Growth Model for Educator Evaluation 2017/18 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 incorporates multiple measures of effectiveness, including measures of student growth.[1] New York State teachers of mathematics and English language arts (ELA) in Grades 4—8 and their principals first received growth scores based on 2011/12 State tests. For APPRs completed pursuant to Education Law §3012-d, the overall rating is determined using a matrix that combines one or more measures of student growth (including State-provided growth scores) as well as teacher observations and school visits of principals, as applicable. More information about the measures making up the remainder of an educator's composite rating can be found on the Teacher/Leader Effectiveness section of the EngageNY.org website. Information specific to evaluations conducted pursuant to Education Law §3012-d may be found on the NYSED.gov website.

In December 2015, the Board of Regents voted to add §30-2.14 and §30-3.17 to the Rules of the Board of Regents, which established a 4-year transition period for APPRs, during which time State-provided growth scores will be provided to educators for advisory purposes only. During the 2015/16 through 2018/19 school years, teachers and principals who receive 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) will receive two sets of scores and ratings: original scores and ratings and transition scores and ratings. The State-provided growth score shall be excluded from the scores and ratings used to calculate the transition score and rating. Only the transition score and rating will 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.

This document describes the models used to measure student growth for the purpose of educator evaluation in New York State for the 2017/18 school year. In 2017/18, growth models were implemented for teacher and principal evaluation 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 2016/17 and prior years and 2017/18 on State assessments compared with students having similar characteristics.

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[11] At its September 2015 meeting, the Board of Regents amended Subparts 30-2 and 30-3 of the Rules of the Board of Regents to prescribe an appeals process for a teacher or principal who wishes to challenge his or her State-provided growth score, in certain limited circumstances for the 2014/15 school year and thereafter while the Department is reviewing the growth model to determine if any changes are needed. Although an individual educator's APPR may change as the result of a successful appeal, appeals do not change the results of the New York State student growth model itself or the results presented in this document. Please see Resources for Appealing State-Provided Growth Scores for more information about the appeals process.

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 the development of APPR regulations and the design of the current State-provided growth scores. In addition, a technical advisory committee reviewed the technical accuracy and utility of the statistical methodology used to calculate scores. A list of the technical advisory committee members is provided in Appendix B. Revisions to the State-provided growth model will be considered during the 2018/19 school year.

Content and Organization of this Report

The results presented in this report are based on 2017/18 and prior school years' data, with some comparisons to prior-year results. For the technical report describing models and full results for 2016/17, visit the NYSED Growth Measures Toolkits page. For the technical reports describing models and full results from 2015/16 and earlier, visit the EngageNY website.

This technical report contains four main sections:

- **Data.** Description of what student growth measures, the data used to implement the student growth model, including data processing rules and relevant issues that arose during processing
- **Model.** Description of the statistical model
- **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: student test scores that can be observed across time and 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 drew on test score data from statewide testing programs in Grades 3—8 in ELA and mathematics for the growth models for teachers, schools, and principals of students in Grades 4—8 and on Regents Exam scores 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)

The New York State tests at the elementary and middle school grade levels measure a range of knowledge and skills in mathematics and ELA. State tests in ELA and mathematics for Grades 3—8 are given in the spring. The 2017/18 school year was the sixth school year that the State tests were designed to measure the Common Core State Standards. In 2017/18, the Department conducted a standards review process because the Grades 3-8 ELA and mathematics assessments were administered over the course of two days rather than over the course of three days as in previous years. Due to the State's new two-session test design and performance standards, the 2018 Grades 3-8 ELA and mathematics results are not directly comparable to with prior-year results. While test scores cannot be compared to prior year scores, growth results may still be computed.

In 2014/15, across all grades and subjects, approximately 200,000 fewer students participated in State tests in mathematics and ELA than in previous years. This lower test taking rate continued in 2015/16, 2016/17, and 2017/18. For more information about how lower participation relates to growth model results, view the 2014/15 growth model technical report on the EngageNY website.

