teachers have students in various grades, and the scale scores are not designed to be averaged directly across grades. [15] The impact of these demographic characteristics on the expected value of students' current test scores used to compute SGPs can be seen through the model coefficients presented in Appendix I. The inclusion of these variables serves to make SGPs for students with different demographic characteristics comparable, given the prior test scores included in the model.

predicted with that demographic variable and, therefore, represents results that are essentially zero. In 2021-22, all correlations of MGPs with classroom characteristics have absolute values of 0.088 or lower.

The scatter plots shown in Figure 9 through Figure 13 provide visual representations of the data underlying the correlations for teachers shown in Table 16. Figure 14 through Figure 18 provide similar images of the data underlying the school-level (principal MGP) correlation shown in Table 17.[16]

Figure 9. Grades 4-8 Teacher MGP Scores by Percentage of ELL Students in Class or Course



[16] Results disaggregated by grade and subject are shown in Appendix J. The results in this section are combined across grades and subjects.

Figure 10. Grades 4-8 Teacher MGP Scores by Percentage of SWD Students in Class or Course

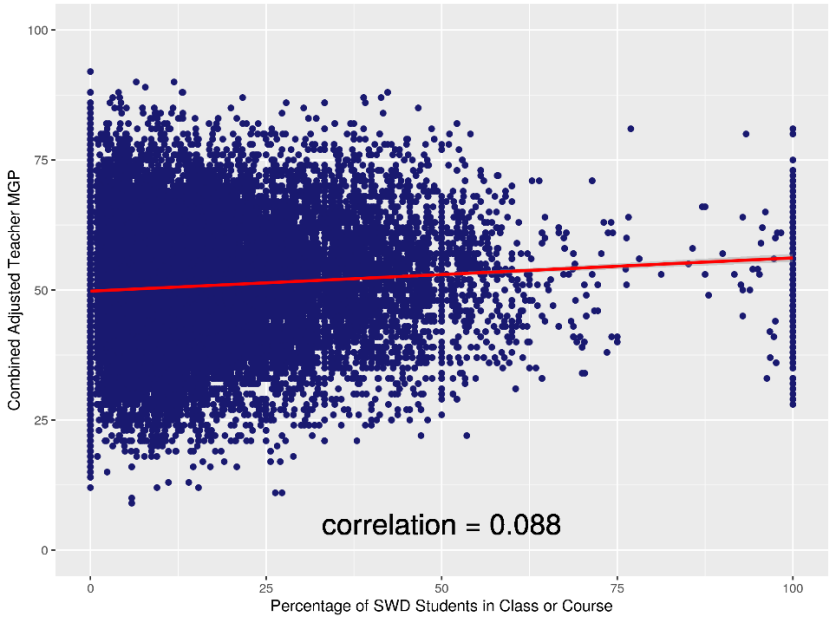


Figure 11. Grades 4-8 Teacher MGP Scores by Percentage of ED Students in Class or Course

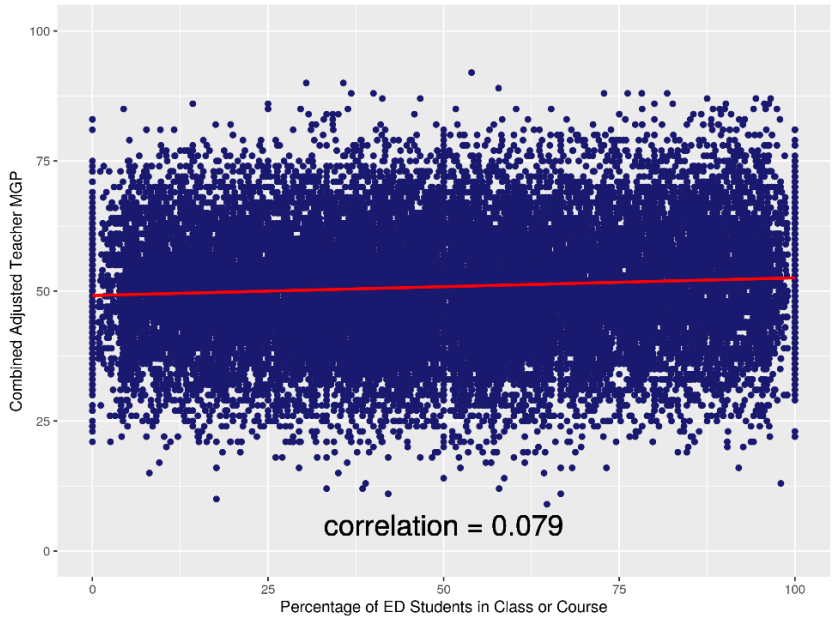


Figure 12. Grades 4-8 Teacher MGP Scores by Mean Prior ELA Z-Score Students in Class or Course

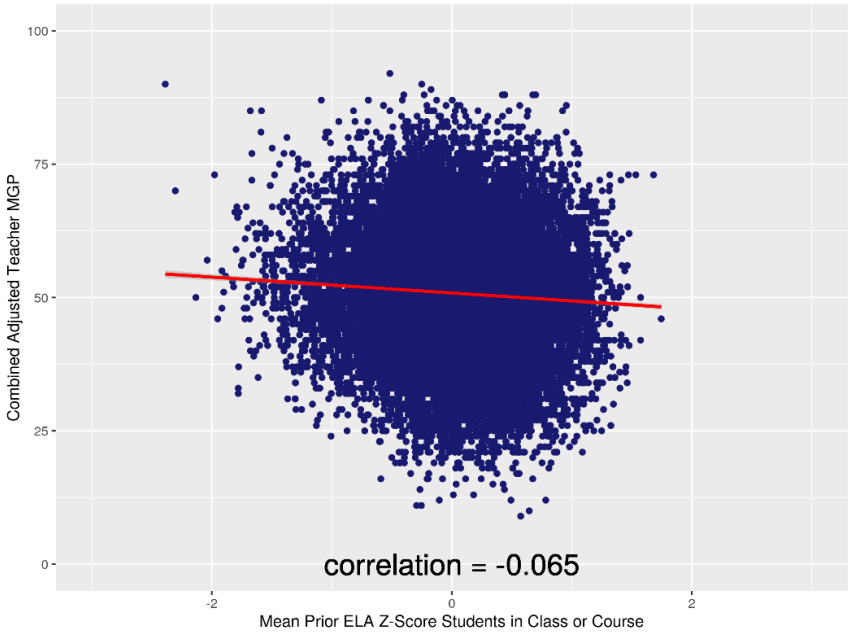


Figure 13. Grades 4-8 Teacher MGP Scores by Mean Prior Mathematics Z-Score Students in Class or Course

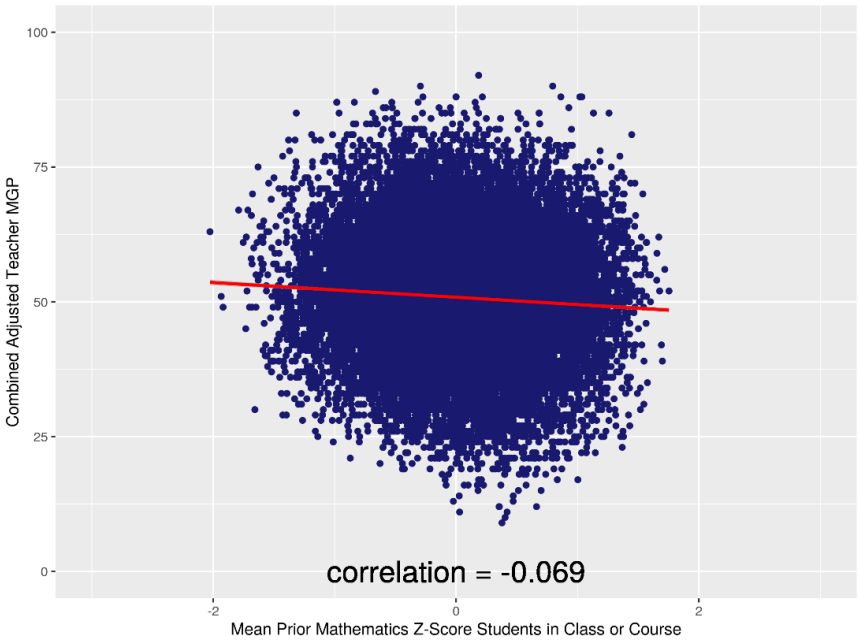


Table 17 provides the observed correlations of school MGPs with the same characteristics presented for teachers but aggregated to the school level. Appendix J contains principal-level correlations.

Table 17. Grades 4-8 School MGP Correlations with School Characteristics

School Characteristics	Correlation
ELL students in school	-0.019
Students with disabilities in school	0.003
Economically disadvantaged students in school	0.234
Mean prior ELA Z-score	0.004
Mean prior mathematics Z-score	-0.027

Figure 14. Grades 4-8 School MGP Scores by Percentage of ELL Students

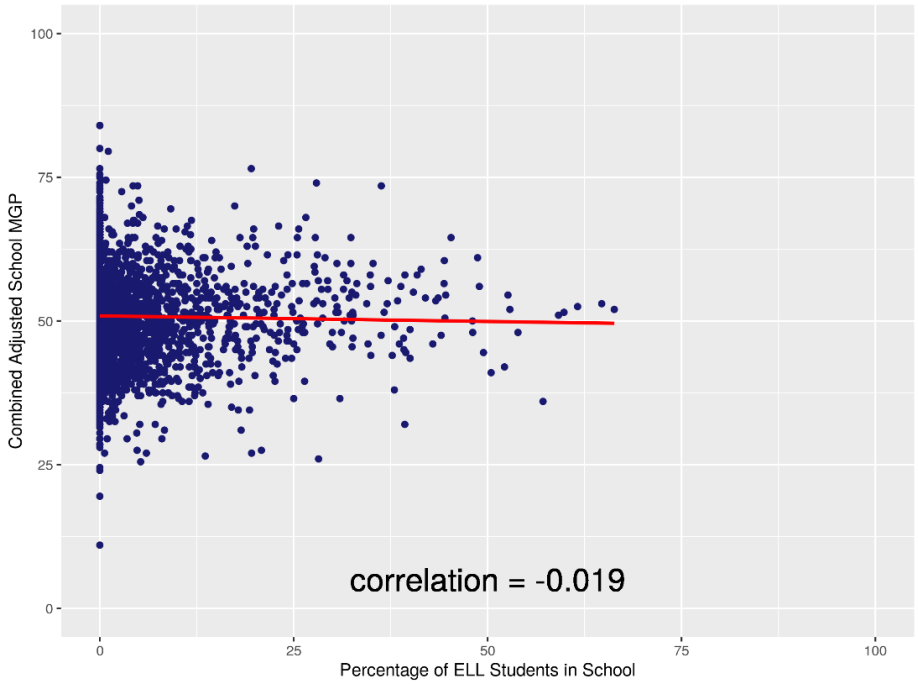


Figure 15. Grades 4-8 School MGP Scores by Percentage of SWD Students

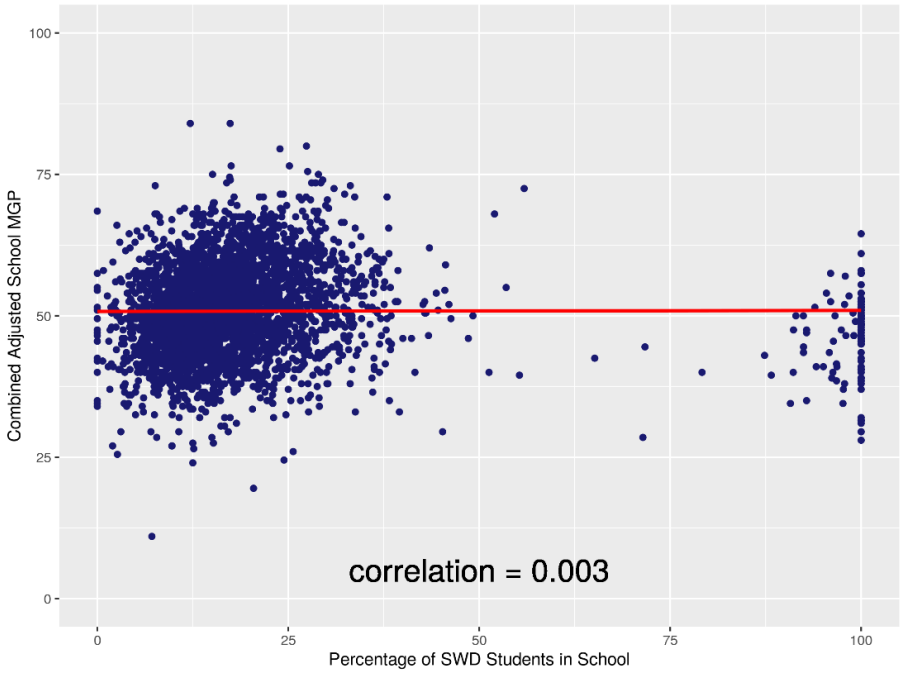


Figure 16. Grades 4-8 School MGP Scores by Percentage of ED Students

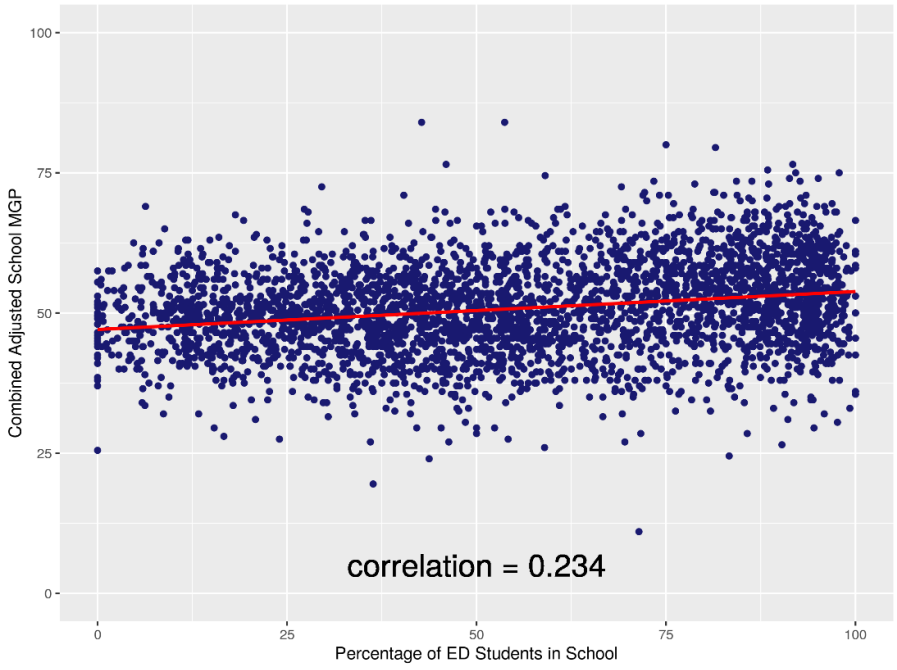


Figure 17. Grades 4-8 School MGP Scores by Mean Prior ELA Z-Score Students

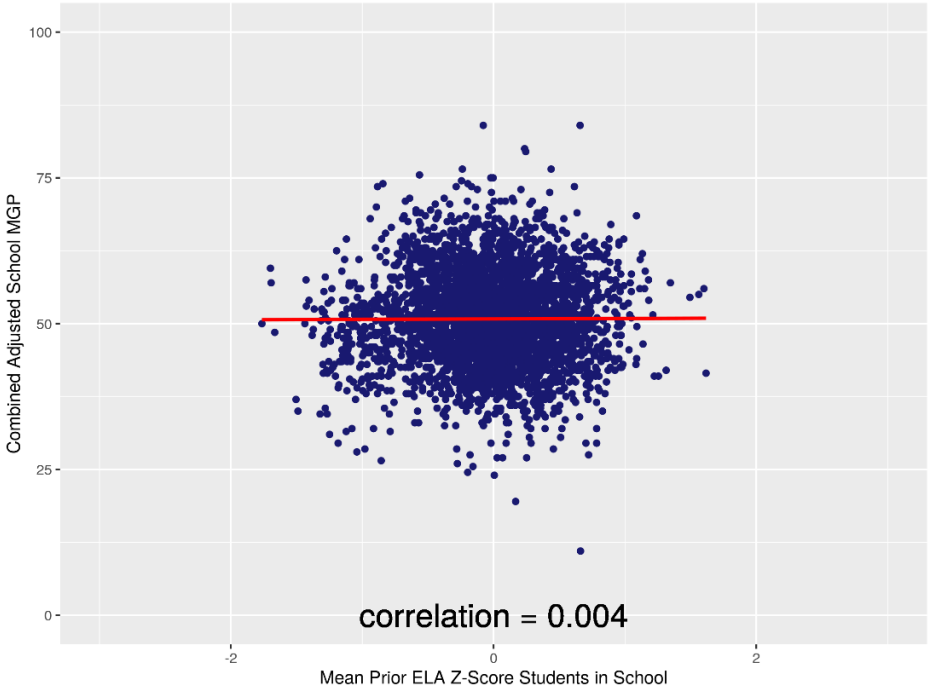
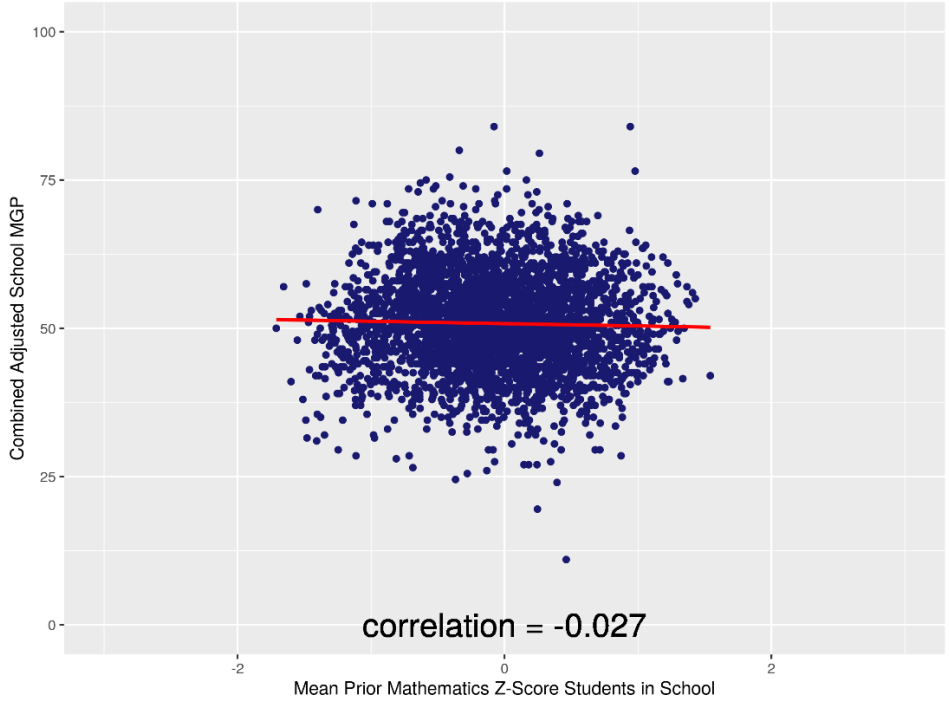


Figure 18. Grades 4-8 School MGP Scores by Mean Prior Mathematics Z-Score Students



Growth Ratings for Grades 4-8

This section describes the observed distribution of the growth ratings assigned using the rules described earlier in the results section. Table 18 shows the distribution for Grades 4-8 teachers, schools, and principals who serve students in Grades 4-8 (including, for instance, schools serving Grades 4-12) in 2018-19 and 2021-22.

Table 18. Grades 4-8 Teacher, School, and Principal Growth Ratings

School Year	Level	Highly Effective	Effective	Developing	Ineffective
2018-19	Teacher	7%	78%	10%	5%
	Principal	7%	80%	7%	6%
	School	7%	80%	8%	5%
2021-22	Teacher	8%	77%	10%	5%
	Principal	6%	78%	10%	6%
	School	7%	78%	10%	5%

Note: Because of rounding, percentages may not add to 100 percent.