The New York Grades 4—8 growth model uses prior test scores in mathematics and ELA to predict test scores in those subjects. For example, we predicted the mathematics scores based on student's mathematics scores in up to the prior three years (depending on the grade) and the prior year ELA score. In addition, the other subject's scores are used because they reflect the general achievement of students prior to the outcome year (e.g., ELA scores are used in mathematics models and vice versa).

Specifically, New York's Grades 4—8 growth model includes three prior test scores in the same subject area and one prior test score in the other subject. 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 2017/18 did not have a valid ELA test score in 2016/17); 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 2017/18 had a 6th grade ELA test score in 2016/17).

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. For the 2017/18 analyses, data from 2017/18 were used as outcomes, with prior achievement predictors coming from as many as 3 years prior (going back to 2014/15). The specific tests used as predictors vary by grade and subject and are as follows:

- Grade 4 ELA and mathematics models used scores from Grade 3 in ELA and mathematics. Students were **NOT** included if they lacked Grade 3 scores from the immediate prior year in the same subject.
- Grade 5 ELA and mathematics models used scores from Grades 3 and 4 in ELA and mathematics. Students were **NOT** included if they lacked Grade 4 scores from the immediate prior year in the same subject.
- Grades 6–8 ELA and mathematics models used scores from Grades 3–7 in ELA and mathematics. Students were **NOT** included if they lacked the immediate prior-year score in the same subject (e.g., Grade 6 students must have had a Grade 5 score in the same subject from 2016/17).

In addition to test scores, the New York Grades 4—8 growth model also used the conditional standard errors of measurement 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). Conditional standard errors were obtained from published technical reports for the assessments' prior-year test scores, and the State's test vendor provided a similar table for the 2017/18 test scores.

Regents Exams

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 Algebra 1 Common Core or the ELA Common Core Regents Exam, compared with those of similar students. Regents Exams in these subjects are the most commonly taken examinations in high school.

Because Regents Exams are offered multiple times each year and students take Regents Exams at different points in their schooling, in 2017/18, the Grades 9—12 New York MGP model included students and test scores using the following rules:

- Students who take the Algebra or ELA 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 of the prior year (except for Grade 9 students) and January and June of the current 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 8 years after first entering Grade 9, to give credit to schools and principals that keep students beyond 4 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 model (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 (more 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 (the four required Regents Exams, plus a second social studies examination and up to three more examinations).[2] A school's or principal's score on this measure reflects whether or not students exceeded the average number of Regents Exams passed each year by

[2] Prior to the 2014/15 school year, students were required to pass five specific Regents Exams. Section 100.5(d) of the Commissioner's regulations was amended to allow multiple pathways to graduation.

similar students statewide. Two reasons for not including students in a Grades 9—12 school's GRE measure include a student lacking Grade 7 or 8 State test scores or a student having already passed the maximum number of Regents Exams used in this measure.

As noted, Regents Exams are offered multiple times each year, and students take Regents Exams at different points in their schooling. In 2017/18, 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 (2017) and January and June of current year (2018).
- Only count the first time a student passes a specific Regents Examination.
- 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 school or principal's results.
- Students must have had a valid prior score from Grade 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 included in determining a school's or principal's score whether or not they took a Regents Exam during the year.
- Students were included for up to 8 years after first entering Grade 9, to acknowledge schools and principals that keep students beyond 4 years in high school to complete graduation requirements.
- Students who dropped out 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 2014/15 school year.

Demographics

The results of growth models are used to measure the effects of educators on student learning gains, taking into account a student's prior achievement; however, some factors beyond an

[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.

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.

For all growth measures used in New York State for educator evaluation, student's academic history and other defined characteristics are controlled for to compare similar students in the state[4] – that is, in computing student-level growth, New York's growth models always assess a student's progress relative to similar students. The rules of the Board of Regents provide that three specific types of characteristics (ELL status, students with disabilities status, and poverty status) be included in the growth models that produce scores used for educator evaluation.

Both student and course or school-level characteristics are included in growth measures used for educator evaluation for 2017/18. 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 or course (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, course, or school with many ELL students compared with a classroom, course, or school with few ELL students. Table 1 provides a complete list of the factors included in 2017/18. Additional descriptions of these variables follow Table 1.

Factors are the same for growth measures for teachers, schools, and principals of students in Grades 4—8 as for schools and principals of 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 variables shown in Table 1. 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.

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

Table 1. Variables Included in the Adjusted Model[5]

Variable[a]	Grades 4 8		Grades 9 12		
	ELA	Mathematics	Regents ELA CC	Regents Algebra 1 CC	Comparative Growth in Regents Exams Passed
Academic History Variables					
Prior-year ELA scale score (student level)[b]	✓	✓	✓	✓	✓
Two-year-prior ELA scale score if available (student-level)[b]	✓		✓	✓	✓
Three-year-prior ELA scale score if available (student level)[b]	✓				
Prior-year mathematics scale score (student level)[b]	✓	✓	✓	✓	✓
Two-year-prior mathematics scale score if available (student level)[b]		✓	✓	✓	✓
Three-year-prior mathematics scale score if available (student level)[b]		✓			
Retained in grade (student level)	✓	✓			
Mean prior score (aggregate level)[b, c]	✓	✓	✓	✓	✓
Range around mean prior score (aggregate level)[b]	✓	✓			
New to school in nonarticulation year (student level)[d]	✓	✓	✓	✓	✓
Number of years since entering ninth grade (student level)[e]			✓	✓	See note e
Count of prior required Regents Exams passed (student level)			✓	✓	✓
Students with Disabilities (SWD) Variables					
SWD status (student level)	✓	✓	✓	✓	✓
SWD in the general education classroom less than 40% of the time (student level)	✓	✓	✓	✓	✓
Percentage of SWD (aggregate level)[c]	✓	✓	✓	✓	✓
English Language Learner (ELL) Variables					

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

Variable[a]	Grades 4 8		Grades 9 12		
	ELA	Mathematics	Regents ELA CC	Regents Algebra 1 CC	Comparative Growth in Regents Exams Passed
ELL status (student level)	✓	✓	✓	✓	✓
Percentage of ELLs (aggregate level)[c]	✓	✓	✓	✓	✓
NYSESLAT scores (student level)[f]	✓	✓	✓	✓	✓
Economically Disadvantaged Variables (ED)					
ED status (student level)	✓	✓	✓	✓	✓
Percentage of ED (aggregate level)[c]	✓	✓	✓	✓	✓

a: Table 1 does not display missing variable indicators. Also, for Grades 9—12 models, prior scores are measured relative to the start of high school (Grade 9). Therefore, "prior-year" means Grade 8 and "two-year-prior" means Grade 7.
b: For Grades 9—12 models, separate predictor variables are included for Common Core – aligned Grades 3–8 State assessments (2012/13) and previous versions of State assessments (2011/12 and earlier).
c: Aggregate-level variables are computed at the class/course 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 (in 2011/12 and earlier, two separate scale scores for Listening/Speaking and Reading/Writing were used, and different scales were used in subsequent years also).
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 link students to teachers and principals of Grades 4—8 and 9—12 and 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.

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 $\left(\frac{Enrollment\ \ Duration}{Course\ Duration} \times \frac{Attendance\ Duration}{Enrollment\ \ Duration}\right)$.[6] SGPs for students who were in a teacher's course for longer periods of time and who attended the class/course more regularly counted more heavily in a teacher's MGP than those who were enrolled and attended for less time.

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

Table 2 shows the attribution of students with at least 2 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 both ELA and mathematics, 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 processing for Grades 9—12 models.

[6] Education Analytics calculated the course duration variable directly from the teacher-student data linkage file.

Table 2. Grades 4—8 Teacher-Student Attribution Rates

Grade	Valid Student Records	Valid Student Records Attributed to at Least One Teacher	Attribution Rate
4	313,702	283,495	90%
5	307,109	278,785	91%
6	288,144	258,169	90%
7	273,963	245,718	90%
8	222,982	191,884	86%
Total	1,405,900	1,258,051	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.