Stability of Growth Ratings for Grades 4-8 across School Years

r teachers who had growth ratings in 2018-19 and 2021-22, Table 19 shows the relationship between ratings across years. Table 20 shows the relationship for school-level MGPs. The results show that the ratings are stable, with about two thirds remaining in the same growth rating category from year to year. The MGPs have a Pearson correlation coefficient of 0.49 for teachers and a correlation coefficient of 0.45 for schools between 2018-19 and 2021-22. The teacher correlation coefficient is the same as the correlation coefficient between 2018-19 and 2021-22 and the school correlation coefficient is slightly higher than the one between 2018-19 and 2021-22, which was 0.32.

Table 19. Grades 4-8 Teacher Growth Ratings for Teachers Receiving Growth Ratings in Both 2018-19 and 2021-22

		2021-22				
		Highly Effective	**Effective**	**Developing**	**Ineffective**	**Total**
2018-19	Highly Effective	2%	5%	<1%	<1%	7%
	Effective	6%	63%	7%	3%	78%
	Developing	<1%	7%	2%	1%	10%
	Ineffective	<1%	3%	1%	1%	5%
	Total	8%	78%	9%	4%	100%

Note: Because of rounding, percentages may not add to 100 percent.

Table 20. Grades 4-8 School Growth Ratings for Schools Receiving Growth Ratings in Both 2018-19 and 2021-22

		2021-22				
		Highly Effective	**Effective**	**Developing**	**Ineffective**	**Total**
2018-19	Highly Effective	1%	5%	<1%	<1%	7%
	Effective	5%	64%	7%	4%	80%
	Developing	<1%	5%	2%	1%	8%
	Ineffective	<1%	4%	1%	1%	5%
	Total	7%	78%	10%	5%	100%

Note: Because of rounding, percentages may not add to 100 percent.

Neutrality of MGPs for Grades 4-8

Given that a primary claim for the use of MGPs is that all educators can demonstrate growth, regardless of the academic starting point of students, it is necessary to determine if there is a strong relationship between MGPs and average prior achievement for students in a school. To that end, Table 21 shows the correlations between MGPs and average prior achievement, which are low to moderate across all grades and subjects. These correlations illustrate that the MGPs are substantially neutral to prior achievement.

Table 21. Correlation Between Adjusted Teacher and School Adjusted MGP and Average Prior

Measure of Prior Achievement		Correlation Between Adjusted MGP and Prior Achievement	
Subject	Grade	Teacher	School
ELA	Grade 4	-0.034	-0.032
	Grade 5	-0.117	-0.139
	Grade 6	-0.097	-0.113
	Grade 7	-0.114	-0.117
	Grade 8	-0.153	-0.120
Mathematics	Grade 4	-0.135	-0.129
	Grade 5	-0.125	-0.181
	Grade 6	-0.142	-0.167
	Grade 7	-0.137	-0.225
	Grade 8	-0.060	-0.062

Results from Growth Models for Grades 9-12

This section provides the results for the Grades 9-12 models using 2021-22 Regents Exam data.

Model Fit Statistics for Grades 9-12 Models

Table 22 shows the *R*-squared values for the MGP models based on ELA and Algebra I Regents Exam data.

Table 22. Grades 9-12 Pseudo R-Squared Values

School year	Subject	Adjusted	Unadjusted
2018-19	Algebra I	0.49	0.42
	ELA	0.60	0.50
2021-22	Algebra I	0.50	0.43
	ELA	0.57	0.52

The GRE model is not a linear model, so we do not provide pseudo *R*-squared values; instead, we evaluate the behavior of the model using impact data.

Correlation of Combined MGP with GRE Results

For Grades 9-12 in 2021-22, the correlation between a school's combined MGP and GRE results was 0.32, which may indicate that these two measures capture different aspects of student growth (one reason both measures were computed for Grades 9-12 schools and principals).

Fraction of Students Included in Measures

On average, the GRE measure includes a larger percentage of students in a Grades 9-12 school than does the combined MGP measure. Table 23 shows the percentages of students included in each measure.

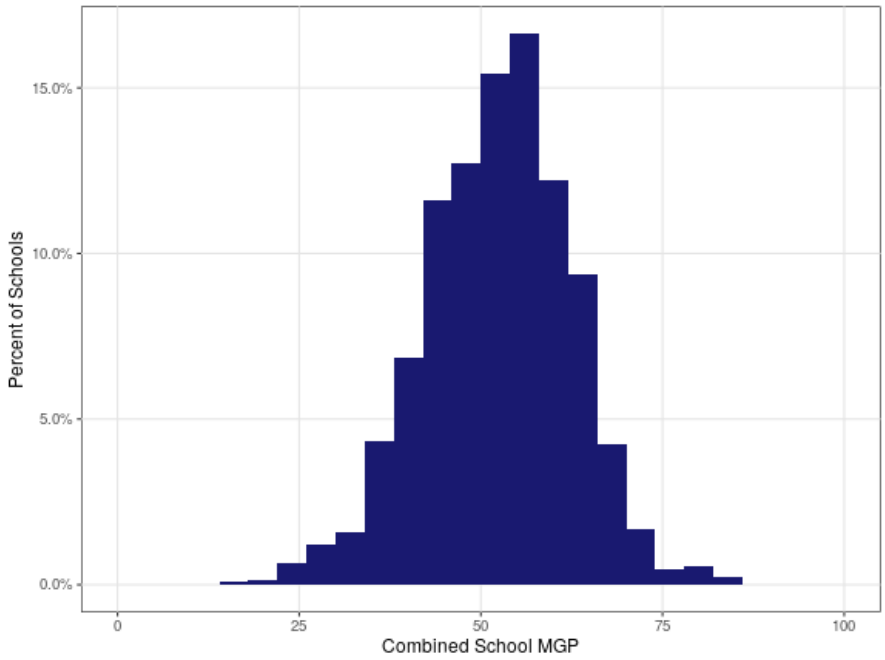
Table 23. Grades 9-12 Weighted Average Percentage of Students Included, weight is number of students attributed to each school.

Measure	Weighted Mean Fraction of Students in a School Included
MGP (ELA/Algebra I)	27%
GRE	69%

Distribution of MGPs and GRE Scores for Grades 9-12

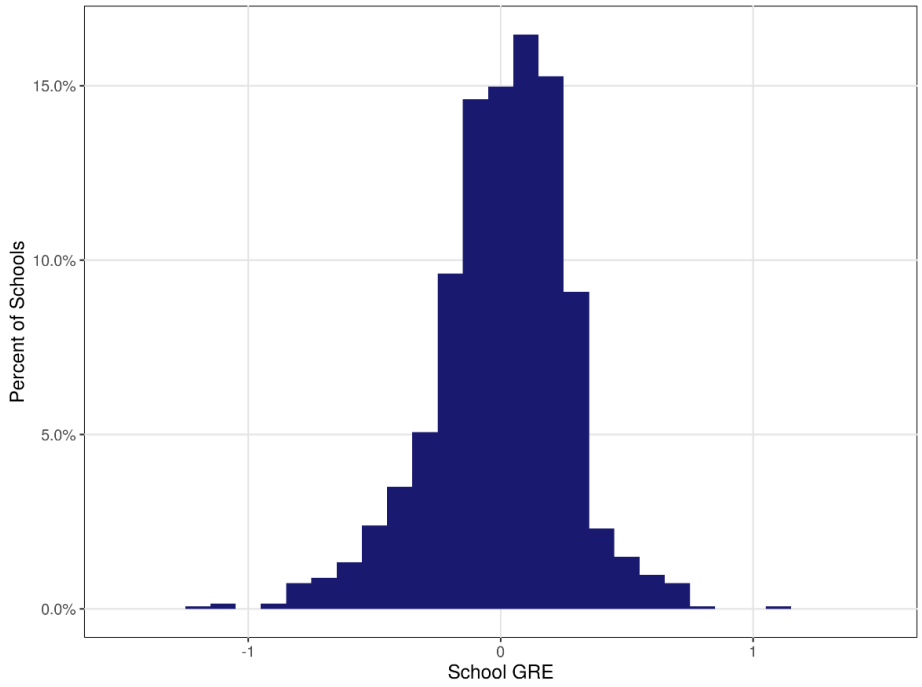
Figure 19 shows the distribution of combined school MGPs for Grades 9-12—that is, MGPs that combine information across SGPs in ELA and Algebra I. The distribution is approximately normal.

Figure 19. Grades 9-12 Distribution of School MGP



The GRE model reports results as the number of Regents Exams that the average student in a school will pass compared with the number passed by similar students. For example, a GRE score of 0.25 would indicate that, on average, students in that school pass one quarter of a Regents Exam more than do similar students. Over four years of high school, this rate per year would add up to one additional Regents Exam passed by each student. Figure 20 is a histogram of the GRE results, which are somewhat skewed relative to the normal distribution.

Figure 20. Grades 9-12 Distribution of School GRE Scores



Precision of the Measures for Grades 9-12

The caterpillar plot in Figure 21 shows 100 randomly selected school MGPs and their confidence interval, giving a sense of the precision of the estimates. A second caterpillar plot in Figure 22 shows the GRE measure values and the associated confidence intervals. In both plots, it is apparent that typical confidence intervals are small relative to the overall dispersion in the measures themselves.

Figure 21. Grades 9-12 Caterpillar Plot of School MGPs

Figure 22. Grades 9-12 Caterpillar Plot of School GRE Scores

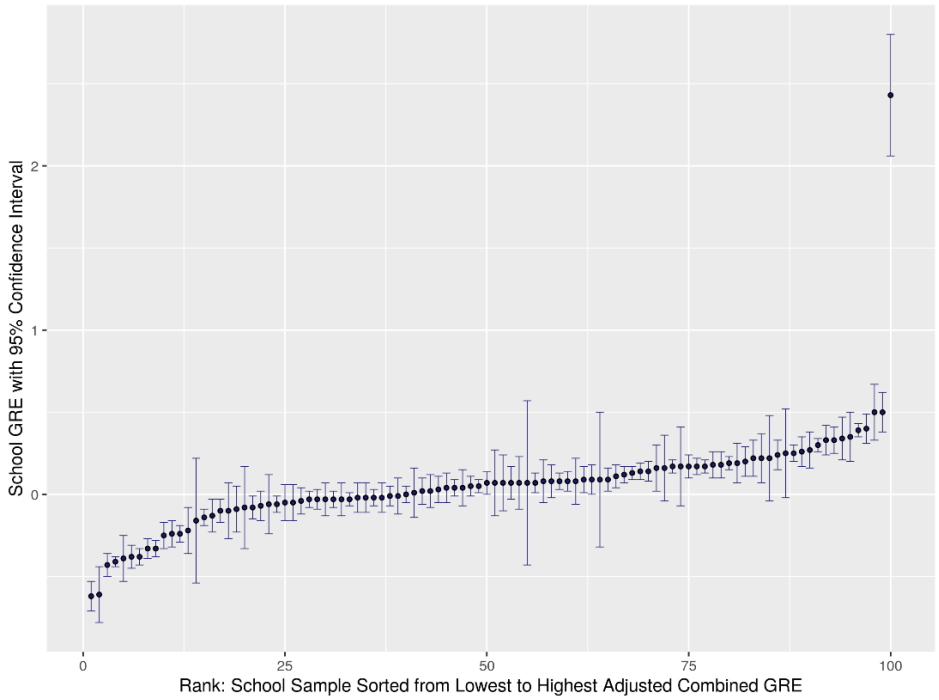


Table 24 shows the share of Grades 9-12 schools whose scores are significantly different from the mean (their confidence intervals on the caterpillar plot do not cross the average value). Once again, the share exceeds what would be expected by chance alone, indicating that the model is able to distinguish among schools.

Table 24. Percentage of Grades 9-12 School Measures Above or Below the Mean at the 95% Confidence Interval

Measure	Below Mean	Above Mean
MGP	28%	31%
GRE	31%	37%

The weighted reliability (ρ) statistic, which was introduced earlier as a measure of the precision of the MGP measure, is shown in Table 25 for both the GRE and MGP adjusted models for Grades 9-12 models. In both cases, the statistics are much closer to one than zero, indicating that the differentiation between schools seen in the measures is not largely the result of measurement variance.

Table 25. Grades 9-12 Weighted Mean Standard Errors, Standard Deviation, and Value of ρ, Weighted by Number of SGPs

Measure	Weighted Mean Standard Error	Weighted Standard Deviation	Weighted Reliability Statistic (ρ)
MGP	1.994	8.775	0.937
GRE	0.034	0.264	0.979

Impact Data Results for Grades 9-12

Table 26 shows the correlations for the MGP and GRE adjusted models with several school-level demographic variables.[17] Several correlations for the GRE model as well as the MGP model are less than 0.10 in absolute value. For example, schools that have a higher percentage of students with disabilities receive slightly lower GRE scores as well slightly lower MGP scores, on average. For the MGP model, the correlation between the school MGP and Grade 8 student test scores (for both math and ELA) is around 0.1, suggesting about one percent of the variation in MGPs is explained by students' prior scores (the percent of variation explained is equal to

[17] Note that for Grades 9-12 models, prior scores are all from Grade 8 but are not all equated. Thus, they are all standardized by year and assessment before being used to compute the correlations shown in this section.

the square of the correlation in Table 25). Appendix J shows correlations of school characteristics with principal-level MGPs.

Table 26. Grades 9-12 School MGP Correlation with Demographic Characteristics

	MGP	GRE
ELL students in school	-0.032	0.049
Students with disabilities in school	-0.020	-0.061
Economically disadvantaged students in school	-0.108	0.009
Mean Grade 8 ELA score	0.126	0.112
Mean Grade 8 mathematics score	0.083	0.095

Figure 23 through Figure 27 plot these data for MGP results, and Figure 28 through Figure 32 plot these data for GRE results. Note that the demographic correlations are higher for the GRE than for the MGP measures. However, note that there is variation in school-level results at all levels of average prior achievement (as seen in the following figures), suggesting that individual schools over a wide range of characteristics can demonstrate strong results.