Overall, in 2017/18, 89% of the 1,405,900 valid student records were linked to at least one teacher. In 2016/17, 90% of the 1,359,428 valid student records were attributed to teachers.[7]

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 3 shows attribution rates for schools.

[7] Details can be found in the *2016/17 Growth Model for Educator Evaluation Technical Report*, which is available on the NYSED growth measures toolkits page.

Table 3. Grades 4—8 School-Student Attribution Rates

Grade	Valid Student Records	Valid Student Records Attributed to at Least One School	Attribution Rate
4	313,702	305,017	97%
5	307,109	299,566	98%
6	288,144	280,634	97%
7	273,963	267,436	98%
8	222,982	217,908	98%
Total	1,405,900	1,370,561	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 2017/18 (97%) was the same as the attribution rate in 2016/17. As with teachers, more student records overall were attributed to schools in 2017/18 than in 2016/17.[8]

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.

[8] Details can be found in the *2016/17 Growth Model for Educator Evaluation Technical Report*, which is available on the NYSED growth measures toolkits page.

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

Grade	Valid Student Records	Valid Student Records Attributed to at Least One Principal	Attribution Rate
4	313,702	300,545	96%
5	307,109	294,741	96%
6	288,144	276,584	96%
7	273,963	263,704	96%
8	222,982	214,420	96%
Total	1,405,900	1,349,994	96%

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 2017/18 (96%) was 1 percentage point higher in 2016/17. As with teachers, more student records overall were attributed to schools in 2017/18 than in 2016/17.[9]

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 at these two points in time in a given school 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.[10] Note also that scores are reported only for schools serving all of Grades 9—12.

Table 5 shows school attribution rates for the MGP model, and Table 6 shows attribution rates for principals for both the MGP and the GRE models. For the MGP models (based on Common Core ELA and Common Core Algebra Regents Exams), students are included in the model if they had a current year score, had at least one valid Grade 7 or 8 assessment in the same subject (mathematics for Algebra and ELA for ELA), and had not passed that Regents Exam in a prior

[9] Details can be found in the *2016/17 Growth Model for Educator Evaluation Technical Report*, which is available on the NYSED Growth Measures Toolkits page.
[10] 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.

year. For the GRE model, students are included in the model when they had at least one valid Grade 7 or 8 assessment in either subject, were enrolled in Grades 9—12 for 1—8 years, had not passed eight Regents Exams as of the end of the prior year, and were attributed to at least one school.[11]

Table 5. Grades 9—12 School-Student Attribution Rates[12]

Model	Students Included in Analysis	Students Included in Analysis Attributed to Schools	Attribution Rate
ELA Common Core	186,717	172,062	92%
Algebra 1 Common Core	137,452	125,077	91%

Table 6. Grades 9—12 Principal-Student Attribution Rates

Model	Students Included in Analysis	Students Included in Analysis Attributed to Principals	Attribution Rate
ELA Common Core	186,717	167,854	90%
Algebra 1 Common Core	137,452	121,103	88%
GRE	554,132	539,361	94%

[11] Schools need to meet the following criteria: not be a transfer or portfolio or non-public school.
[12] Note that the GRE model was excluded from this table because students need to be attributed to at least one school to be included in analysis.

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 Common Core ELA and Common Core Algebra. To produce scores describing how well students are progressing toward passing Regents Exams, a second model was implemented for Grades 9—12. This model is referred to as the GRE model. These two models are described in detail in the sections that follow.

Mean Growth Percentile 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.

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, $Y_{t-r,i}$ 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. 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.

Figure 1. Conditional Standard Error of Measurement Plot (Grade 8 ELA, 2017/18)

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, $X = X^* + U$, 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 2017/18 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 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. 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:

[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.

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

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

Here, the regression is of the form

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

where

$$\epsilon \sim N(0, \sigma_e^2)$$

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

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

The second refinement is to replace the population variance in w_i, called $\bar{\Sigma}$, with the individual variance in w_i, called Σ_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

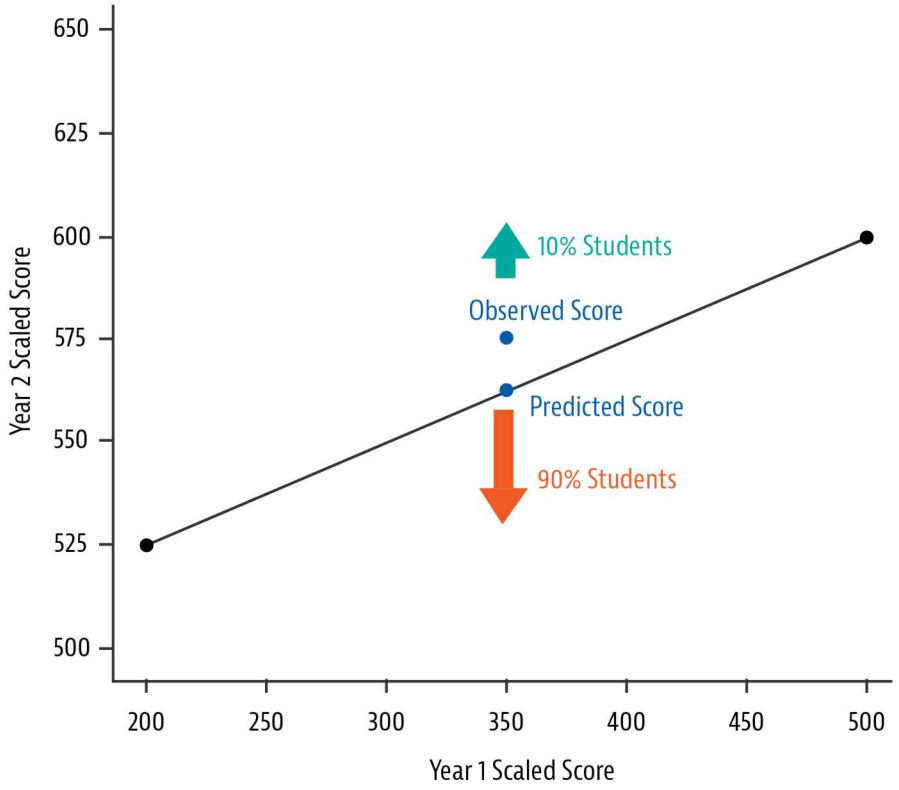
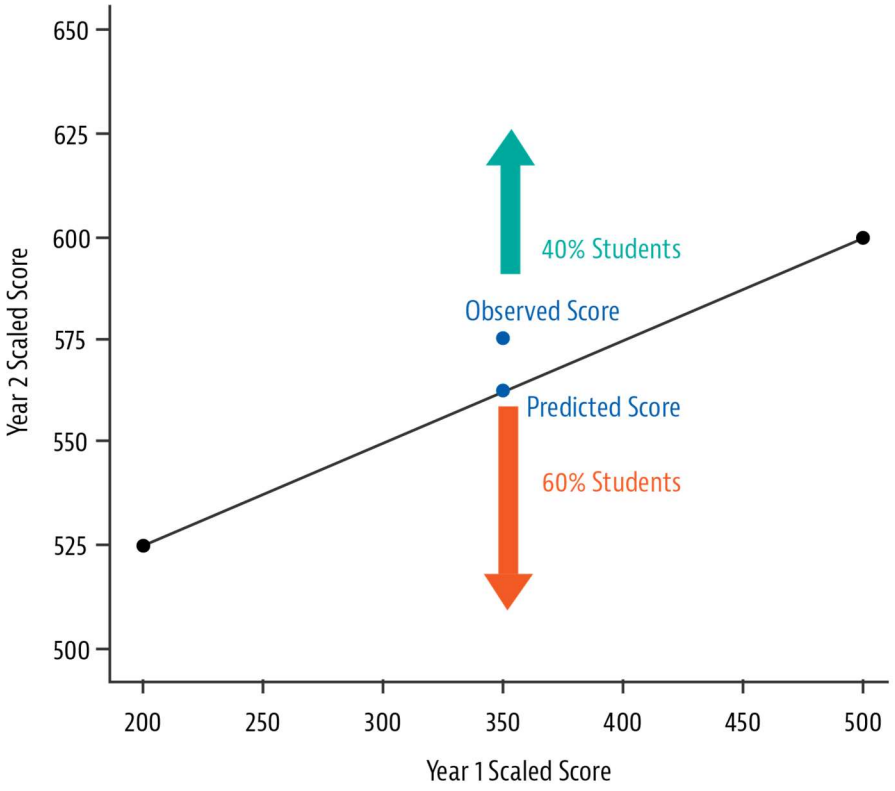