Figure 23. Grades 9-12 School MGP Scores by Percentage of ELL Students in School

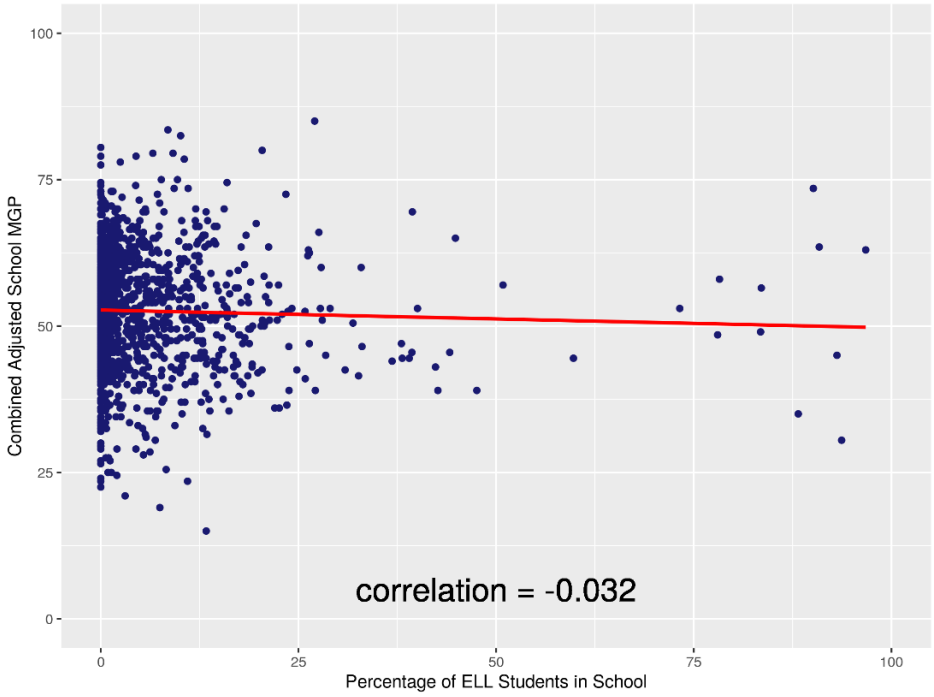


Figure 24. Grades 9-12 School MGP Scores by Percentage of SWD Students

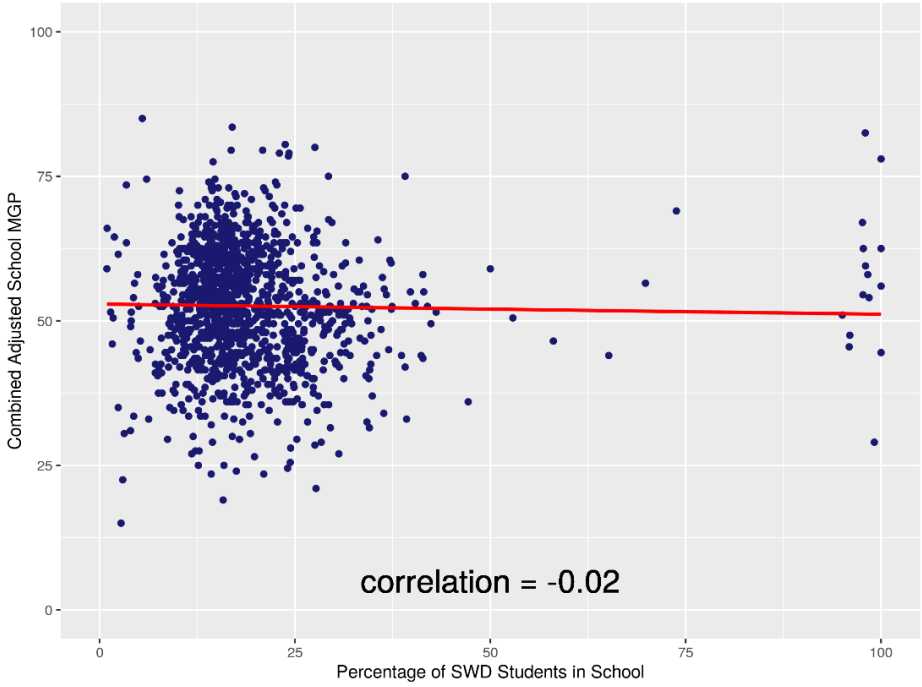


Figure 25. Grades 9-12 School MGP Scores by Percentage of ED Students

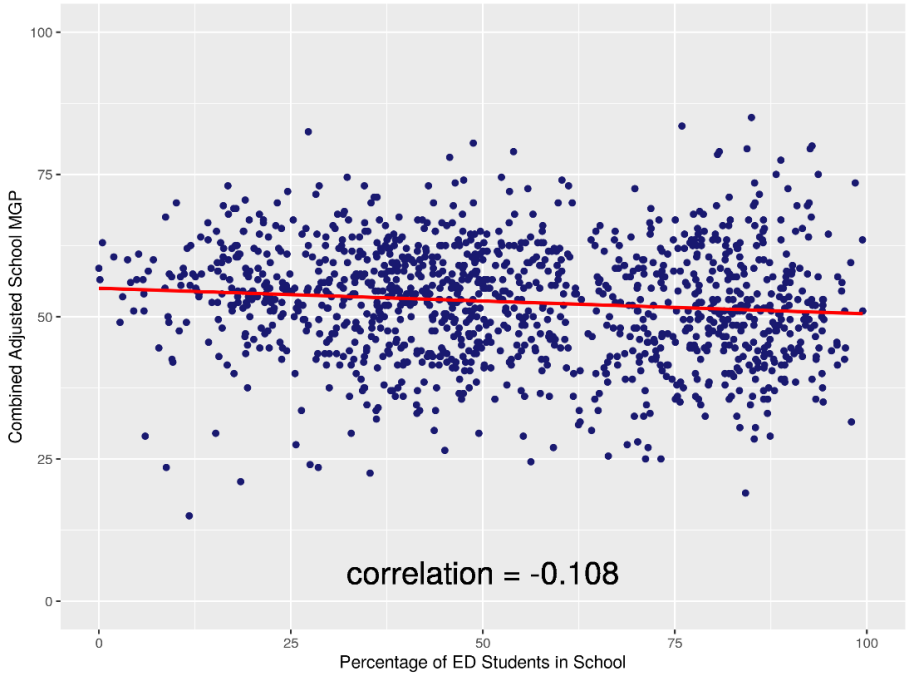


Figure 26. Grades 9-12 School MGP Scores by Mean Grade 8 ELA Z-Score

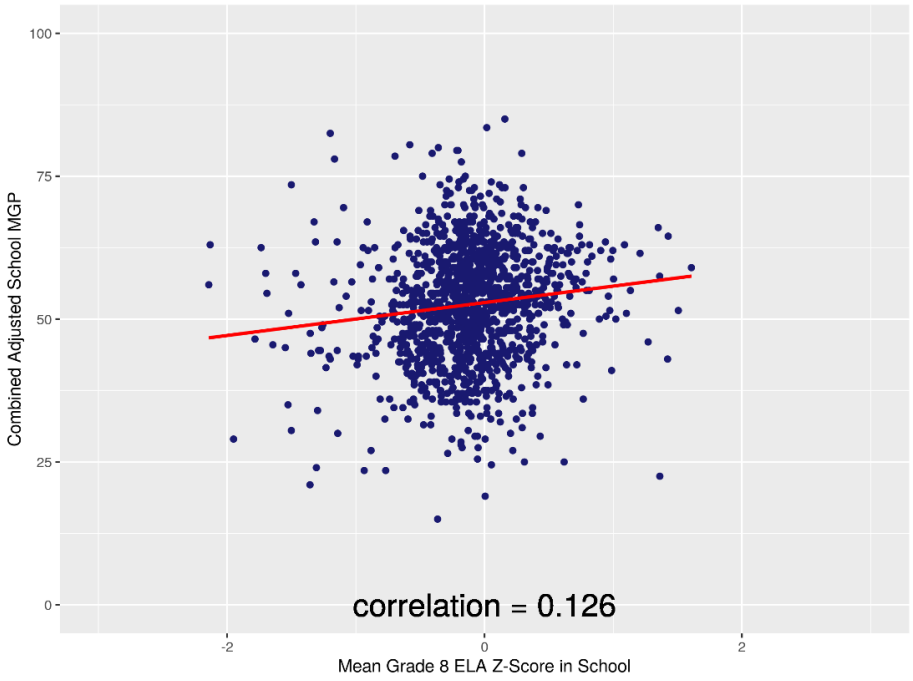


Figure 27. Grades 9-12 School MGP Scores by Mean Grade 8 Mathematics Z-Score

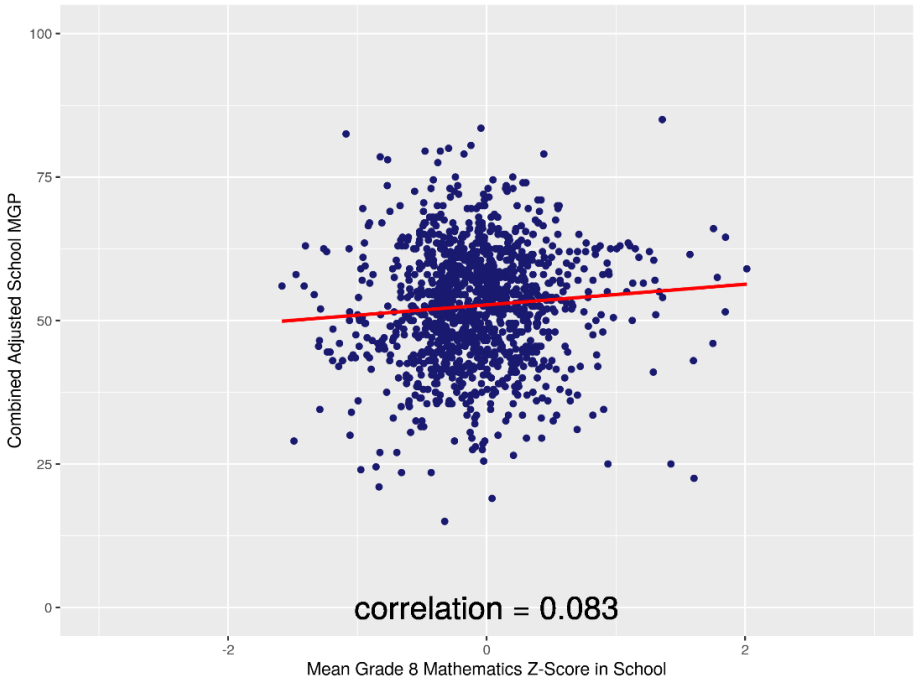


Figure 28. Grades 9-12 School GRE Scores by Percentage of ELL Students

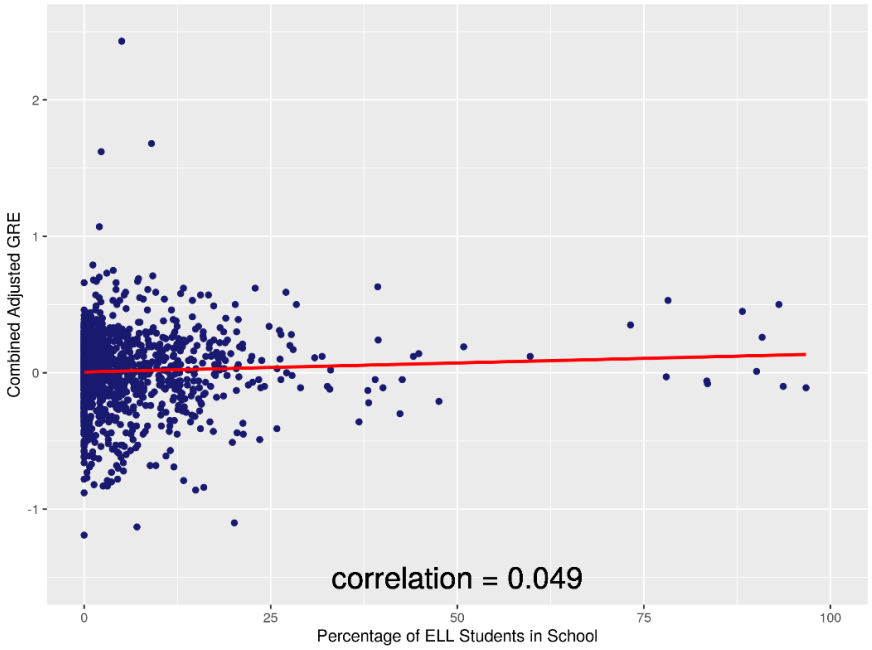


Figure 29. Grades 9-12 School GRE Scores by Percentage of SWD Students

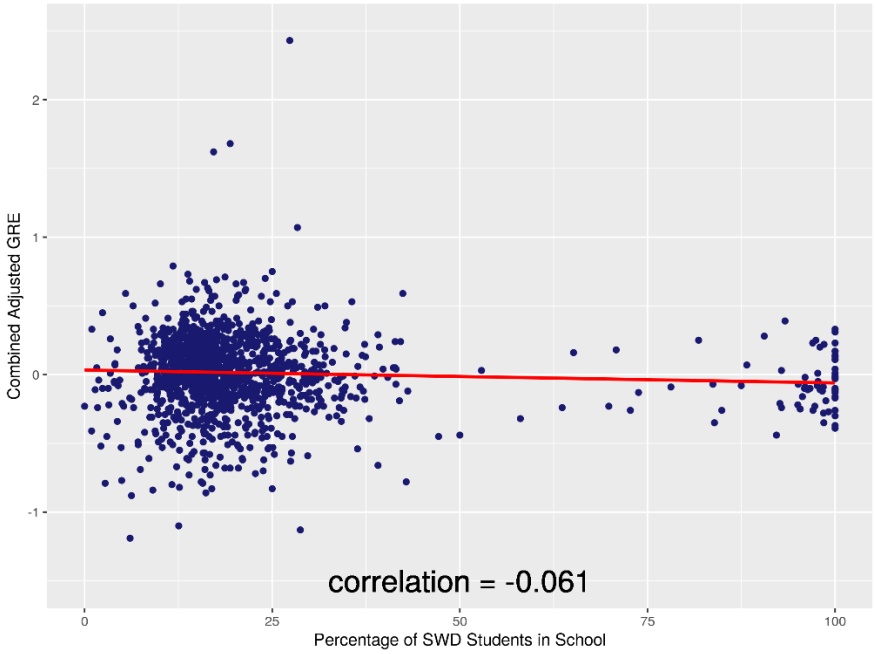


Figure 30. Grades 9-12 School GRE Scores by Percentage of ED Students

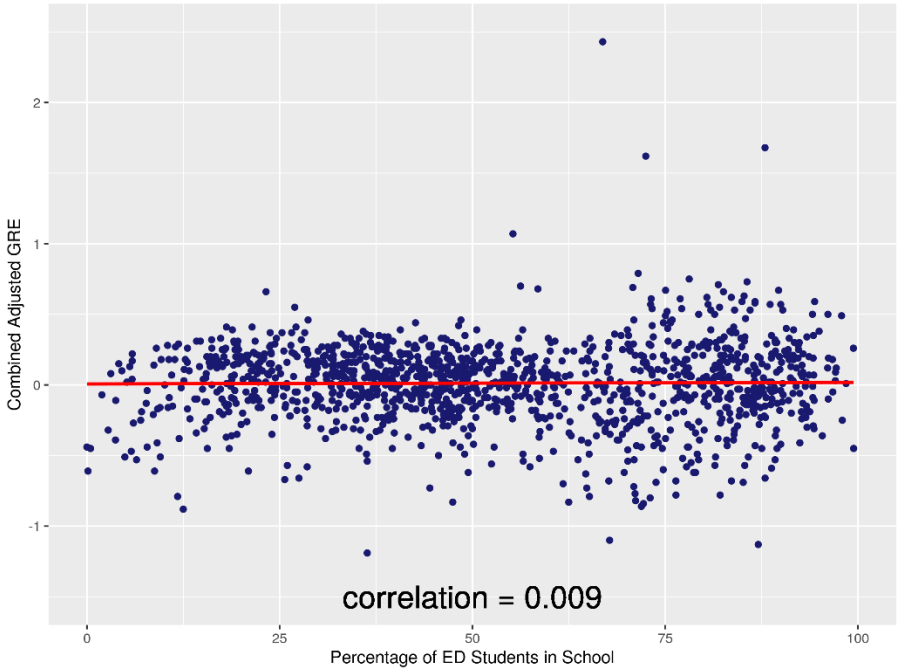


Figure 31. Grades 9-12 School GRE Scores by Mean Grade 8 ELA Z-Score

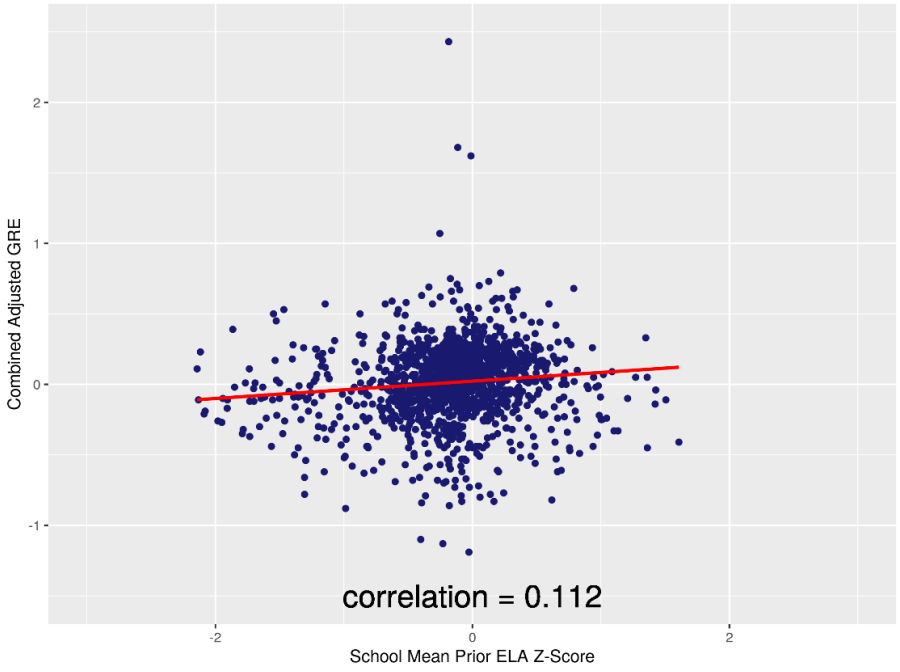
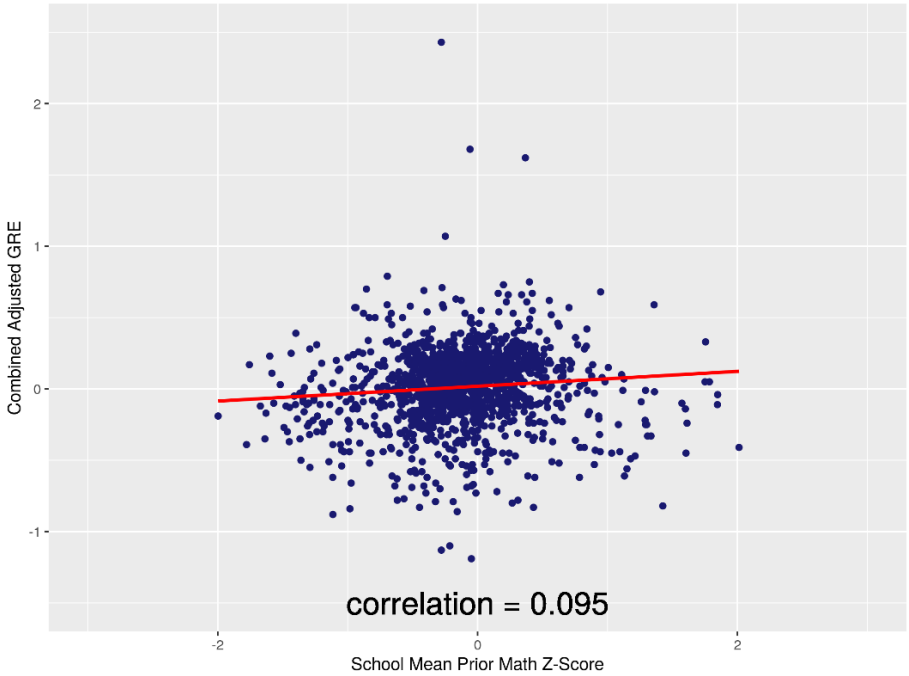


Figure 32. Grades 9-12 School GRE Scores by Mean Grade 8 Mathematics Z-Score



Growth Ratings for Schools with Grades 9-12

Table 27 shows the distribution of growth ratings for schools and principals serving Grades 9-12 (including schools that may serve other grades, such as Grades 4-8) for 2018-19 and 2021-22.

Table 27. Grades 9-12 School and Principal Growth Ratings

School Year	Level	Highly Effective	Effective	Developing	Ineffective
2018-19	Principal	3%	78%	15%	4%
	School	3%	79%	14%	3%
2021-22	Principal	2%	82%	11%	4%
	School	3%	83%	11%	4%

Note: Because of rounding, percentages may not add to 100 percent.

Table 28 shows the relationship between school ratings across years. The results show that the ratings are stable, with 76% of schools remaining in the same growth rating category from year to year.

Table 28. Grades 9-12 School Growth Ratings for Schools Receiving Growth Ratings in Both 2018-19 and 2021-22

		2021-22				
		Highly Effective	Effective	Developing	Ineffective	Total
2018-19	Highly Effective	1%	2%	<1%	<1%	3%
	Effective	2%	71%	6%	1%	80%
	Developing	<1%	9%	3%	1%	13%
	Ineffective	<1%	1%	1%	1%	3%
	Total	3%	84%	10%	3%	100%

Note: Because of rounding, percentages may not add to 100 percent.

Growth Ratings for Schools and principals Serving Grades 4-8 and Grades 9-12

Some schools receive separate growth ratings for Grades 4-8 and Grades 9-12.

Table 29 shows growth ratings for schools that serve only Grades 4-8 (4-8 only), schools that serve only Grades 9-12 (9-12 only), schools that serve Grades 4-12 and receive both 4-8 and 9-12 growth ratings (4-8 and 9-12), and all schools that received a growth rating (all schools).

Table 30 shows similar information for principals.

Table 29. Growth Ratings for Schools

	Model	Highly Effective	Effective	Developing	Ineffective	Number of Schools
4-8 Growth Rating	4-8 Only	7%	78%	10%	5%	3,003
	4-8 and 9-12	3%	77%	11%	9%	399
	All Schools	7%	78%	10%	5%	3,402
9-12 Growth Rating	4-8 and 9-12	3%	83%	11%	3%	399
	9-12 Only	3%	83%	11%	4%	946
	All Schools	3%	83%	11%	4%	1,345
Overall Growth Rating	4-8 and 9-12	1%	82%	16%	1%	399
	All Schools	6%	79%	11%	4%	4,348

Note: Because of rounding, percentages may not add to 100 percent.

Table 30. Growth Ratings for Principals

	Model	Highly Effective	Effective	Developing	Ineffective	Number of Principals
4-8 Growth Rating	4-8 Only	7%	78%	10%	5%	2,790
	4-8 and 9-12	3%	79%	10%	7%	431
	All Principals	6%	78%	10%	6%	3,221
9-12 Growth Rating	4-8 and 9-12	2%	84%	10%	4%	431
	9-12 Only	3%	82%	11%	4%	838
	All Principals	3%	83%	11%	4%	1,269
Overall Growth Rating	4-8 and 9-12	0%	86%	13%	1%	431
	All Principals	5%	79%	11%	5%	4,059

Note: Because of rounding, percentages may not add to 100 percent.

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Appendix A. Variables Included in the Adjusted Model

Academic History Variables

- **Prior Achievement**
  - For Grades 4-8 growth measures, up to three years of prior achievement scores in the same subject were included (except for Grades 4 and 5, where fewer years of data were available). Students without scores from the immediate prior grade level in the immediate prior year were excluded from analysis. In addition, the immediate prior grade-level score in the other subject (for ELA models, the mathematics score; for mathematics models, the ELA score) was included if available. For those students missing scores for 2019-20, 2017-18 scores were used for prior year achievement.
  - For Grades 9-12 growth measures, scores from Grade 6, Grade 7, and Grade 8 assessments (if available) in ELA and mathematics were used as predictors. For the MGP measure, students must have had at least one score from Grade 6, Grade 7 or Grade 8 in the same subject (for the Algebra I Regents model, from the Grade 6, Grade 7, or Grade 8 mathematics test; for the ELA Regents models, from the Grade 6, Grade 7, or Grade 8 ELA test). For the GRE measure, to be included in the analysis, students must have had at least one Grade 6, Grade 7, or Grade 8 score in either ELA or mathematics.
- **Retained in Grade (Grades 4-8 Growth Measures Only).** This variable is a yes or no variable that indicates whether a student was retained in grade in one of the two years preceding the most recent school year for students above Grade 4 (e.g., if a student was in Grade 5, Grade 5 again, and then Grade 6). Because students must have an immediate prior score from the prior grade, students who were retained in grade between 2020-21 and 2021-22 were not included in the model (e.g., students with data from Grade 6 in 2020-21 and Grade 6 in 2021-22).
  - This variable was computed based on students' tested grade in the assessment score file.
  - Because of the COVID-19 disruption, we check for retained status three and four years ago instead of two and three years ago to match the pretest availability.
- **Mean Prior Score.** This variable is intended to account for differences in learning environments that are made up of students with disparate levels of incoming achievement.
  - For Grades 4-8 growth measures, the average immediate prior same-subject achievement on the State test of all students attributed to a teacher in the

current year was included in the model (e.g., the average prior ELA achievement of all students in a teacher's class/course was included in ELA models).
    - For Grades 9-12 growth measures, average Grade 8 achievement of the schools' students when they were in Grade 8 was included in each model. For the MGP measure, average Grade 8 achievement of the schools' students when they were in Grade 8 at the school level in the same subject (for the Algebra I Regents model, from the Grade 8 mathematics test; for the ELA Regents model, from the Grade 8 ELA test) was used. For the GRE measure, average Grade 8 achievement at the school level in ELA and mathematics was used. Note that separate mean prior variables were used for Common Core–aligned and prior versions of State assessments.
- **Range Around Mean Prior Score (Grades 4-8 Growth Measures Only).** Classrooms or courses with the same average prior score may differ in the range of prior scores, and students may have different growth trajectories based on being in classrooms or courses with more widely varying prior scores than those with more closely bunched prior scores. In other words, students' peers may affect students not only through their average ability but also through the diversity of ability levels in the classroom or course. This aggregate-level variable is an indicator of the magnitude of difference in prior achievement in a teacher's class or course, calculated as the interquartile range of prior test scores—that is, the distance between the 25th and the 75th percentile of prior performance in the class or course. This variable was calculated using prior achievement scores in the same subject in a teacher's class or course. For example, for the ELA model, the interquartile range of prior scores in ELA in a teacher's class or course was used in the model.
- **New to School in Non-articulation Year.** This student-level variable is intended to account for differences among students who enroll in a school at a different grade level than the typical entering year for most students. For example, a student enrolls as a seventh grader in a school that serves Grades 6-8 when most other students entered the school at Grade 6, or for students in a Grades 9-12 school, a student enters in a grade other than Grade 9. To compute this variable for the Grades 4-8 model, a student's tested school and grade in 2021-22 was compared with their prior tested school and the range of grades served in the school, if available. For Grades 9-12 models, enrollment data from 2020-21 and 2021-22 were compared.
- **Years Since Entering Ninth Grade (Grades 9-12 Growth Measures Only).** This variable is intended to account for differences among students related to when they take Regents Exams, rather than using a student's grade level (because student grade assignment is affected by credit accumulation and Regents Exams are taken in many different grades).

For example, a student who takes the Algebra I Regents Exam in his third year after entering Grade 9 has a different academic history than a student who takes the exam in his first year as a 9th grader. This variable is used as an alternative to the "retained in grade" variable used in Grades 4-8 analysis as a way to compare students with similar kinds of academic histories. To compute this variable, the Grade 9 entry date provided on an enrollment file was used.

- **Count of Prior Required Regents Exams (Grades 9-12 Measures Only).** This variable captures the number of Regents Exams, Exemptions, and Alternatives in the five traditionally required subject areas[18] that students have passed before the current year (in this case, 2021-22) for Grades 9-12 MGP models. To compute this variable, we reviewed Regents assessment score files back to 2013-14, including Regents exemptions from 2019-20.

Students with Disabilities Variables

- **Student with Disability Status.** A yes or no variable is used for each student to indicate the student has an individualized education program (IEP). This variable was derived directly from the assessment score file, representing data that districts reported to the State.
- **Student with Disability Spending Less Than 40% Time in General Education Settings.** This variable is intended to account for differences among special education students in terms of the intensity or type of services received. According to Individuals with Disabilities Education Act (IDEA) requirements, students should be enrolled in the least restrictive environment (LRE) appropriate for their learning needs. This variable identifies students who spend less than 40% of their time in a general education setting (who may have a disability requiring more specialized or intensive services). This variable was derived directly from the assessment score file, representing data that districts reported to the State.
- **Percentage of Students with Disabilities.** This variable is intended to account for differences in the learning environment for courses or schools serving different proportions of special education students. The variable was defined as the percentage of students identified as having a disability in the class or course for Grades 4-8 growth measures and the percentage of students identified as having a disability in the school for Grades 9-12 measures.

[18] See footnote 2 for details on the change in graduation requirements beginning in the 2014-15 school year.

English Language Learner Variables

- **ELL Status.** This variable is a yes or no variable for each student to indicate whether he or she is an ELL student. This variable was derived directly from the assessment score file, representing data that districts reported to the State. Part 154 of Commissioner's Regulations defines students with limited English proficiency as students who, by reason of foreign birth or ancestry, speak or understand a language other than English and speak or understand little or no English, and require support in order to become proficient in English and are identified pursuant to Section 154-2.3 of this Subpart.
- **NYSESLAT Scores.** This variable is intended to account for differences in the English language proficiency of students identified as ELLs by controlling directly for their prior year NYSESLAT scores. For Grades 9-12 models, NYSESLAT scores from Grade 7/8 forms were used. Two versions of NYSESLAT scores are used in Grades 9-12 models. Separate predictor variables were included for NYSESLAT scores from, 2014-15, and 2015-16 and later. For Grades 4-8 models, only NYSESLAT scores from the immediate prior year were used.
- **Percentage of ELL Students.** This variable is intended to account for differences in the learning environment for courses or schools serving diverse proportions of ELL students. The variable was defined as the percentage of students identified as ELL in the class or course for the Grades 4-8 growth measures and the percentage of students identified as ELL in the school for the Grades 9-12 measures.

Economically Disadvantaged Variables

- **Economic Disadvantage (Poverty).** A yes or no variable for each student indicates whether the student is identified as economically disadvantaged based on eligibility for a variety of State economic assistance programs. This flag was set to yes for students whose families participate in economic assistance programs, such as the free or reduced-price lunch programs, Social Security Insurance, food stamps, foster care, refugee assistance, earned income tax credit, the Home Energy Assistance Program, Safety Net Assistance, the Bureau of Indian Affairs, or Temporary Assistance for Needy Families, based on district-provided information. This variable was derived directly from the assessment score file, representing data that districts reported to the State.
- **Percentage of Economically Disadvantaged Students.** This variable is intended to account for differences in the learning environment for courses or schools serving diverse proportions of economically disadvantaged students. The variable was defined as the percentage of students identified as economically disadvantaged in the class or course for the Grades 4-8 growth measures and percentage of students identified as economically disadvantaged in the school for the Grades 9-12 measures.

Appendix B. Technical Advisory Committee Members

Member	Affiliation[1]
Dan Goldhaber	University of Washington
Hamilton Lankford	State University of New York Albany
Daniel F. McCaffrey	ETS/RAND
Jonah Rockoff	Columbia University
Tim R. Sass	Georgia State University
Douglas Staiger	Dartmouth College
Marty West	Harvard University
James A. Wyckoff	University of Virginia

1. Affiliations are shown as of the time of the Technical Advisory Group's meetings with New York State in 2012-13.

Appendix C. Grades 4-8 Data Processing Overview

The process used to convert the raw data to results runs through six standardized processes for both the 4-8 and 9-12 results. The process and raw data files used to produce the 4-8 results are explained in greater detail below.

Raw Data

All historical and current data files transferred from NYSED. In addition to EA's standard raw data QC process, we conducted an additional quality control check this year where EA and NYSED separately confirmed the file size and number of rows in each file transferred. This ensured that the files were complete and there would be no missing data. The raw data files that were used in the production of 4-8 growth results this year include:

1. **Assessment and CSEM (2021-22, 2020-21, 2018-19, and 2017-18)** – Student-level results on the state 3-8 assessments and CSEMs.
2. **New York State English as a Second Language Achievement Test (NYSESLAT)** – Assessment to determine an English language learner's English language proficiency level.
3. **Directory** – Listing of all New York State Public and Nonpublic Schools.
4. **Teacher Student Course** – Students linked to each teachers' classroom used to attribute students to teachers.
5. **Staff Assignment** – Students linked to programs that principals oversee including the start and end dates.
6. **Enrollment (Grade 8 Algebra I Continuous Enrollment, and BOCES Enrollment)** – Students who were enrolled on Basic Educational Data System (BEDS) day and during the test administration period.

Standard Data

Raw data are transformed into a standardized format that 1) facilitates the processing of raw data through business rules and 2) can be interpreted by other analysts. Throughout this process, raw data modifications are catalogued, all observations are maintained, and variable names are standardized.

Input Sets

Most of the business rules in data processing are applied in transition from standard data to input sets. Input sets are the data sets that are used to estimate the regression models. Students who will ultimately be excluded from the model are retained in the input sets with an exclusion reason flag activated. These exclusion reasons, which describe students excluded

from the growth results for teachers, schools, and principals, are investigated as part of the process of producing input sets.

Modeling

The statistical models are computed using the input sets in the modeling phase and the output is analyzed using a diagnostics tool that examines coefficients, residual mean squared error, student predictions, highest observable scale score, lowest observable scale score, and other key metrics.

Aggregation

Results from the modeling phase are combined to create teacher, principal, and school level metrics, such as Mean Growth Percentile, for each level. This step also includes examining aggregate diagnostic measures such as neutralities, reliability, and sample size.

Output

After the aggregation step, the rules for HEDI points and ratings are applied and the final files are created for NYSED and parsed for each district.

Appendix D. Grades 4-8 Item Description Used in Analysis

The teacher-student-course linkage file includes information about courses taught to students. The item description provides information about which courses are relevant to State tests. Table D1 shows the records used for growth model analysis. Students enrolled in Algebra I (course code 02052CC), Geometry (course code 02072CC), or Algebra 2 (course code 02056CC) who take Grades 6-8 mathematics assessments or Grade 8 students who take the Algebra I Regents examination are included in the analysis.

Table D1. Relevant Grades 4-8 Item Descriptions

Item Description
Grade 3 ELA
Grade 3 Mathematics
Grade 4 ELA
Grade 4 Mathematics
Grade 5 ELA
Grade 5 Mathematics
Grade 6 ELA
Grade 6 Mathematics
Grade 7 ELA
Grade 7 Mathematics
Grade 8 ELA
Grade 8 Mathematics
Grade 8 Algebra I

Appendix E. Model Derivation

The following describes a general case of the growth model described in this report.

To describe how the model accounts for measurement variance, we first re-express the true score regression as follows:

$$y_t^* = X\beta + \sum_{r=1}^{L} y_{t-r}^* \gamma_{t-r} + Z\theta + e$$

We use $*$ to denote the variables without measurement variance. For convenience, the matrices are defined as $\mathrm{W} = \{\mathrm{X}, \mathrm{y_{t-1}}, \mathrm{y_{t-2}}, \ldots, \mathrm{y_{t-L}}\}$, $W^* = \{X, y_{t-1}^*, y_{t-2}^*, \ldots, y_{t-L}^*\}$, and $\delta' = \{\beta', \gamma'\}$. Label the matrix of measurement variance disturbances U for disturbances associated with $y_{t-1,} y_{t-2,\ldots} y_{t-L,}$ and label the vector of measurement disturbances with the dependent variable, y_t, v, hence $y_t = y_t^* + v$ v. Let U have the same dimensions as W, but only the final L columns of U are nonzero, so $\mathrm{W} = \mathrm{W}^* + \mathrm{U}$. If those disturbances were observed, the parameters $\{\delta', \theta'\}$ can be estimated using Henderson's methods (1953) by solving the following mixed model equations:

$$\begin{pmatrix} W^{*\prime}\Omega^{-1}W^* & W^{*\prime}\Omega^{-1}Z \\ Z'\Omega^{-1}W^* & Z'\Omega^{-1}Z + D^{-1} \end{pmatrix} \begin{pmatrix} \delta \\ \theta \end{pmatrix} = \begin{pmatrix} W'\Omega^{-1}y_t^* \\ Z'\Omega^{-1}y_t^* \end{pmatrix}$$

The matrix D is made up of Q diagonal blocks, one for each level in the hierarchy. Each diagonal is constructed as $\sigma_q^2 I_q$, where I_q is an identity matrix with dimensions equal to the number of units at level q, and σ_q^2 is the estimated variance of the random effects among units at level q. When concatenated diagonally, the square matrix D has dimension $m = \Sigma_{q=1}^{Q} J_q$.

Two complications intervene. First, we cannot observe U; second, the unobservable nature of this term, along with the heterogeneous measurement variance in the dependent variable, renders this estimator inefficient.

Addressing the first issue, on expansion we see that

$$W'\Omega^{-1}W = (W^{*\prime} + U')\Omega^{-1}(W^* + U) = W^{*\prime}\Omega^{-1}W^* + U'\Omega^{-1}W^* + W^{*\prime}\Omega^{-1}U + U'\Omega^{-1}U$$

Taking expectation over the measurement error distributions and treating the true score matrix, W^*, as fixed, we have

$$\mathrm{E}(\mathrm{W}'\Omega_{-1}\mathrm{W}) = \mathrm{E}((\mathrm{W}_{*'} + \mathrm{U}')\Omega_{-1}(\mathrm{W}_* + \mathrm{U})) = \mathrm{W}_{*'}\Omega_{-1}\mathrm{W}_* + \mathrm{E}(\mathrm{U}'\Omega_{-1}\mathrm{U})$$

We also have $Z'\Omega^{-1}W^* = \mathrm{E}(Z'\Omega^{-1}W)$, with the expectation taken over the measurement

error distributions associated with observed W, and $\begin{pmatrix} W'\Omega^{-1}y_t^* \\ Z'\Omega^{-1}y_t^* \end{pmatrix} = E\begin{pmatrix} W'\Omega^{-1}y^t \\ Z'\Omega^{-1}y^t \end{pmatrix}$, with the expectation taken over the measurement error distributions associated with observed y_t.

Addressing the second issue, both the right-side and left-side variables in the model equation measured with variance contribute to the heteroscedasticity. Although the correction $U'\Omega^{-1}U$ eliminates the bias caused by measurement variance associated with the independent variables, we still do not have a variance-free measure of y for any time period. Therefore, the residual is made up of

$$\bar{\bar{y}} - W'\delta = -U'\delta + v + e$$

where $\bar{\bar{y}} = y - z\tilde{\theta}$, and $\tilde{\theta}$ is the conditional mean of the random effects. The residual variance of any given observation is:

$$\sigma_{ti}^2 = \sigma_e^2 + \sigma_v^2 + \sum_{r=1}^{L} \delta_{t-r}^2 \, \sigma_{u,t-r(i)}^2$$

where $\sigma_{u,t-r(i)}^2$ is the known measurement variance of r prior test scores. Now, let Ω be a diagonal matrix of dimension N with diagonal elements σ_{ti}^2.

We can now define the mixed model equations as follows:

$$\begin{pmatrix} E(W'\Omega^{-1}W) - E(U'\Omega^{-1}U) & W'\Omega^{-1}Z \\ E(Z'\Omega^{-1}W) & Z'\Omega^{-1}Z + D^{-1} \end{pmatrix}\begin{pmatrix} \delta \\ \theta \end{pmatrix} = E\begin{pmatrix} W'\Omega^{-1}y_t \\ Z'\Omega^{-1}y_t \end{pmatrix}$$

Using observed scores and measurement error variance, the mixed model equations are redefined as follows:

$$\begin{pmatrix} W'\Omega^{-1}W - E(U'\Omega^{-1}U) & W'\Omega^{-1}Z \\ Z'\Omega^{-1}W & Z'\Omega^{-1}Z + D^{-1} \end{pmatrix}\begin{pmatrix} \delta \\ \theta \end{pmatrix} = \begin{pmatrix} W'\Omega^{-1}y_t \\ Z'\Omega^{-1}y_t \end{pmatrix}$$

Observed Values for $E(U'\Omega^{-1}U)$

As indicated, U is unobserved, so solving the mixed model equation cannot be computed unless U is replaced with some observed values. First, the mixed model equations are redefined as

$$\begin{pmatrix} W'\Omega^{-1}W - S & W'\Omega^{-1}Z \\ Z'\Omega^{-1}W & W'\Omega^{-1}Z \end{pmatrix}\begin{pmatrix}\delta \\ \theta\end{pmatrix} = \begin{pmatrix} W'\Omega^{-1}y_t \\ Z'\Omega^{-1}y_t \end{pmatrix}$$

where S is a diagonal "correction" matrix with dimensions p × p accounting for measurement variance in the predictor variables $p - p_x + L$, and p_x is the column dimension of X.
The matrix S is used in lieu of $\mathrm{E}(\mathrm{U}'\Omega^{-1}\mathrm{U})$ based on the following justification. Recall that we previously defined Ω as $diag(\sigma_{t1}^2, \sigma_{t2}^2, \ldots \sigma_{tN}^2$, and the matrix of unobserved disturbances is

$$U = \begin{bmatrix} 0_{pX} & 0 \\ 0 & U_L \end{bmatrix}$$

where $0_{pX}$is a matrix of dimension of $p_x$with elements of 0, and

$$U_L = \begin{bmatrix} u_{11} & u_{12} & \cdots & u_{1L} \\ u_{21} & u_{22} & \cdots & u_{2L} \\ \vdots & \vdots & \ddots & \vdots \\ u_{N1} & u_{N2} & \cdots & u_{NL} \end{bmatrix}$$

The theoretical result of the matrix operation yields the following symmetric matrix:

$$\begin{bmatrix} \sum_{i=1}^{N}\frac{1}{\sigma_{ti}^2}u_{i1}^2 & \sum_{i=1}^{N}\frac{1}{\sigma_{ti}^2}u_{i1}u_{i2} & \cdots & \sum_{i=1}^{N}\frac{1}{\sigma_{ti}^2}u_{i1}u_{iL} \\ \sum_{i=1}^{N}\frac{1}{\sigma_{ti}^2}u_{i1}u_{i2} & \sum_{i=1}^{N}\frac{1}{\sigma_{ti}^2}u_{i2}^2 & \cdots & \sum_{i=1}^{N}\frac{1}{\sigma_{ti}^2}u_{i2}u_{iL} \\ \vdots & \vdots & \ddots & \vdots \\ \sum_{i=1}^{N}\frac{1}{\sigma_{ti}^2}u_{i1}u_{iL} & \sum_{i=1}^{N}\frac{1}{\sigma_{ti}^2}u_{i2}u_{iL} & \cdots & \sum_{i=1}^{N}\frac{1}{\sigma_{ti}^2}u_{iL}^2 \end{bmatrix}$$

The theoretical result is limited only because we do not observe u_{ip} because it is latent.

However, $\mathrm{E}(u_{ip}u_{ip}) = \sigma_{ip}^2$, where σ_{ip}^2 is taken as the square of the conditional standard error of measurement for student i. The theoretical result also simplifies because variances of measurement on different variables are by expectation uncorrelated: $\mathrm{E}(u_{ip}u_{ip'}) = 0$ when p $\neq$ p′.

Because the conditional standard error of measurement varies for each student i and the off-diagonals can be ignored, let S be

$$\mathrm{S} = \mathrm{diag}\,(0, \ldots, 0, \sum_{i=1}^{N}\frac{1}{\sigma_{ti}^2}\sigma_{u,t-1(i)}^2, \sum_{i=1}^{N}\frac{1}{\sigma_{ti}^2}\sigma_{u,t-2(i)}^2, \ldots, \sum_{i=1}^{N}\frac{1}{\sigma_{ti}^2}\sigma_{u,t-L(i)}^2)$$

where $\sigma_{u^2,j(i)}$ denotes the measurement variance for the jth – $j = (1,2, \dots, L)$ – variable measured with variance.

Appendix F. Interpolating Standard Errors of Measurement at the Lowest and Highest Obtainable Scale Scores

The linear model used to produce student-level predictions $\hat{y}_i$ can cause these predictions to fall outside the boundaries of the defined scale score. Let the floor and ceiling in the data be denoted as η_f and η_c, respectively. It is, therefore, possible that $\hat{y}_i < \eta_f$ or $\eta_c < \hat{y}_i$. However, the observed score can never fall outside these bounds.

When a prediction falls outside the boundaries of the scale score, it can cause bias in the statistics used to characterize a student, teacher, principal, or school. This phenomenon seems to occur as a result of the large conditional standard errors of measurement at the extreme scores, $csem(\hat{\theta}_i)$. The following procedure is implemented to deal with these large standard errors.

Interpolation Procedure for Conditional Standard Errors of Lowest and Highest Obtainable Scale Scores

Interpolate new conditional standard errors of measurement as the "nearest neighbor" of any extreme value. Thus, at an $M = 2$ cutoff, for the highest obtainable scale score (HOSS) and the score immediately below the HOSS, the SEM associated with the score two below the HOSS would be used. Similarly, the lowest obtainable scale score (LOSS) and the score immediately above the LOSS would have the SEM associated with the score two above the LOSS. As M increases, more points are included, and the point they are set to moves toward the middle of the scale score distribution.