Figure 3 illustrates the same hypothetical student shown in Figure 2. Note that the observed score and predicted value are exactly the same. However, the prediction variance is larger than in Figure 2. As a result, when we integrate over the normal from $-\infty$ to y_i, the SGP is 60, not 90 as in the 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

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

for Grades 4—8 teachers, 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

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

and in the weighted case (teachers) as

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

where $sd(SGP_{ij})$ 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 and 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, 2017/18). 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

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

where $\hat{y}$ is the estimated number of Regents Exams passed by similar students, and N_{yy-1} is the number of Regents Exams passed at the initiation of this school year. In the previous

[14] These sometimes are called intercepts.

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_{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 school or principal'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 (School or Principal).** The mean of the SGPs for students attributed to the school or principal 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 (School or Principal).** The mean of the SGPs for students attributed to the school or principal, based on similar prior achievement scores, *including* consideration of ELL, disability, economic disadvantage, and other student characteristics. This MGP is used to determine a school or principal'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.** Highest and lowest 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.** Highest and lowest possible measure 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 school or principal's evaluation on the State-provided growth subcomponent.
- **Growth Score.** A growth score of 0-20 points is assigned to each school and principal (for each MGP or GRE measure and overall) within each growth rating category using the scoring bands for implementation of Education Law §3012-d. The overall growth score is used in a principal's evaluation on the State-provided growth subcomponent.

As with Grades 4—8 measures, districts also are provided with student-level files that show which students were included 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 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 fraction of teachers, schools, and principals with reported results is shown for Grades 4—8 in Table 7 and for Grades 9—12 in Table 8. The percentage of teachers, principals, and schools receiving results in 2017/18 compared to 2016/17 are summarized below:

- The percentage of teachers receiving results in 2017/18 (77%) was higher by 1 percentage point compared to 2016/17 (76%).
- The percentage of principals receiving 4—8 results in 2017/18 remained the same from 2016/17 (98%).
- The percentage of schools receiving 9—12 results in 2017/18 was lower by 1 percentage point compared to 2015/16 (92% in 2016/17 and 91% in 2017/18).
- The percentages of principals receiving 9—12 results and percentage of schools receiving 4—8 results in 2017/18 were unchanged compared to 2016/17.[15]

Table 7. Grades 4—8 Reporting Rates

	Number with at Least One Student Attributed	Number Meeting the Minimum Sample Size Requirement	Percentage Meeting the Minimum Sample Size Requirement
Teachers	46,340	35,849	77%
Principals	3,762	3,691	98%
Schools	3,784	3,591	95%

Table 8. Grades 9—12 Reporting Rates

	Number with at Least One Student Attributed	Number Meeting the Minimum Sample Size Requirement	Percentage Meeting the Minimum Sample Size Requirement
Principals	1,372	1,335	97%
Schools	1,459	1,329	91%