Implement the linear regression using the following steps:

Step 1. Run the regression without modification.
Step 2. Verify that $\eta_f \leq \hat{y}_i \leq \eta_c$ for all i.
Step 3. If the inequality in Step 2 is true, stop; the run is complete. Otherwise, continue to Step 4.
Step 4. Set $M = 1$ and update the SEMs of the exact HOSS and LOSS scores.
Step 5. Use the updated $csem(\hat{\theta}_i)$ in lieu of the standard error of the LOSS and HOSS in the test score data.
Step 6. Run the growth model.
Step 7. Verify the inequality in Step 2; if it holds, stop updating. If it does not hold, increase M by 1 and return to Step 5.

If this method does not result in the inequality in Step 2 being met after $M = 7$ (i.e., after running with $M = 7$), then simply take the most recent run that did converge, set $\hat{y}_i = \eta_c$where $\hat{y}_i > \eta_c$, and $\hat{y}_i = \eta_f$ where $\hat{y}_i < \eta_f$. For the predicted variance, use the predicted variance of the closest estimate where the inequality in Step 6 does hold.

Appendix G. Grades 9-12 Data Processing Overview

The process used to convert the raw data to results for Grades 9-12 runs through the same six standardized processes outlined in Appendix C for Grades 4-8. The raw data files used to produce the Grades 9-12 results are explained in greater detail below.

Raw Data

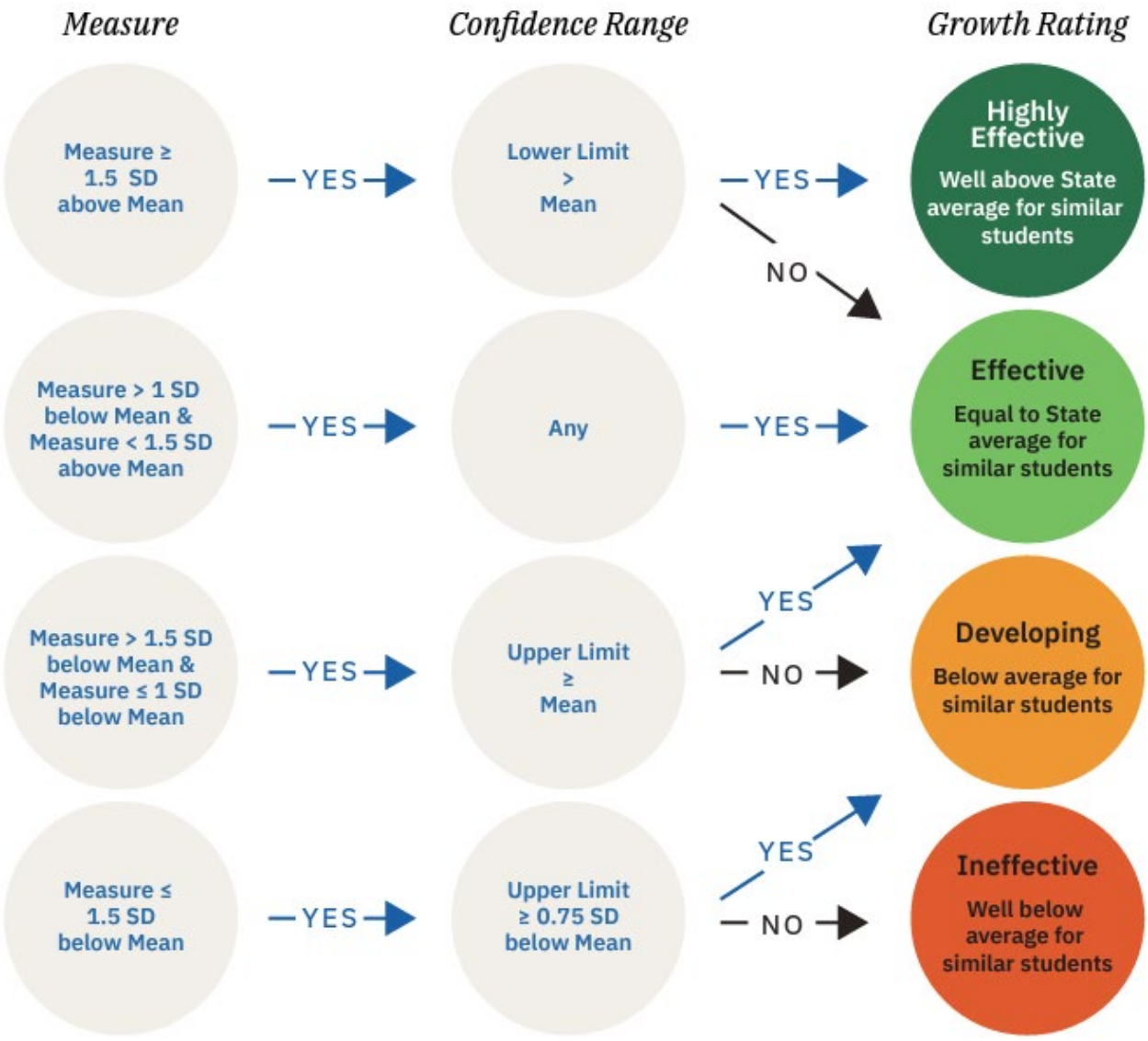
The raw data files that were used in the production of 9-12 growth results this year include:

1. **Regents Assessment Files (2013-14 – 2021-22)** – Student-level results on the Regents Examinations.
2. **Assessment and CSEM (2010-11 – 2021-22)** – Student-level results on the state Grades 3-8 assessments and CSEMs.
3. **New York State English as a Second Language Achievement Test (NYSESLAT)** – Assessment to determine an English language learner's English language proficiency level.
4. **Directory** – Listing of all New York State Public and Nonpublic Schools and the grades served.
5. **Staff Assignment** – Students linked to programs that principals oversee including the start and end dates.
6. **Enrollment (2018-19 – 2021-22)** – Students that were enrolled on Basic Educational Data System (BEDS) day and during the test administration period and demographics information.

Appendix H. Assigning HEDI Ratings and Points

HEDI ratings are assigned according to Figure G 1, shown in the body of the report but repeated here for reference.

Figure H1 HEDI Rating Rules



HEDI ratings are assigned in Grades 4-8 for the combined MGPs (pooled across Grades 4-8 ELA and Grades 4-8 mathematics), in Grades 9-12 for the combined growth model (pooled across ELA and Algebra I), and in Grades 9-12 for the GRE model. Values used in 2021-22 to assign

HEDI ratings for teachers are shown in Table G1; for schools, in Table G2; and for principals, in Table G3.

Table H1 Teachers Grades 4-8 HEDI Rating Values

Measure	Grades 4-8 Growth Model
Mean	50.779
Standard Deviation	11.508
Highly Effective	68 ≤ MGP and confidence range lower limit > 51
Effective	68 ≤ MGP and confidence range lower limit ≤ 51
Effective	39 < MGP < 68
Effective	34 < MGP ≤ 39 and confidence range upper limit ≥ 51
Developing	34 < MGP ≤ 39 and confidence range upper limit < 42
Developing	MGP ≤ 34 and confidence range upper limit ≥ 42
Ineffective	MGP ≤ 34 and confidence range upper limit < 42

Table H2 School HEDI Rating Values

Measure	Grades 4-8 Growth Model	Grades 9-12 Growth Model	Grades 9-12 GRE Model
Mean	50.752	52.560	0.012
Standard Deviation	8.048	10.074	0.280
Highly Effective	63 ≤ MGP and confidence range lower limit > 59	68 ≤ MGP and confidence range lower limit > 42	0.43 ≤ MGP and confidence range lower limit > 0.29
Effective	69 ≤ MGP and confidence range lower limit ≤ 51	68 ≤ MGP and confidence range lower limit ≤ 53	0.43 ≤ MGP and confidence range lower limit ≤ 0.01
Effective	43 < MGP < 63	42 < MGP < 68	0.27 < MGP < 0.43
Effective	43 < MGP ≤ 45 and confidence range upper limit ≥ 51	42 < MGP ≤ 45 and confidence range upper limit ≥ 51	0.27 < MGP ≤ 0.20 and confidence range upper limit ≥ 0.01
Developing	39 < MGP ≤ 43 and confidence range upper limit < 45	37 < MGP ≤ 42 and confidence range upper limit < 45	0.41 < MGP ≤ 0.20 and confidence range upper limit < 0.27

Developing	MGP ≤ 39 and confidence range upper limit ≥ 43	MGP ≤ 37 and confidence range upper limit < 42	MGP ≤ 0.41 and confidence range upper limit < 0.27
Ineffective	MGP ≤ 43 and confidence range upper limit < 39	MGP ≤ 37 and confidence range upper limit < 42	MGP ≤ 0.41 and confidence range upper limit < 0.27

Table H3 Principal HEDI Rating Values

Measure	Grades 4-8 Growth Model	Grades 9-12 Growth Model	Grades 9-12 GRE Model
Mean	50.650	52.481	0.016
Standard Deviation	7.933	10.267	0.275
Highly Effective	63 ≤ MGP and confidence range lower limit > 58	68 ≤ MGP and confidence range lower limit > 42	0.43 ≤ MGP and confidence range lower limit > 0.29
Effective	68 ≤ MGP and confidence range lower limit ≤ 51	68 ≤ MGP and confidence range lower limit ≤ 53	0.43 ≤ MGP and confidence range lower limit ≤ 0.01
Effective	43 < MGP < 63	42 < MGP < 68	0.27 < MGP < 0.43
Effective	43 < MGP ≤ 63 and confidence range upper limit ≥ 51	42 < MGP ≤ 45 and confidence range upper limit ≥ 51	0.27 < MGP ≤ 0.20 and confidence range upper limit ≥ 0.01
Developing	39 < MGP ≤ 43 and confidence range upper limit < 45	37 < MGP ≤ 42 and confidence range upper limit < 45	0.41 < MGP ≤ 0.20 and confidence range upper limit < 0.27
Developing	MGP ≤ 39 and confidence range upper limit ≥ 43	MGP ≤ 37 and confidence range upper limit < 42	MGP ≤ 0.41 and confidence range upper limit < 0.27
Ineffective	MGP ≤ 43 and confidence range upper limit < 39	MGP ≤ 37 and confidence range upper limit < 42	MGP ≤ 0.41 and confidence range upper limit < 0.27

Table H4 Cut Points for HEDI Scores

HEDI Points	HEDI Score Points	
	Minimum	Maximum
Highly Effective	18	20
Effective	15	17
Developing	13	14
Ineffective	0	12

Starting from the highest MGP or GRE score in a HEDI category, educators are awarded HEDI points so that those with the highest value on the metric (MGP or GRE) in the rating category receive the highest score.

Scores lower than the highest score are assigned so that at any HEDI score point, the number of educators with that HEDI score or higher is proportional to (or larger than) the proportion of score points in that category that are at least as large as the score point. For example, the HEDI rating Highly Effective is associated with HEDI score points 18, 19, and 20. For educators who receive a HEDI rating of Highly Effective, at least one third of them will receive 20 HEDI score points, and at least two thirds of them will receive 19 or 20 HEDI score points.

The tables that follow display the observed minimum and maximum MGP and GRE scores for the Grades 4-8 and 9-12 MGP and GRE models.

Table H5 Grades 4-8 Teacher, School, and Principal MGP HEDI Point Distribution

	Teacher		School		Principal	
HEDI Points	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
0	9	20	11.0	28.0	11.0	28.5
1	21	22	28.5	31.5	29.5	31.5
2	23	23	32.0	33.0	32.0	33.0
3	24	24	33.5	34.0	33.5	34.0
4	25	25	34.5	35.0	34.5	35.0
5	26	26	35.5	35.5	35.5	35.5
6	27	27	36.0	36.0	36.0	36.0
7	28	28	36.5	36.5	36.5	36.5

8	29	29	37.0	37.0	37.0	37.0
9	30	30	37.5	37.5	37.5	37.5
10	31	31	38.0	38.0	38.0	38.0
11	32	32	38.5	38.5	38.5	38.5
12	33	34	39.0	39.0	39.0	39.0
13	26	35	33.0	40.5	34.0	41.0
14	36	39	41.0	43.0	41.5	43.0
15	35	47	39.5	48.5	40.0	48.0
16	48	55	49.0	53.5	48.5	53.5
17	56	67	54.0	64.5	54.0	63.5
18	68	69	63.0	64.0	63.0	64.0
19	70	72	64.5	67.0	64.5	67.0
20	73	92	67.5	84.0	67.5	84.0

Table H6 Grades 9-12 School and Principal MGP HEDI Point Distribution

	School		Principal	
HEDI Points	Minimum	Maximum	Minimum	Maximum
0	15.0	22.5	15.0	22.5
1	23.5	25.5	23.5	25.5
2	26.5	27.5	26.5	27.5
3	28.0	29.0	28.0	29.0
4	29.5	30.5	29.5	30.5
5	31.0	32.0	31.0	32.0
6	32.5	33.0	32.5	33.0
7	33.5	33.5	33.5	33.5
8	34.5	34.5	34.5	34.5
9	35.0	35.0	35.0	35.0
10	35.5	35.5	35.5	35.5
11	36.0	36.5	36.0	36.5
12	37.0	37.0	37.0	37.0
13	30.0	39.5	30.0	39.5

14	40.0	42.0	40.0	42.0
15	39.0	50.5	39.0	50.5
16	51.0	57.0	51.0	57.0
17	57.5	69.0	57.5	69.0
18	68.0	69.5	68.0	69.5
19	70.0	72.5	70.0	72.5
20	73.0	85.0	73.0	85.0

Table H7 Grades 9-12 School and Principal GRE HEDI Point Distribution

	School		Principal	
HEDI Points	Minimum	Maximum	Minimum	Maximum
0	-1.19	-0.84	-1.19	-0.84
1	-0.84	-0.78	-0.83	-0.78
2	-0.77	-0.69	-0.77	-0.69
3	-0.68	-0.63	-0.68	-0.63
4	-0.62	-0.60	-0.62	-0.60
5	-0.59	-0.57	--0.59	-0.57
6	-0.56	-0.54	-0.56	-0.54
7	-0.53	-0.52	-0.53	-0.52
8	-0.51	-0.49	-0.51	-0.49
9	-0.47	-0.46	-0.47	-0.46
10	-0.45	-0.45	-0.25	-0.45
11	-0.44	-0.44	-0.44	-0.44
12	-0.43	-0.41	-0.43	-0.41
13	-0.42	-0.33	-0.42	-0.33
14	-0.32	-0.27	-0.32	-0.27
15	-0.39	-0.04	-0.39	-0.04
16	-0.03	0.14	-0.03	0.14
17	0.15	0.42	0.15	0.42
18	0.44	0.52	0.44	0.52
19	0.53	0.61	0.53	0.61

20	0.62	2.43	0.62	2.43

When an educator has at least 16 attributed students or student scores in only one of the three growth measures (Grades 4-8 MGP, Grades 9-12 MGP, or Grades 9-12 GRE), then the HEDI rating and score based on that growth measure serves as the educator's final HEDI rating and score. However, most Grades 9-12 schools and principals have multiple HEDI ratings and scores (Grades 9-12 MGP and Grades 9-12 GRE), and some schools and principals may have multiple HEDI ratings and scores if they serve students in Grades 4-8 and 9-12. HEDI ratings and scores from the Grades 9-12 MGP and Grades 9-12 GRE models are first combined to create an overall Grades 9-12 HEDI rating and score. HEDI ratings and scores from the Grades 4-8 MGP model and the overall Grades 9-12 HEDI rating and score are then combined to obtain a final overall rating.

To combine HEDI ratings and scores, we used the following procedure, pooling all educators at a given level (principals or schools) across the State into a single group and using only their appropriate HEDI score from the column labeled "HEDI Score Points" in Table G4.

Step 1. Find the aggregate HEDI growth score using the following equation:

$$G = \frac{n_A G_{A+} n_B G_B}{n_{A+} n_B}$$

where G is the growth score, n is the number of students attributed to a school, the subscript A is one of the two HEDI scores being combined, and the subscript B is the other HEDI score being combined. If either of the HEDI scores is not assigned because n was not at least 16, simply set G equal to the assigned HEDI score and continue. For example, if only n_A is greater than or equal to 16 ($n_A \geq 16, n_B < 16$), then $G = G_A$.

The same also holds if A and B are switched in the example. Also, if neither HEDI scores was assigned ($n_A < 16, n_B < 16$), set G to missing and do not include in the final HEDI score.

Step 2. Round G to the nearest integer. This integer is the HEDI score for the combination.

Step 3. For *all* schools and principals, assign a final HEDI rating by using the cut points table, assigning the HEDI rating associated with each principal's or school's final rounded HEDI point value (G from Step 2) based on the column labeled "HEDI Score Points".

Step 4. Every principal and school with two HEDI ratings and scores to combine is assigned a 3012-d HEDI rating and score by applying the rules for assigning scores described previously to the unrounded value of G found in Step 1. 3012-d ratings are then reported only to educators in relevant districts.

Appendix I. Model Coefficients

The tables that follow display regression model coefficients (labeled as "Effects") for the New York growth model in each grade and subject. For the Grades 4-8 model and the Grades 9-12 MGP model, these model coefficients represent the predicted change in current year test scores for one unit of change in each variable shown in the table, holding other variables constant. For example, in Table H2, holding all other variables constant, the predicted change in a student's current year ELA test score given a one-point increase in a student's prior grade ELA test score is 0.822. The interpretation of a one-unit change varies by variable type. For yes/no variables, model coefficients represent the predicted change in current year test scores given a change from no to yes. For example, in Table H2, holding all other variables constant, the predicted difference in a student's current year ELA test score if the student has a disability (versus a student without a disability) is -3.489 points. Missing flags also are yes/no variables set to yes if the noted variable is missing and no otherwise. Variables that are percentages are on a scale from 0 to 100 and represent the change in prediction for a single percentage point increase.

Because the GRE model has a different form (an ordered logistic regression) than the MGP model, GRE model coefficients (labeled as "Estimates") are not interpretable as linear changes in the outcome given a one-unit change in a predictor. Instead, the predicted number of Regents Exams passed varies according to the equations in the section titled "Comparative Growth in Regents Exams Passed Model." For example, in Table H31, because the coefficient is positive, an increase in the Grade 8 ELA scale scores from 2017-18 and subsequent years is associated with a higher number of GRE Exams passed in the current year. Larger positive coefficients indicate larger predicted increases in the number of Regents Exams passed in the current year per unit change in the predictor variable. Predictor variables with fewer than 10 cases in the GRE models were dropped from analysis.

Because of the differences in model and variable types, it is important to keep in mind that effect sizes cannot be compared directly across different types of variables.

Table I1. Grade 4 ELA Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	60.251	2.083	0.000
Prior-Grade ELA Scale Score	0.892	0.003	0.000

Table I2. Grade 4 ELA Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	79.37	3.921	0.000
Mean Prior Score	-0.061	0.007	0.000
Range Around Prior Score	-0.023	0.005	0.000
Prior-Grade ELA Scale Score	0.822	0.010	0.000
Prior-Grade Mathematics Scale Score	0.070	0.008	0.000
Missing Flag: Prior-Grade Mathematics Scale Score	41.392	4.667	0.000
Grades 3-4 NYSESLAT Scale Score	0.072	0.005	0.000
Missing Flag: Grades 3-4 NYSESLAT Scale Scores	18.684	1.539	0.000
Missing Flag: Percentage Variables	-37.563	4.512	0.000
New to School	-0.132	0.191	0.49
General Education < 40% (LRE3)	-6.554	0.410	0.000
ELLs	2.835	0.381	0.000
Percentage of ELLs	-0.051	0.005	0.000
Economically Disadvantaged	-0.228	0.122	0.060
Percentage of Economically Disadvantaged	0.018	0.003	0.000
Students with Disabilities	-3.489	0.179	0.000
Percentage of Students with Disabilities	-0.006	0.004	0.107

Table I3. Grade 5 ELA Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	103.553	2.169	0.000
Prior-Grade ELA Scale Score	0.826	0.004	0.000

Table I4. Grade 5 ELA Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	131.142	3.675	0.000
Mean Prior Score	-0.108	0.007	0.000
Range Around Prior Score	-0.036	0.005	0.000

Prior-Grade ELA Scale Score	0.774	0.009	0.000
Prior-Grade Mathematics Scale Score	0.073	0.007	0.000
Missing Flag: Prior-Grade Mathematics Scale Score	42.311	4.293	0.000
Retained in Grade	-0.562	0.774	0.468
Grades 3-4 NYSESLAT Scale Score	0.094	0.006	0.000
Missing Flag: Grades 3-4 NYSESLAT Scale Scores	27.597	1.720	0.000
New to School	0.421	0.219	0.054
Missing Flag: Percentage Variables	-67.327	4.155	0.000
General Education < 40% (LRE3)	-5.579	0.400	0.000
ELLs	3.77	0.388	0.000
Percentage of ELLs	-0.057	0.006	0.000
Economically Disadvantaged	0.066	0.119	0.579
Percentage of Economically Disadvantaged	0.012	0.003	0.000
Students with Disabilities	-3.069	0.177	0.000
Percentage of Students with Disabilities	-0.029	0.004	0.000

Table I5. Grade 6 ELA Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	73.473	1.786	0.000
Prior-Grade ELA Scale Score	0.581	0.005	0.000
Three-Grades-Prior ELA Scale Score	0.300	0.006	0.000
Missing Flag: Three-Grades-Prior ELA Scale Score	177.497	3.415	0.000

Table I6. Grade 6 ELA Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	52.145	3.880	0.000
Mean Prior Score	0.009	0.006	0.140
Range Around Prior Score	-0.02	0.006	0.001
Prior-Grade ELA Scale Score	0.528	0.007	0.000
Prior-Grade Mathematics Scale Score	0.071	0.005	0.000
Missing Flag: Prior-Grade Mathematics Scale Score	42.274	3.113	0.000
Retained in Grade	-0.294	0.565	0.603
Three-Grades-Prior ELA Scale Score	0.272	0.006	0.000
Missing Flag: Three-Grades-Prior ELA Scale Score	160.834	3.427	0.000
Grades 5-6 NYSESLAT Scale Score	0.085	0.006	0.000

Missing Flag: Grades 5-6 NYSESLAT Scale Scores	22.254	1.657	0.000
New to School	0.300	0.212	0.157
Missing Flag: Percentage Variables	6.220	3.816	0.103
General Education < 40% (LRE3)	-2.222	0.394	0.000
ELLs	0.939	0.368	0.011
Percentage of ELLs	-0.031	0.005	0.000
Economically Disadvantaged	-0.628	0.107	0.000
Percentage of Economically Disadvantaged	0.035	0.002	0.000
Students with Disabilities	-2.924	0.160	0.000
Percentage of Students with Disabilities	-0.009	0.003	0.008

Table I7. Grade 7 ELA Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	45.736	1.846	0.000
Prior-Grade ELA Scale Score	0.618	0.006	0.000
Three-Grades-Prior ELA Scale Score	0.219	0.008	0.000
Missing Flag: Three-Grades-Prior ELA Scale Score	129.162	4.647	0.000
Four-Grades-Prior ELA Scale Score	0.091	0.006	0.000
Missing Flag: Four-Grades-Prior ELA Scale Score	54.469	3.854	0.000

Table I8. Grade 7 ELA Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	-34.283	4.235	0.000
Mean Prior Score	0.064	0.007	0.000
Range Around Prior Score	-0.02	0.007	0.006
Prior-Grade ELA Scale Score	0.509	0.008	0.000
Prior-Grade Mathematics Scale Score	0.162	0.006	0.000
Missing Flag: Prior-Grade Mathematics Scale Score	95.819	3.695	0.000
Retained in Grade	-1.450	0.699	0.038
Three-Grades-Prior ELA Scale Score	0.203	0.007	0.000
Missing Flag: Three-Grades-Prior ELA Scale Score	119.262	4.453	0.000
Four-Grades-Prior ELA Scale Score	0.084	0.006	0.000
Missing Flag: Four-Grades-Prior ELA Scale Score	50.605	3.701	0.000
Grades 5-6 NYSESLAT Scale Score	0.086	0.006	0.000
Missing Flag: Grades 5-6 NYSESLAT Scale Scores	22.098	1.672	0.000

New to School	-0.774	0.187	0.000
Missing Flag: Percentage Variables	41.448	4.359	0.000
General Education < 40% (LRE3)	-1.684	0.452	0.000
ELLs	0.207	0.371	0.578
Percentage of ELLs	-0.053	0.006	0.000
Economically Disadvantaged	-0.001	0.104	0.991
Percentage of Economically Disadvantaged	0.062	0.002	0.000
Students with Disabilities	-1.119	0.157	0.000
Percentage of Students with Disabilities	0.004	0.004	0.288

Table I9. Grade 8 ELA Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	1.057	2.229	0.635
Prior-Grade ELA Scale Score	0.737	0.008	0.000
Three-Grades-Prior ELA Scale Score	0.16	0.009	0.000
Missing Flag: Three-Grades-Prior ELA Scale Score	94.566	5.224	0.000
Four-Grades-Prior ELA Scale Score	0.100	0.008	0.000
Missing Flag: Four-Grades-Prior ELA Scale Score	59.198	4.794	0.000

Table I10. Grade 8 ELA Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	-53.467	4.767	0.000
Mean Prior Score	0.049	0.008	0.000
Range Around Prior Score	-0.011	0.008	0.174
Prior-Grade ELA Scale Score	0.660	0.011	0.000
Prior-Grade Mathematics Scale Score	0.073	0.006	0.000
Missing Flag: Prior-Grade Mathematics Scale Score	43.000	3.765	0.000
Retained in Grade	-1.685	0.767	0.028
Three-Grades-Prior ELA Scale Score	0.161	0.009	0.000
Missing Flag: Three-Grades-Prior ELA Scale Score	95.304	5.108	0.000
Four-Grades-Prior ELA Scale Score	0.087	0.008	0.000
Missing Flag: Four-Grades-Prior ELA Scale Score	51.571	4.689	0.000
Grades 7-8 NYSESLAT Scale Score	0.126	0.008	0.000
Missing Flag: Grades 7-8 NYSESLAT Scale Scores	33.486	2.239	0.000
New to School	-1.795	0.279	0.000

Missing Flag: Percentage Variables	32.077	4.934	0.000
General Education < 40% (LRE3)	-1.826	0.595	0.002
ELLs	0.576	0.504	0.253
Percentage of ELLs	-0.034	0.007	0.000
Economically Disadvantaged	-0.247	0.126	0.049
Percentage of Economically Disadvantaged	0.056	0.003	0.000
Students with Disabilities	-2.570	0.194	0.000
Percentage of Students with Disabilities	-0.010	0.004	0.018

Table I11. Grade 4 Mathematics Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	3.358	2.074	0.105
Prior-Grade Mathematics Scale Score	0.997	0.003	0.000

Table I12. Grade 4 Mathematics Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	64.627	3.727	0.000
Mean Prior Score	-0.144	0.007	0.000
Range Around Prior Score	-0.027	0.006	0.000
Prior-Grade ELA Scale Score	0.105	0.008	0.000
Missing Flag: Prior-Grade ELA Scale Score	64.065	4.681	0.000
Prior-Grade Mathematics Scale Score	0.911	0.010	0.000
Grades 3-4 NYSESLAT Scale Score	0.060	0.005	0.000
Missing Flag: Grades 3-4 NYSESLAT Scale Scores	15.428	1.391	0.000
New to School	-0.328	0.189	0.082
Missing Flag: Percentage Variables	-89.015	4.435	0.000
General Education < 40% (LRE3)	-6.353	0.426	0.000
ELLs	-1.431	0.364	0.000
Percentage of ELLs	-0.044	0.005	0.000
Economically Disadvantaged	-0.008	0.120	0.948
Percentage of Economically Disadvantaged	-0.01	0.003	0.000
Students with Disabilities	-2.606	0.175	0.000
Percentage of Students with Disabilities	-0.034	0.004	0.000

Table I13. Grade 5 Mathematics Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	-12.726	2.075	0.000
Prior-Grade Mathematics Scale Score	1.021	0.003	0.000

Table I14. Grade 5 Mathematics Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	42.434	3.555	0.000
Mean Prior Score	-0.150	0.007	0.000
Range Around Prior Score	-0.030	0.006	0.000
Prior-Grade ELA Scale Score	0.096	0.006	0.000
Missing Flag: Prior-Grade ELA Scale Score	58.698	3.738	0.000
Prior-Grade Mathematics Scale Score	0.972	0.009	0.000
Retained in Grade	-2.382	0.794	0.003
Grades 3-4 NYSESLAT Scale Score	0.032	0.005	0.000
Missing Flag: Grades 3-4 NYSESLAT Scale Scores	7.224	1.560	0.000
New to School	0.054	0.217	0.803
Missing Flag: Percentage Variables	-91.666	4.160	0.000
General Education < 40% (LRE3)	-4.774	0.439	0.000
ELLs	-1.710	0.380	0.000
Percentage of ELLs	-0.087	0.005	0.000
Economically Disadvantaged	0.210	0.115	0.067
Percentage of Economically Disadvantaged	0.018	0.002	0.000
Students with Disabilities	-2.540	0.173	0.000
Percentage of Students with Disabilities	-0.038	0.004	0.000

Table I15. Grade 6 Mathematics Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	-4.887	1.688	0.004
Prior-Grade Mathematics Scale Score	0.603	0.005	0.000
Three-Grades-Prior Mathematics Scale Score	0.407	0.005	0.000
Missing Flag: Three-Grades-Prior Mathematics Scale Score	242.779	2.970	0.000

Table I16. Grade 6 Mathematics Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	36.206	3.423	0.000
Mean Prior Score	-0.089	0.006	0.000
Range Around Prior Score	0.005	0.007	0.405
Prior-Grade ELA Scale Score	0.130	0.004	0.000
Missing Flag: Prior-Grade ELA Scale Score	78.023	2.660	0.000
Prior-Grade Mathematics Scale Score	0.540	0.007	0.000
Retained in Grade	-2.220	0.526	0.000
Three-Grades-Prior Mathematics Scale Score	0.341	0.005	0.000
Missing Flag: Three-Grades-Prior Mathematics Scale Score	203.597	3.056	0.000
Grades 5-6 NYSESLAT Scale Score	0.048	0.004	0.000
Missing Flag: Grades 5-6 NYSESLAT Scale Scores	12.283	1.303	0.000
New to School	0.816	0.201	0.000
Missing Flag: Percentage Variables	-55.082	3.708	0.000
General Education < 40% (LRE3)	0.127	0.387	0.742
ELLs	-0.192	0.332	0.563
Percentage of ELLs	-0.032	0.005	0.000
Economically Disadvantaged	-0.249	0.100	0.013
Percentage of Economically Disadvantaged	-0.011	0.002	0.000
Students with Disabilities	-1.559	0.150	0.000
Percentage of Students with Disabilities	-0.035	0.003	0.000

Table I17. Grade 7 Mathematics Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	-56.255	2.095	0.000
Prior-Grade Mathematics Scale Score	0.801	0.008	0.000
Three-Grades-Prior Mathematics Scale Score	0.211	0.008	0.000
Missing Flag: Three-Grades-Prior Mathematics Scale Score	125.736	5.067	0.000
Four-Grades-Prior Mathematics Scale Score	0.083	0.007	0.000
Missing Flag: Four-Grades-Prior Mathematics Scale Score	49.996	4.141	0.000

Table I18. Grade 7 Mathematics Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	-49.834	3.866	0.000
Mean Prior Score	-0.046	0.007	0.000
Range Around Prior Score	-0.032	0.008	0.000
Prior-Grade ELA Scale Score	0.134	0.006	0.000
Missing Flag: Prior-Grade ELA Scale Score	80.843	3.320	0.000
Prior-Grade Mathematics Scale Score	0.739	0.011	0.000
Retained in Grade	-2.402	0.701	0.001
Three-Grades-Prior Mathematics Scale Score	0.172	0.008	0.000
Missing Flag: Three-Grades-Prior Mathematics Scale Score	102.461	4.996	0.000
Four-Grades-Prior Mathematics Scale Score	0.064	0.007	0.000
Missing Flag: Four-Grades-Prior Mathematics Scale Score	38.947	4.074	0.000
Grades 5-6 NYSESLAT Scale Score	0.055	0.005	0.000
Missing Flag: Grades 5-6 NYSESLAT Scale Scores	13.157	1.534	0.000
New to School	-1.615	0.194	0.000
Missing Flag: Percentage Variables	-28.749	4.474	0.000
General Education < 40% (LRE3)	-4.863	0.501	0.000
ELLs	0.142	0.378	0.707
Percentage of ELLs	-0.097	0.006	0.000
Economically Disadvantaged	0.123	0.104	0.238
Percentage of Economically Disadvantaged	0.009	0.002	0.000
Students with Disabilities	-1.169	0.164	0.000
Percentage of Students with Disabilities	-0.012	0.004	0.001

Table I19. Grade 8 Mathematics Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	-31.403	3.032	0.000
Prior-Grade Mathematics Scale Score	0.669	0.009	0.000
Three-Grades-Prior Mathematics Scale Score	0.267	0.012	0.000
Missing Flag: Three-Grades-Prior Mathematics Scale Score	157.973	7.013	0.000
Four-Grades-Prior Mathematics Scale Score	0.121	0.011	0.000
Missing Flag: Four-Grades-Prior Mathematics Scale Score	72.086	6.510	0.000

Table I20. Grade 8 Mathematics Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	-60.838	5.704	0.000
Mean Prior Score	0.078	0.010	0.000
Range Around Prior Score	0.032	0.009	0.000
Prior-Grade ELA Scale Score	0.166	0.008	0.000
Missing Flag: Prior-Grade ELA Scale Score	98.488	4.604	0.000
Prior-Grade Mathematics Scale Score	0.521	0.012	0.000
Retained in Grade	-2.746	0.875	0.002
Three-Grades-Prior Mathematics Scale Score	0.234	0.011	0.000
Missing Flag: Three-Grades-Prior Mathematics Scale Score	138.303	6.686	0.000
Four-Grades-Prior Mathematics Scale Score	0.087	0.011	0.000
Missing Flag: Four-Grades-Prior Mathematics Scale Score	52.23	6.264	0.000
Grades 7-8 NYSESLAT Scale Score	0.060	0.007	0.000
Missing Flag: Grades 7-8 NYSESLAT Scale Scores	12.862	2.021	0.000
New to School	-3.106	0.323	0.000
Missing Flag: Percentage Variables	45.275	6.263	0.000
General Education < 40% (LRE3)	-2.375	0.611	0.000
ELLs	-1.412	0.541	0.009
Percentage of ELLs	-0.042	0.007	0.000
Economically Disadvantaged	-0.109	0.151	0.472
Percentage of Economically Disadvantaged	-0.006	0.003	0.082
Students with Disabilities	-1.732	0.215	0.000
Percentage of Students with Disabilities	0.006	0.005	0.214

Table I21. Grade 8 Algebra Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	p-value
Constant Term	-319.249	2.432	0.000
Prior-Grade Mathematics Scale Score	0.489	0.006	0.000
Three-Grades-Prior Mathematics Scale Score	0.110	0.008	0.000
Missing Flag: Three-Grades-Prior Mathematics Scale Score	68.087	4.851	0.000
Four-Grades-Prior Mathematics Scale Score	0.055	0.007	0.000
Missing Flag: Four-Grades-Prior Mathematics Scale Score	33.938	4.505	0.000

Table I22. Grade 8 Algebra Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	p-value
Constant Term	-283.038	4.259	0.000
Mean Prior Score	0.011	0.007	0.105
Range Around Prior Score	-0.043	0.007	0.000
Prior-Grade ELA Scale Score	0.085	0.005	0.000
Missing Flag: Prior-Grade ELA Scale Score	51.616	3.348	0.000
Prior-Grade Mathematics Scale Score	0.348	0.008	0.000
Retained in Grade	-4.999	0.915	0.000
Three-Grades-Prior Mathematics Scale Score	0.105	0.007	0.000
Missing Flag: Three-Grades-Prior Mathematics Scale Score	64.583	4.312	0.000
Four-Grades-Prior Mathematics Scale Score	0.030	0.007	0.000
Missing Flag: Four-Grades-Prior Mathematics Scale Score	18.641	4.059	0.000
Grades 7-8 NYSESLAT Scale Score	0.049	0.008	0.000
Missing Flag: Grades 7-8 NYSESLAT Scale Scores	14.442	2.269	0.000
New to School	-1.504	0.328	0.000
Missing Flag: Percentage Variables	-1.265	4.174	0.762
General Education < 40% (LRE3)	-4.490	1.483	0.002
ELLs	-2.164	0.565	0.000
Percentage of ELLs	-0.012	0.011	0.280
Economically Disadvantaged	-0.505	0.115	0.000
Percentage of Economically Disadvantaged	-0.096	0.002	0.000
Students with Disabilities	-2.893	0.244	0.000
Percentage of Students with Disabilities	-0.053	0.006	0.000

Table I23. Grades 9-12, Algebra Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	-1090.1	13.938	0.000
Grade 6 (only) Mathematics Scale Score 2012-13 to 2016-17	0.186	0.016	0.000
Missing Flag: Grade 6 (only) Mathematics Scale Score 2012-13 to 2016-17	56.915	4.356	0.000
Grade 6 (only) Mathematics Scale Score 2017-18 and Subsequent	0.672	0.002	0.000
Missing Flag: Grade 6 (only) Mathematics Scale Score 2017-18 and Subsequent	401.662	1.504	0.000
Grade 6 Mathematics Scale Score 2012-13 to 2016-17	0.002	0.006	0.755
Missing Flag: Grade 6 Mathematics Scale Score 2012-13 to 2016-17	6.341	1.554	0.000
Grade 6 Mathematics Scale Score 2017-18 and Subsequent	0.298	0.004	0.000

Missing Flag: Grade 6 Mathematics Scale Score 2017-18 and Subsequent	178.16	2.447	0.000
Grade 7 Mathematics Scale Score 2012-13 to 2016-17	0.157	0.022	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2012-13 to 2016-17	45.297	5.981	0.000
Grade 7 Mathematics Scale Score 2017-18 and Subsequent	0.296	0.006	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2017-18 and Subsequent	176.065	3.392	0.000
Grade 8 ELA Scale Score 2012-13 to 2016-17	0.018	0.048	0.700
Missing Flag: Grade 8 ELA Scale Score 2012-13 to 2016-17	6.136	12.41	0.621
Grade 8 ELA Scale Score 2017-18 and Subsequent	0.141	0.004	0.000
Missing Flag: Grade 8 ELA Scale Score 2017-18 and Subsequent	83.563	2.178	0.000

Table I24. Grades 9-12, Algebra Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	p-value
Cohort 1	3.304	2.319	0.154
Cohort 2	2.778	2.319	0.231
Cohort 3	2.693	2.318	0.245
Cohort 4	1.148	2.347	0.625
Count of Prior Required Regents Exams = 0	-971.13	16.679	0.000
Count of Prior Required Regents Exams = 1	-969.835	16.680	0.000
Count of Prior Required Regents Exams = 2	-970.46	16.685	0.000
Count of Prior Required Regents Exams = 3	-969.724	16.689	0.000
Count of Prior Required Regents Exams = 4	-969.599	16.691	0.000
Count of Prior Required Regents Exams = 5	-969.37	16.735	0.000
Grade 6 (only) ELA Scale Score 2012-13 to 2016-17	0.05	0.028	0.079
Missing Flag: Grade 6 (only) ELA Scale Score 2012-13 to 2016-17	15.853	7.789	0.042
Grade 6 (only) ELA Scale Score 2017-18 and Subsequent	0.064	0.003	0.000
Missing Flag: Grade 6 (only) ELA Scale Score 2017-18 and Subsequent	39.775	1.881	0.000
Grade 6 (only) Mathematics Scale Score 2012-13 to 2016-17	0.126	0.027	0.000
Missing Flag: Grade 6 (only) Mathematics Scale Score 2012-13 to 2016-17	35.899	7.489	0.000
Grade 6 (only) Mathematics Scale Score 2017-18 and Subsequent	0.520	0.004	0.000
Missing Flag: Grade 6 (only) Mathematics Scale Score 2017-18 and Subsequent	307.477	2.378	0.000
Grade 6 ELA Scale Score 2012-13 to 2016-17	-0.046	0.010	0.000
Missing Flag: Grade 6 ELA Scale Score 2012-13 to 2016-17	-9.268	2.564	0.000
Grade 6 ELA Scale Score 2017-18 and Subsequent	-0.009	0.004	0.036
Missing Flag: Grade 6 ELA Scale Score 2017-18 and Subsequent	-4.628	2.544	0.069
Grade 6 Mathematics Scale Score 2012-13 to 2016-17	0.027	0.009	0.005