Performance Categories

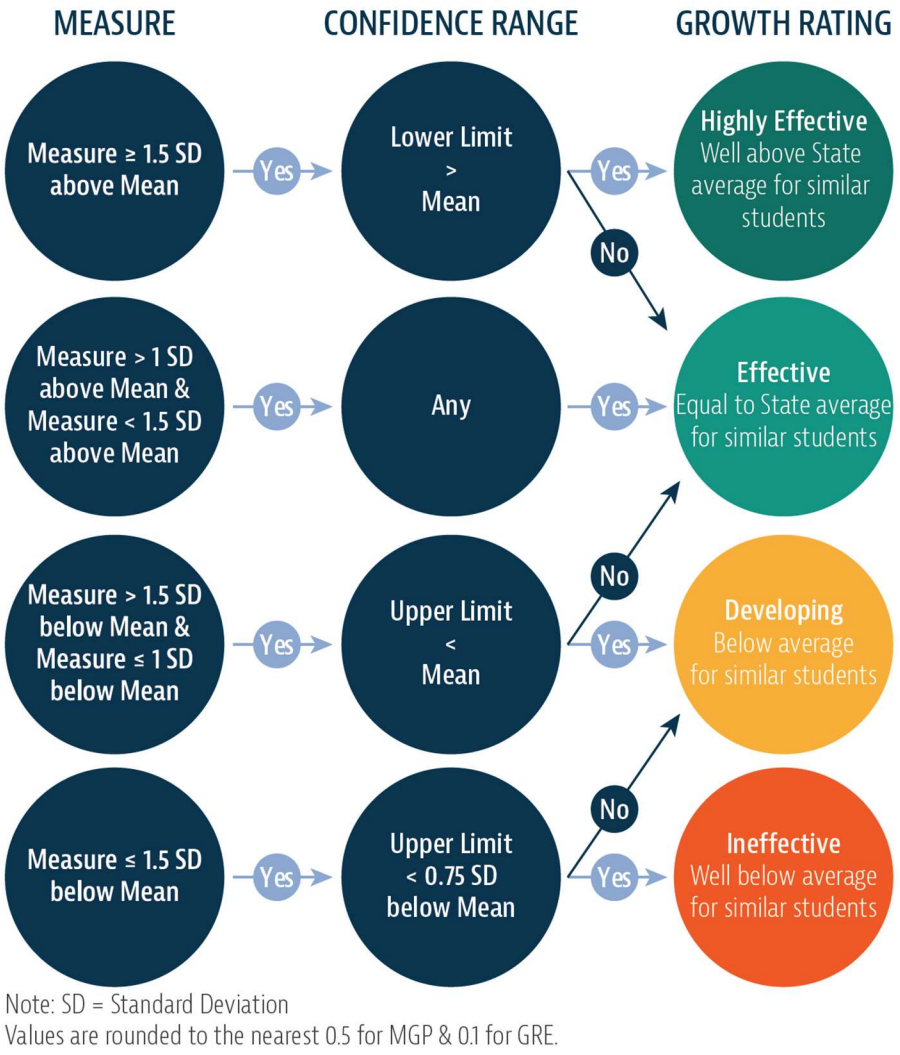
To determine an educator's growth rating (HEDI category) and growth points (0-20), NYSED has developed a set of general rules that describe how similar or different a score on each measure is from the State average. The general rules used to obtain growth ratings are shown in Figure 4. Specific values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

[15] Details can be found in the *2016/17 Growth Model for Educator Evaluation Technical Report*, which is available on the NYSED Growth Measures Toolkits page.

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



Note: SD = Standard Deviation
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 school or principal 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 that and principals who serve Grades 4—8 and 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 measure 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 students 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 2017/18 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 a least squares regression, we refer to this as a *pseudo R*-square. (See page 24 for more information on the EiV model.) Table 9 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 9. Grades 4—8 Pseudo R-Squared Values by Grade and Subject

Subject	Grade	Unadjusted Model	Adjusted Model
ELA	4	0.61	0.64
	5	0.66	0.68
	6	0.68	0.69
	7	0.70	0.72
	8	0.68	0.70
Mathematics	4	0.67	0.70
	5	0.73	0.74
	6	0.73	0.74
	7	0.74	0.76
	8	0.65	0.66

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 10 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. As shown in Table 10, prior-year test scores explain about 2% to 5% of the variation in Adjusted SGPs. Because SGPs are intended to allow students to show low or high growth no matter their prior performance, this result is as expected.