Missing Flag: Grade 6 Mathematics Scale Score 2012-13 to 2016-17	7.695	2.500	0.002
Grade 6 Mathematics Scale Score 2017-18 and Subsequent	0.255	0.005	0.000
Missing Flag: Grade 6 Mathematics Scale Score 2017-18 and Subsequent	151.475	3.198	0.000
Grade 7 ELA Scale Score 2012-13 to 2016-17	-0.006	0.032	0.843
Missing Flag: Grade 7 ELA Scale Score 2012-13 to 2016-17	1.186	8.445	0.888
Grade 7 ELA Scale Score 2017-18 and Subsequent	0.050	0.007	0.000
Missing Flag: Grade 7 ELA Scale Score 2017-18 and Subsequent	30.884	3.977	0.000
Grade 7 Mathematics Scale Score 2012-13 to 2016-17	0.148	0.041	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2012-13 to 2016-17	37.005	10.764	0.001
Grade 7 Mathematics Scale Score 2017-18 and Subsequent	0.243	0.008	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2017-18 and Subsequent	142.944	4.813	0.000
Grade 8 ELA Scale Score 2012-13 to 2016-17	0.019	0.058	0.743
Missing Flag: Grade 8 ELA Scale Score 2012-13 to 2016-17	3.995	14.993	0.790
Grade 8 ELA Scale Score 2017-18 and Subsequent	0.109	0.005	0.000
Missing Flag: Grade 8 ELA Scale Score 2017-18 and Subsequent	64.257	2.895	0.000
Grade 8 Mathematics Scale Score 2012-13 to 2016-17	-0.009	0.096	0.930
Missing Flag: Grade 8 Mathematics Scale Score 2012-13 to 2016-17	0.237	23.949	0.992
Grade 8 Mathematics Scale Score 2017-18 and Subsequent	0.312	0.007	0.000
Missing Flag: Grade 8 Mathematics Scale Score 2017-18 and Subsequent	183.994	4.025	0.000
Missing Flag: Mean Prior Grade 8 Mathematics 2012-13 to 2016-17	0.533	0.292	0.068
Mean Prior Grade 8 Mathematics 2012-13 to 2016-17	0.000	0.001	0.752
Missing Flag: Mean Prior Grade 8 Mathematics 2017-18 and Subsequent	5.997	2.184	0.006
Mean Prior Grade 8 Mathematics 2017-18 and Subsequent	0.027	0.003	0.000
Missing Flag: NYSESLAT Scale Score 2015-16 and Subsequent	17.035	0.828	0.000
NYSESLAT Scale Score 2015-16 and Subsequent	0.063	0.003	0.000
New to School After Grade 9	1.085	0.209	0.000
Missing Flag: School Percentage Variables	-3.478	0.933	0.000
General Education < 40% (LRE3)	-1.641	0.256	0.000
ELLs	-0.205	0.143	0.152
School Percentage of ELLs	0.046	0.003	0.000
Economically Disadvantaged	-1.186	0.055	0.000
School Percentage of Economically Disadvantaged	-0.118	0.001	0.000
Students with Disabilities	-2.178	0.069	0.000
School Percentage of Students with Disabilities	-0.100	0.004	0.000

Table I25. Grades 9-12, ELA Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p*-value
Constant Term	-1307.774	14.170	0.000
Grade 6 (only) ELA Scale Score 2012-13 to 2016-17	0.318	0.004	0.000
Missing Flag: Grade 6 (only) ELA Scale Score 2012-13 to 2016-17	92.830	1.338	0.000
Grade 6 (only) ELA Scale Score 2017-18 and Subsequent	0.767	0.015	0.000
Missing Flag: Grade 6 (only) ELA Scale Score 2017-18 and Subsequent	466.669	8.700	0.000
Grade 6 ELA Scale Score 2012-13 to 2016-17	0.092	0.002	0.000
Missing Flag: Grade 6 ELA Scale Score 2012-13 to 2016-17	27.011	0.644	0.000
Grade 6 ELA Scale Score 2017-18 and Subsequent	0.474	0.006	0.000
Missing Flag: Grade 6 ELA Scale Score 2017-18 and Subsequent	289.593	3.392	0.000
Grade 7 ELA Scale Score 2012-13 to 2016-17	0.166	0.009	0.000
Missing Flag: Grade 7 ELA Scale Score 2012-13 to 2016-17	53.102	2.549	0.000
Grade 7 ELA Scale Score 2017-18 and Subsequent	0.281	0.004	0.000
Missing Flag: Grade 7 ELA Scale Score 2017-18 and Subsequent	167.549	2.427	0.000
Grade 8 ELA Scale Score 2012-13 to 2016-17	0.139	0.032	0.000
Missing Flag: Grade 8 ELA Scale Score 2012-13 to 2016-17	41.501	8.808	0.000
Grade 8 ELA Scale Score 2017-18 and Subsequent	0.219	0.004	0.000
Missing Flag: Grade 8 ELA Scale Score 2017-18 and Subsequent	130.993	2.386	0.000

Table I26. Grades 9-12, ELA Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	p-value
Cohort 1	-2.562	1.582	0.105
Cohort 2	-0.165	1.538	0.915
Cohort 3	1.355	1.510	0.370
Cohort 4	-0.724	1.517	0.633
Count of Prior Required Regents Exams = 0	-1083.548	15.397	0.000
Count of Prior Required Regents Exams = 1	-1082.077	15.402	0.000
Count of Prior Required Regents Exams = 2	-1078.577	15.405	0.000
Count of Prior Required Regents Exams = 3	-1076.433	15.404	0.000
Count of Prior Required Regents Exams = 4	-1077.602	15.408	0.000
Count of Prior Required Regents Exams = 5	-1077.338	15.413	0.000
Grade 6 (only) ELA Scale Score 2012-13 to 2016-17	0.217	0.006	0.000
Missing Flag: Grade 6 (only) ELA Scale Score 2012-13 to 2016-17	63.516	1.867	0.000
Grade 6 (only) ELA Scale Score 2017-18 and Subsequent	0.602	0.024	0.000
Missing Flag: Grade 6 (only) ELA Scale Score 2017-18 and Subsequent	358.493	14.413	0.000

Grade 6 (only) Mathematics Scale Score 2012-13 to 2016-17	0.072	0.007	0.000
Missing Flag: Grade 6 (only) Mathematics Scale Score 2012-13 to 2016-17	22.235	1.967	0.000
Grade 6 (only) Mathematics Scale Score 2017-18 and Subsequent	0.097	0.025	0.000
Missing Flag: Grade 6 (only) Mathematics Scale Score 2017-18 and Subsequent	57.453	14.962	0.000
Grade 6 ELA Scale Score 2012-13 to 2016-17	0.078	0.003	0.000
Missing Flag: Grade 6 ELA Scale Score 2012-13 to 2016-17	23.268	0.775	0.000
Grade 6 ELA Scale Score 2017-18 and Subsequent	0.306	0.008	0.000
Missing Flag: Grade 6 ELA Scale Score 2017-18 and Subsequent	183.403	4.767	0.000
Grade 6 Mathematics Scale Score 2012-13 to 2016-17	-0.013	0.002	0.000
Missing Flag: Grade 6 Mathematics Scale Score 2012-13 to 2016-17	-3.682	0.722	0.000
Grade 6 Mathematics Scale Score 2017-18 and Subsequent	0.047	0.008	0.000
Missing Flag: Grade 6 Mathematics Scale Score 2017-18 and Subsequent	27.620	4.821	0.000
Grade 7 ELA Scale Score 2012-13 to 2016-17	0.121	0.015	0.000
Missing Flag: Grade 7 ELA Scale Score 2012-13 to 2016-17	34.589	3.988	0.000
Grade 7 ELA Scale Score 2017-18 and Subsequent	0.191	0.005	0.000
Missing Flag: Grade 7 ELA Scale Score 2017-18 and Subsequent	113.461	2.751	0.000
Grade 7 Mathematics Scale Score 2012-13 to 2016-17	0.064	0.017	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2012-13 to 2016-17	19.439	4.583	0.000
Grade 7 Mathematics Scale Score 2017-18 and Subsequent	0.092	0.005	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2017-18 and Subsequent	54.652	3.216	0.000
Grade 8 ELA Scale Score 2012-13 to 2016-17	0.101	0.034	0.003
Missing Flag: Grade 8 ELA Scale Score 2012-13 to 2016-17	28.770	9.246	0.002
Grade 8 ELA Scale Score 2017-18 and Subsequent	0.202	0.004	0.000
Missing Flag: Grade 8 ELA Scale Score 2017-18 and Subsequent	121.366	2.426	0.000
Grade 8 Mathematics Scale Score 2012-13 to 2016-17	0.008	0.059	0.897
Missing Flag: Grade 8 Mathematics Scale Score 2012-13 to 2016-17	3.653	15.013	0.808
Grade 8 Mathematics Scale Score 2017-18 and Subsequent	0.091	0.004	0.000
Missing Flag: Grade 8 Mathematics Scale Score 2017-18 and Subsequent	55.667	2.329	0.000
Missing Flag: Mean Prior Grade 8 ELA 2012-13 to 2016-17	-1.933	0.325	0.000
Mean Prior Grade 8 ELA 2012-13 to 2016-17	-0.007	0.001	0.000
Missing Flag: Mean Prior Grade 8 ELA 2017-18 and Subsequent	-60.524	4.612	0.000
Mean Prior Grade 8 ELA 2017-18 and Subsequent	-0.092	0.005	0.000
Missing Flag: NYSESLAT Scale Score 2015-16 and Subsequent	54.400	1.305	0.000
NYSESLAT Scale Score 2015-16 and Subsequent	0.179	0.004	0.000
New to School After Grade 9	-0.401	0.158	0.011

Missing Flag: School Percentage Variables	-5.441	3.481	0.118
General Education < 40% (LRE3)	-4.437	0.462	0.000
ELLs	-0.489	0.282	0.083
School Percentage of ELLs	0.048	0.004	0.000
Economically Disadvantaged	-1.542	0.067	0.000
School Percentage of Economically Disadvantaged	-0.091	0.002	0.000
Students with Disabilities	-3.924	0.093	0.000
School Percentage of Students with Disabilities	-0.104	0.005	0.000

The tables that follow are for the unadjusted and adjusted GRE models by Year in School. Note: a dash (—) indicates that the coefficient was either excluded because there were fewer than 10 students with that variable or for perfect collinearity.

Table I27. Grades 9-12, GRE, Year in School 1 Model Coefficients, Unadjusted Model

Effect Name	Estimate	Standard Error
Intercept 1	-112.069	2.875
Intercept 2	-113.488	2.875
Intercept 3	-117.562	2.876
Intercept 4	-119.995	2.876
Intercept 5	-122.950	2.884
Intercept 6	-125.946	3.045
Grade 6 (only) ELA Scale Score 2017-18 and Subsequent	0.022	0.000
Missing Flag: Grade 6 (only) ELA Scale Score 2017-18 and Subsequent	13.334	0.279
Grade 6 (only) Mathematics Scale Score 2017-18 and Subsequent	0.044	0.001
Missing Flag: Grade 6 (only) Mathematics Scale Score 2017-18 and Subsequent	26.184	0.315
Grade 6 ELA Scale Score 2017-18 and Subsequent	0.009	0.001
Missing Flag: Grade 6 ELA Scale Score 2017-18 and Subsequent	5.170	0.372
Grade 6 Mathematics Scale Score 2017-18 and Subsequent	0.034	0.001

Table I28. Grades 9-12, GRE, Year in School 1 Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error
Intercept 1	-124.236	2.992
Intercept 2	-125.745	2.992
Intercept 3	-129.951	2.993
Intercept 4	-132.383	2.994
Intercept 5	-135.338	3.002

Intercept 6	-138.334	3.156
Count of Prior Required Regents Exams = 0	2.505	0.263
Count of Prior Required Regents Exams = 1	1.947	0.263
Count of Prior Required Regents Exams = 2	1.922	0.263
Count of Prior Required Regents Exams = 3	1.264	0.267
Count of Prior Required Regents Exams = 4	0.811	0.280
Flag: Only Grade 6 Scale Score	-0.129	0.067
Grade 6 (only) ELA Scale Score 2017-18 and Subsequent	0.023	0.000
Missing Flag: Grade 6 (only) ELA Scale Score 2017-18 and Subsequent	13.950	0.298
Grade 6 (only) Mathematics Scale Score 2017-18 and Subsequent	0.045	0.001
Missing Flag: Grade 6 (only) Mathematics Scale Score 2017-18 and Subsequent	26.477	0.335
Grade 6 ELA Scale Score 2017-18 and Subsequent	0.009	0.001
Missing Flag: Grade 6 ELA Scale Score 2017-18 and Subsequent	5.483	0.383
Grade 6 Mathematics Scale Score 2017-18 and Subsequent	0.035	0.001
Missing Flag: Grade 6 Mathematics Scale Score 2017-18 and Subsequent	20.545	0.431
Grade 7 ELA Scale Score 2017-18 and Subsequent	0.017	0.005
Missing Flag: Grade 7 ELA Scale Score 2017-18 and Subsequent	11.000	2.833
Grade 7 Mathematics Scale Score 2017-18 and Subsequent	0.018	0.005
Missing Flag: Grade 7 Mathematics Scale Score 2017-18 and Subsequent	10.621	2.696
Grade 8 ELA Scale Score 2017-18 and Subsequent	0.022	0.001
Missing Flag: Grade 8 ELA Scale Score 2017-18 and Subsequent	13.200	0.353
Grade 8 Mathematics Scale Score 2017-18 and Subsequent	0.021	0.001
Missing Flag: Grade 8 Mathematics Scale Score 2017-18 and Subsequent	12.784	0.408
Missing Flag: Mean Prior Grade 8 ELA 2012-13 to 2016-17	-0.370	0.080
Mean Prior Grade 8 ELA 2012-13 to 2016-17	-0.002	0.000
Missing Flag: Mean Prior Grade 8 ELA 2017-18 and Subsequent	18.107	1.600
Mean Prior Grade 8 ELA 2017-18 and Subsequent	0.026	0.002
Missing Flag: Mean Prior Grade 8 Mathematics 2012-13 to 2016-17	-0.201	0.078
Mean Prior Grade 8 Mathematics 2012-13 to 2016-17	-0.002	0.000
Missing Flag: Mean Prior Grade 8 Mathematics 2017-18 and Subsequent	-12.994	0.798
Mean Prior Grade 8 Mathematics 2017-18 and Subsequent	-0.016	0.001
Missing Flag: NYSESLAT Scale Score 2015-16 and Subsequent	4.062	0.256
NYSESLAT Scale Score 2015-16 and Subsequent	0.014	0.001
General Education < 40% (LRE3)	-0.341	0.059
ELLs	-0.230	0.035
School Percentage of ELLs	0.001	0.001
Economically Disadvantaged	-0.422	0.013
School Percentage of Economically Disadvantaged	-0.008	0.000

Students with Disabilities	0.250	0.016
School Percentage of Students with Disabilities	-0.012	0.001

Table I29. Grades 9-12, GRE, Year in School 2 Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error
Intercept 1	-78.824	3.308
Intercept 2	-80.311	3.308
Intercept 3	-82.033	3.309
Intercept 4	-84.520	3.309
Intercept 5	-87.046	3.309
Intercept 6	-89.342	3.313
Intercept 7	-92.312	3.383
Grade 6 (only) ELA Scale Score 2017-18 and Subsequent	0.024	0.001
Missing Flag: Grade 6 (only) ELA Scale Score 2017-18 and Subsequent	14.028	0.788
Grade 6 (only) Mathematics Scale Score 2017-18 and Subsequent	0.025	0.001
Missing Flag: Grade 6 (only) Mathematics Scale Score 2017-18 and Subsequent	14.926	0.856
Grade 6 ELA Scale Score 2017-18 and Subsequent	0.004	0.000
Missing Flag: Grade 6 ELA Scale Score 2017-18 and Subsequent	2.449	0.267
Grade 6 Mathematics Scale Score 2017-18 and Subsequent	0.012	0.000
Missing Flag: Grade 6 Mathematics Scale Score 2017-18 and Subsequent	7.210	0.268
Grade 7 ELA Scale Score 2017-18 and Subsequent	0.010	0.000
Missing Flag: Grade 7 ELA Scale Score 2017-18 and Subsequent	5.958	0.253
Grade 7 Mathematics Scale Score 2017-18 and Subsequent	0.022	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2017-18 and Subsequent	13.160	0.259
Grade 8 ELA Scale Score 2017-18 and Subsequent	0.015	0.005
Missing Flag: Grade 8 ELA Scale Score 2017-18 and Subsequent	9.459	3.002
Grade 8 Mathematics Scale Score 2017-18 and Subsequent	0.022	0.005
Missing Flag: Grade 8 Mathematics Scale Score 2017-18 and Subsequent	13.270	2.977

Table I30. Grades 9-12, GRE, Year in School 2 Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error
Intercept 1	-85.428	3.431
Intercept 2	-87.004	3.431
Intercept 3	-88.809	3.431
Intercept 4	-91.335	3.432
Intercept 5	-93.862	3.432
Intercept 6	-96.158	3.435
Intercept 7	-99.128	3.504

Count of Prior Required Regents Exams = 0	2.985	0.139
Count of Prior Required Regents Exams = 1	3.267	0.139
Count of Prior Required Regents Exams = 2	2.960	0.138
Count of Prior Required Regents Exams = 3	2.587	0.139
Count of Prior Required Regents Exams = 4	1.651	0.143
Flag: Only Grade 6 Scale Score	0.335	0.089
Grade 6 (only) ELA Scale Score 2017-18 and Subsequent	0.024	0.001
Missing Flag: Grade 6 (only) ELA Scale Score 2017-18 and Subsequent	14.265	0.807
Grade 6 (only) Mathematics Scale Score 2017-18 and Subsequent	0.026	0.001
Missing Flag: Grade 6 (only) Mathematics Scale Score 2017-18 and Subsequent	15.442	0.867
Grade 6 ELA Scale Score 2017-18 and Subsequent	0.004	0.000
Missing Flag: Grade 6 ELA Scale Score 2017-18 and Subsequent	2.661	0.274
Grade 6 Mathematics Scale Score 2017-18 and Subsequent	0.009	0.000
Missing Flag: Grade 6 Mathematics Scale Score 2017-18 and Subsequent	5.325	0.275
Grade 7 ELA Scale Score 2017-18 and Subsequent	0.010	0.000
Missing Flag: Grade 7 ELA Scale Score 2017-18 and Subsequent	6.199	0.262
Grade 7 Mathematics Scale Score 2017-18 and Subsequent	0.022	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2017-18 and Subsequent	12.633	0.268
Grade 8 ELA Scale Score 2017-18 and Subsequent	0.020	0.005
Missing Flag: Grade 8 ELA Scale Score 2017-18 and Subsequent	12.017	3.080
Grade 8 Mathematics Scale Score 2017-18 and Subsequent	0.019	0.005
Missing Flag: Grade 8 Mathematics Scale Score 2017-18 and Subsequent	11.334	3.013
Missing Flag: Mean Prior Grade 8 ELA 2012-13 to 2016-17	-0.961	0.073
Mean Prior Grade 8 ELA 2012-13 to 2016-17	-0.002	0.000
Mean Prior Grade 8 ELA 2017-18 and Subsequent	-0.006	0.002
Missing Flag: Mean Prior Grade 8 Mathematics 2012-13 to 2016-17	0.192	0.072
Mean Prior Grade 8 Mathematics 2012-13 to 2016-17	-0.001	0.000
Missing Flag: Mean Prior Grade 8 Mathematics 2017-18 and Subsequent	1.860	0.713
Mean Prior Grade 8 Mathematics 2017-18 and Subsequent	0.012	0.001
Missing Flag: NYSESLAT Scale Score 2015-16 and Subsequent	1.878	0.177
NYSESLAT Scale Score 2015-16 and Subsequent	0.007	0.001
New to School After Grade 9	-0.173	0.022
General Education < 40% (LRE3)	-0.267	0.068
ELLs	-0.293	0.045
School Percentage of ELLs	-0.002	0.001
Economically Disadvantaged	-0.192	0.011
School Percentage of Economically Disadvantaged	-0.007	0.000
Students with Disabilities	0.206	0.015

School Percentage of Students with Disabilities	-0.018	0.001

Table I31. Grades 9-12, GRE, Year in School 3 Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error
Intercept 1	-12.837	0.373
Intercept 2	-14.512	0.374
Intercept 3	-16.660	0.374
Intercept 4	-18.765	0.375
Intercept 5	-20.405	0.376
Intercept 6	-21.833	0.383
Intercept 7	-23.025	0.403
Intercept 8	-25.445	0.625
Grade 6 (only) ELA Scale Score 2012-13 to 2016-17	0.008	0.001
Missing Flag: Grade 6 (only) ELA Scale Score 2012-13 to 2016-17	2.423	0.242
Grade 6 (only) Mathematics Scale Score 2012-13 to 2016-17	0.007	0.001
Missing Flag: Grade 6 (only) Mathematics Scale Score 2012-13 to 2016-17	2.003	0.230
Grade 6 ELA Scale Score 2012-13 to 2016-17	0.002	0.000
Missing Flag: Grade 6 ELA Scale Score 2012-13 to 2016-17	0.553	0.081
Grade 6 Mathematics Scale Score 2012-13 to 2016-17	0.002	0.000
Missing Flag: Grade 6 Mathematics Scale Score 2012-13 to 2016-17	0.883	0.072
Grade 7 ELA Scale Score 2017-18 and Subsequent	-0.001	0.000
Missing Flag: Grade 7 ELA Scale Score 2017-18 and Subsequent	-0.706	0.289
Grade 7 Mathematics Scale Score 2017-18 and Subsequent	0.001	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2017-18 and Subsequent	0.924	0.293
Grade 8 ELA Scale Score 2017-18 and Subsequent	0.001	0.000
Missing Flag: Grade 8 ELA Scale Score 2017-18 and Subsequent	0.589	0.266
Grade 8 Mathematics Scale Score 2017-18 and Subsequent	0.015	0.000
Missing Flag: Grade 8 Mathematics Scale Score 2017-18 and Subsequent	8.459	0.238

Table I32. Grades 9-12, GRE, Year in School 3 Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error
Intercept 1	-23.354	0.637
Intercept 2	-25.531	0.638
Intercept 3	-28.048	0.638
Intercept 4	-30.203	0.639
Intercept 5	-31.843	0.640
Intercept 6	-33.270	0.644
Intercept 7	-34.461	0.656
Intercept 8	-36.882	0.811

Count of Prior Required Regents Exams = 0	1.831	0.061
Count of Prior Required Regents Exams = 1	3.369	0.059
Count of Prior Required Regents Exams = 2	4.078	0.052
Count of Prior Required Regents Exams = 3	4.068	0.049
Count of Prior Required Regents Exams = 4	1.857	0.049
Flag: Only Grade 6 Scale Score	-0.135	0.097
Grade 6 (only) ELA Scale Score 2012-13 to 2016-17	0.007	0.001
Missing Flag: Grade 6 (only) ELA Scale Score 2012-13 to 2016-17	1.792	0.268
Grade 6 (only) Mathematics Scale Score 2012-13 to 2016-17	0.004	0.001
Missing Flag: Grade 6 (only) Mathematics Scale Score 2012-13 to 2016-17	1.023	0.243
Grade 6 ELA Scale Score 2012-13 to 2016-17	0.001	0.000
Missing Flag: Grade 6 ELA Scale Score 2012-13 to 2016-17	0.377	0.085
Grade 6 Mathematics Scale Score 2012-13 to 2016-17	-0.001	0.000
Missing Flag: Grade 6 Mathematics Scale Score 2012-13 to 2016-17	-0.268	0.076
Grade 7 ELA Scale Score 2017-18 and Subsequent	0.002	0.001
Missing Flag: Grade 7 ELA Scale Score 2017-18 and Subsequent	1.086	0.302
Grade 7 Mathematics Scale Score 2017-18 and Subsequent	0.002	0.001
Missing Flag: Grade 7 Mathematics Scale Score 2017-18 and Subsequent	1.248	0.308
Grade 8 ELA Scale Score 2017-18 and Subsequent	0.003	0.000
Missing Flag: Grade 8 ELA Scale Score 2017-18 and Subsequent	1.854	0.277
Grade 8 Mathematics Scale Score 2017-18 and Subsequent	0.017	0.000
Missing Flag: Grade 8 Mathematics Scale Score 2017-18 and Subsequent	9.837	0.252
Missing Flag: Mean Prior Grade 8 ELA 2012-13 to 2016-17	-0.167	0.077
Mean Prior Grade 8 ELA 2012-13 to 2016-17	0.000	0.000
Missing Flag: Mean Prior Grade 8 ELA 2017-18 and Subsequent	12.434	1.574
Mean Prior Grade 8 ELA 2017-18 and Subsequent	0.019	0.002
Missing Flag: Mean Prior Grade 8 Mathematics 2012-13 to 2016-17	-0.154	0.077
Mean Prior Grade 8 Mathematics 2012-13 to 2016-17	0.000	0.000
Missing Flag: Mean Prior Grade 8 Mathematics 2017-18 and Subsequent	-9.852	0.739
Mean Prior Grade 8 Mathematics 2017-18 and Subsequent	-0.013	0.001
Missing Flag: NYSESLAT Scale Score 2015-16 and Subsequent	2.229	0.192
NYSESLAT Scale Score 2015-16 and Subsequent	0.008	0.001
New to School After Grade 9	-0.075	0.036
General Education < 40% (LRE3)	-1.190	0.080
ELLs	-0.247	0.048
School Percentage of ELLs	0.010	0.001
Economically Disadvantaged	-0.163	0.012
School Percentage of Economically Disadvantaged	-0.006	0.000
Students with Disabilities	-0.139	0.016

School Percentage of Students with Disabilities	-0.003	0.001

Table I33. Grades 9-12, GRE, Year in School 4 Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error
Intercept 1	0.129	0.585
Intercept 2	-1.099	0.585
Intercept 3	-2.355	0.585
Intercept 4	-3.640	0.586
Intercept 5	-4.985	0.591
Intercept 6	-6.428	0.612
Intercept 7	-7.559	0.665
Intercept 8	-9.169	0.917
Grade 6 (only) ELA Scale Score 2012-13 to 2016-17	-0.001	0.001
Missing Flag: Grade 6 (only) ELA Scale Score 2012-13 to 2016-17	-0.345	0.345
Grade 6 (only) Mathematics Scale Score 2012-13 to 2016-17	0.003	0.001
Missing Flag: Grade 6 (only) Mathematics Scale Score 2012-13 to 2016-17	0.693	0.388
Grade 6 ELA Scale Score 2012-13 to 2016-17	0.001	0.000
Missing Flag: Grade 6 ELA Scale Score 2012-13 to 2016-17	0.300	0.132
Grade 6 Mathematics Scale Score 2012-13 to 2016-17	-0.002	0.000
Missing Flag: Grade 6 Mathematics Scale Score 2012-13 to 2016-17	-0.698	0.118
Grade 7 ELA Scale Score 2012-13 to 2016-17	0.000	0.001
Missing Flag: Grade 7 ELA Scale Score 2012-13 to 2016-17	-0.038	0.146
Grade 7 Mathematics Scale Score 2012-13 to 2016-17	-0.001	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2012-13 to 2016-17	-0.270	0.123
Grade 8 ELA Scale Score 2017-18 and Subsequent	-0.004	0.001
Missing Flag: Grade 8 ELA Scale Score 2017-18 and Subsequent	-2.068	0.456
Grade 8 Mathematics Scale Score 2017-18 and Subsequent	0.002	0.001
Missing Flag: Grade 8 Mathematics Scale Score 2017-18 and Subsequent	1.031	0.435

Table I34. Grades 9-12, GRE, Year in School 4 Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error
Intercept 1	-14.343	1.170
Intercept 2	-15.825	1.170
Intercept 3	-17.226	1.171
Intercept 4	-18.559	1.172
Intercept 5	-19.917	1.174
Intercept 6	-21.363	1.184
Intercept 7	-22.495	1.213
Intercept 8	-24.104	1.368

Count of Prior Required Regents Exams = 0	0.955	0.065
Count of Prior Required Regents Exams = 1	2.315	0.059
Count of Prior Required Regents Exams = 2	2.683	0.043
Count of Prior Required Regents Exams = 3	2.851	0.031
Count of Prior Required Regents Exams = 4	1.678	0.025
Flag: Only Grade 6 Scale Score	0.319	0.188
Grade 6 (only) ELA Scale Score 2012-13 to 2016-17	-0.001	0.001
Missing Flag: Grade 6 (only) ELA Scale Score 2012-13 to 2016-17	-0.054	0.419
Grade 6 (only) Mathematics Scale Score 2012-13 to 2016-17	0.001	0.001
Missing Flag: Grade 6 (only) Mathematics Scale Score 2012-13 to 2016-17	0.460	0.425
Grade 6 ELA Scale Score 2012-13 to 2016-17	0.001	0.001
Missing Flag: Grade 6 ELA Scale Score 2012-13 to 2016-17	0.184	0.148
Grade 6 Mathematics Scale Score 2012-13 to 2016-17	-0.002	0.000
Missing Flag: Grade 6 Mathematics Scale Score 2012-13 to 2016-17	-0.602	0.130
Grade 7 ELA Scale Score 2012-13 to 2016-17	0.000	0.001
Missing Flag: Grade 7 ELA Scale Score 2012-13 to 2016-17	0.057	0.160
Grade 7 Mathematics Scale Score 2012-13 to 2016-17	-0.001	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2012-13 to 2016-17	-0.373	0.135
Grade 8 ELA Scale Score 2017-18 and Subsequent	-0.007	0.001
Missing Flag: Grade 8 ELA Scale Score 2017-18 and Subsequent	-3.924	0.504
Grade 8 Mathematics Scale Score 2017-18 and Subsequent	0.003	0.001
Missing Flag: Grade 8 Mathematics Scale Score 2017-18 and Subsequent	1.782	0.477
Missing Flag: Mean Prior Grade 8 ELA 2012-13 to 2016-17	0.031	0.165
Mean Prior Grade 8 ELA 2012-13 to 2016-17	0.001	0.001
Missing Flag: Mean Prior Grade 8 ELA 2017-18 and Subsequent	4.457	22.633
Mean Prior Grade 8 ELA 2017-18 and Subsequent	0.015	0.003
Missing Flag: Mean Prior Grade 8 Mathematics 2012-13 to 2016-17	0.493	0.162
Mean Prior Grade 8 Mathematics 2012-13 to 2016-17	0.002	0.001
Missing Flag: Mean Prior Grade 8 Mathematics 2017-18 and Subsequent	-1.593	1.577
Mean Prior Grade 8 Mathematics 2017-18 and Subsequent	0.004	0.002
Missing Flag: NYSESLAT Scale Score 2015-16 and Subsequent	1.227	0.259
NYSESLAT Scale Score 2015-16 and Subsequent	0.004	0.001
New to School After Grade 9	0.807	0.058
General Education < 40% (LRE3)	-0.636	0.124
ELLs	-0.037	0.068
School Percentage of ELLs	0.012	0.001
Economically Disadvantaged	0.182	0.023
School Percentage of Economically Disadvantaged	0.015	0.001
Students with Disabilities	-0.247	0.027

School Percentage of Students with Disabilities	0.005	0.001

Table I35. Grades 9-12, GRE, Year in School 5+ Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error
Intercept 1	-1.294	27.705
Intercept 2	-2.468	27.705
Intercept 3	-3.611	27.705
Intercept 4	-4.654	27.705
Intercept 5	-6.018	27.706
Intercept 6	-7.755	27.711
Intercept 7	-8.161	27.714
Grade 6 (only) ELA Scale Score 2012-13 to 2016-17	0.005	0.003
Missing Flag: Grade 6 (only) ELA Scale Score 2012-13 to 2016-17	1.241	0.835
Grade 6 (only) Mathematics Scale Score 2012-13 to 2016-17	0.002	0.004
Missing Flag: Grade 6 (only) Mathematics Scale Score 2012-13 to 2016-17	0.653	0.995
Grade 6 ELA Scale Score 2011-12 and Prior	-0.057	0.072
Missing Flag: Grade 6 ELA Scale Score 2011-12 and Prior	-39.111	47.876
Grade 6 ELA Scale Score 2012-13 to 2016-17	-0.003	0.001
Missing Flag: Grade 6 ELA Scale Score 2012-13 to 2016-17	-0.386	0.387
Grade 6 Mathematics Scale Score 2011-12 and Prior	0.048	0.066
Missing Flag: Grade 6 Mathematics Scale Score 2011-12 and Prior	37.083	45.472
Grade 6 Mathematics Scale Score 2012-13 to 2016-17	0.001	0.001
Missing Flag: Grade 6 Mathematics Scale Score 2012-13 to 2016-17	0.229	0.368
Grade 7 ELA Scale Score 2012-13 to 2016-17	0.005	0.001
Missing Flag: Grade 7 ELA Scale Score 2012-13 to 2016-17	1.317	0.397
Grade 7 Mathematics Scale Score 2012-13 to 2016-17	-0.002	0.001
Missing Flag: Grade 7 Mathematics Scale Score 2012-13 to 2016-17	-0.716	0.347
Grade 8 ELA Scale Score 2012-13 to 2016-17	0.000	0.001
Missing Flag: Grade 8 ELA Scale Score 2012-13 to 2016-17	-0.19	0.353
Grade 8 Mathematics Scale Score 2012-13 to 2016-17	-0.001	0.001
Missing Flag: Grade 8 Mathematics Scale Score 2012-13 to 2016-17	-0.284	0.296

Table I36. Grades 9-12, GRE, Year in School 5+ Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error
Intercept 1	-7.682	470.643
Intercept 2	-8.979	470.643
Intercept 3	-10.172	470.643
Intercept 4	-11.227	470.643
Intercept 5	-12.594	470.643

Intercept 6	-14.330	470.644
Intercept 7	-14.735	470.644
Count of Prior Required Regents Exams = 0	0.294	0.155
Count of Prior Required Regents Exams = 1	1.362	0.140
Count of Prior Required Regents Exams = 2	1.862	0.123
Count of Prior Required Regents Exams = 3	2.250	0.105
Count of Prior Required Regents Exams = 4	1.853	0.098
Flag: Only Grade 6 Scale Score	0.168	0.638
Grade 6 (only) ELA Scale Score 2012-13 to 2016-17	0.003	0.003
Missing Flag: Grade 6 (only) ELA Scale Score 2012-13 to 2016-17	0.488	1.035
Grade 6 (only) Mathematics Scale Score 2012-13 to 2016-17	0.000	0.004
Missing Flag: Grade 6 (only) Mathematics Scale Score 2012-13 to 2016-17	0.359	1.131
Grade 6 ELA Scale Score 2011-12 and Prior	-0.097	0.102
Missing Flag: Grade 6 ELA Scale Score 2011-12 and Prior	-67.285	67.477
Grade 6 ELA Scale Score 2012-13 to 2016-17	-0.003	0.002
Missing Flag: Grade 6 ELA Scale Score 2012-13 to 2016-17	-0.486	0.422
Grade 6 Mathematics Scale Score 2011-12 and Prior	0.054	0.071
Missing Flag: Grade 6 Mathematics Scale Score 2011-12 and Prior	42.969	49.082
Grade 6 Mathematics Scale Score 2012-13 to 2016-17	0.001	0.001
Missing Flag: Grade 6 Mathematics Scale Score 2012-13 to 2016-17	0.112	0.399
Grade 7 ELA Scale Score 2012-13 to 2016-17	0.003	0.002
Missing Flag: Grade 7 ELA Scale Score 2012-13 to 2016-17	0.740	0.432
Grade 7 Mathematics Scale Score 2012-13 to 2016-17	-0.002	0.001
Missing Flag: Grade 7 Mathematics Scale Score 2012-13 to 2016-17	-0.637	0.368
Grade 8 ELA Scale Score 2012-13 to 2016-17	0.000	0.002
Missing Flag: Grade 8 ELA Scale Score 2012-13 to 2016-17	-0.239	0.406
Grade 8 Mathematics Scale Score 2012-13 to 2016-17	-0.001	0.001
Missing Flag: Grade 8 Mathematics Scale Score 2012-13 to 2016-17	-0.221	0.330
Missing Flag: Mean Prior Grade 8 ELA 2012-13 to 2016-17	-0.269	0.715
Mean Prior Grade 8 ELA 2012-13 to 2016-17	-0.001	0.002
Missing Flag: Mean Prior Grade 8 ELA 2017-18 and Subsequent	-8.460	5.633
Mean Prior Grade 8 ELA 2017-18 and Subsequent	-0.013	0.009
Missing Flag: Mean Prior Grade 8 Mathematics 2012-13 to 2016-17	0.527	0.645
Mean Prior Grade 8 Mathematics 2012-13 to 2016-17	0.001	0.002
Missing Flag: Mean Prior Grade 8 Mathematics 2017-18 and Subsequent	19.024	4.574
Mean Prior Grade 8 Mathematics 2017-18 and Subsequent	0.034	0.008
NYSESLAT Scale Score 2012-13 and 2013-14	0.009	0.562
Missing Flag: NYSESLAT Scale Scores 2012-13 and 2013-14	16.237	471.049
New to School After Grade 9	0.898	0.159

General Education < 40% (LRE3)	-0.586	0.216
ELLs	-0.100	0.108
School Percentage of ELLs	0.011	0.004
Economically Disadvantaged	0.249	0.079
School Percentage of Economically Disadvantaged	0.009	0.002
Students with Disabilities	-0.102	0.075
School Percentage of Students with Disabilities	0.003	0.003

Appendix J. Additional Impact Correlation Tables (Grades 4-8 by Grade and Subject and Grades 4-8 and 9-12 Principal)

Table J1. Principal Impact Correlations by Grade for ELA[19]

Grade	Percent ELL	Percent SWD	Percent ED	Mean Prior Scale Score
4	0.021	0.094	0.129	-0.051
5	0.016	0.131	0.134	-0.133
6	0.044	0.069	0.067	-0.127
7	0.020	0.114	0.136	-0.105
8	0.019	0.107	0.157	-0.138

Table J2. Principal Impact Correlations by Grade for Mathematics[19]

Grade	Percent ELL	Percent SWD	Percent ED	Mean Prior Scale Score
4	0.056	0.086	0.135	-0.147
5	0.057	0.121	0.157	-0.190
6	0.083	0.011	0.060	-0.207
7	0.031	0.138	0.170	-0.242
8	0.002	0.008	-0.001	-0.085

Table J3. Principal Impact Correlations[19]

Model	Percent ELL	Percent SWD	Percent ED	Mean Prior ELA	Mean Prior Mathematics
4-8 MGP	0.026	0.079	0.159	0.000	-0.026
9-12 MGP	0.000	0.000	0.000	0.000	0.000
9-12 GRE	0.028	-0.094	-0.013	0.155	0.118

[19] Correlations for 4-8 models were calculated between principals' 4-8 MGPs and school-level percent demographics and mean prior scores.