Table 10. Grades 4—8 Correlation Between Adjusted SGP and Prior-Year Scale Score

Grade	ELA	Mathematics
4	-0.133	-0.184
5	-0.140	-0.157
6	-0.141	-0.179
7	-0.126	-0.197
8	-0.126	-0.259

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 schools or principals. In this section, we provide descriptive statistics on overall or 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 or 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

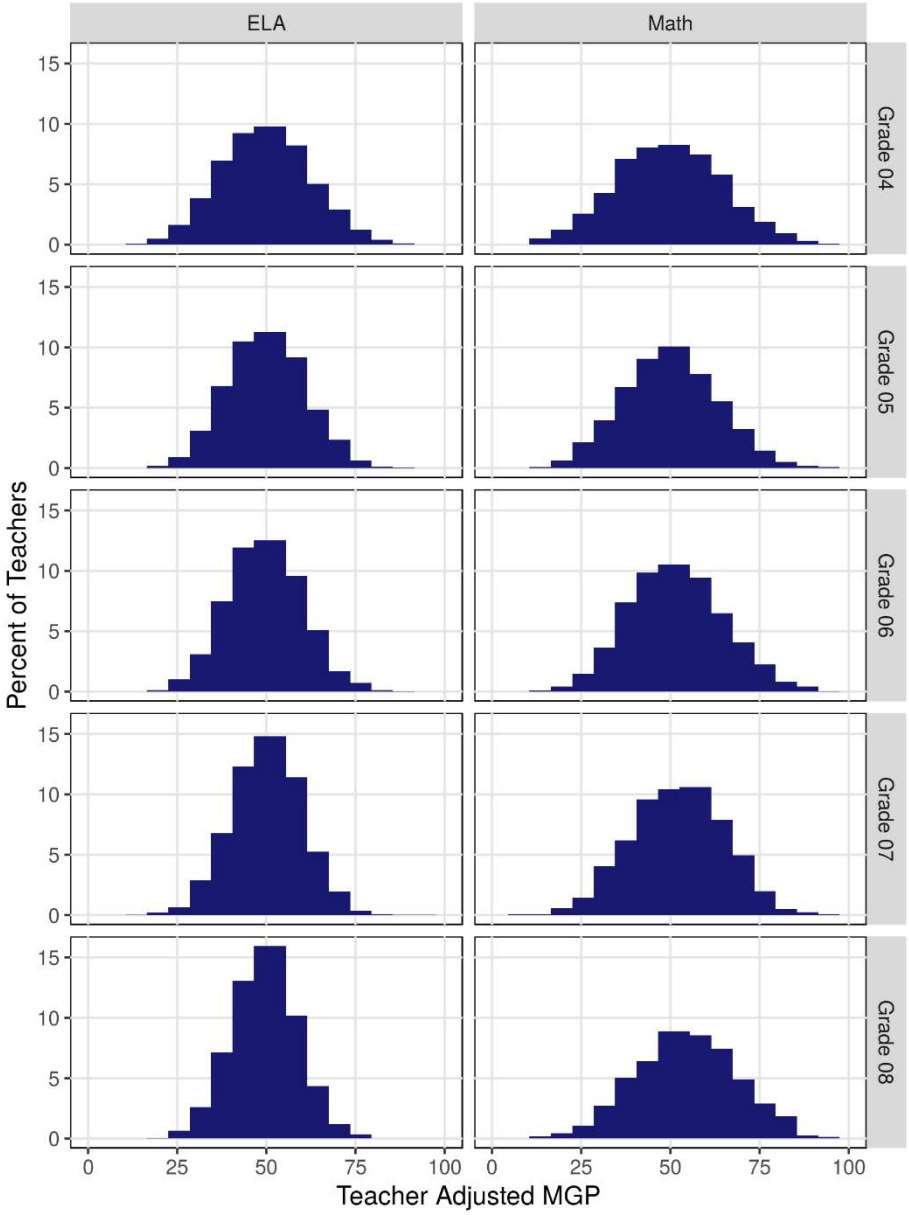
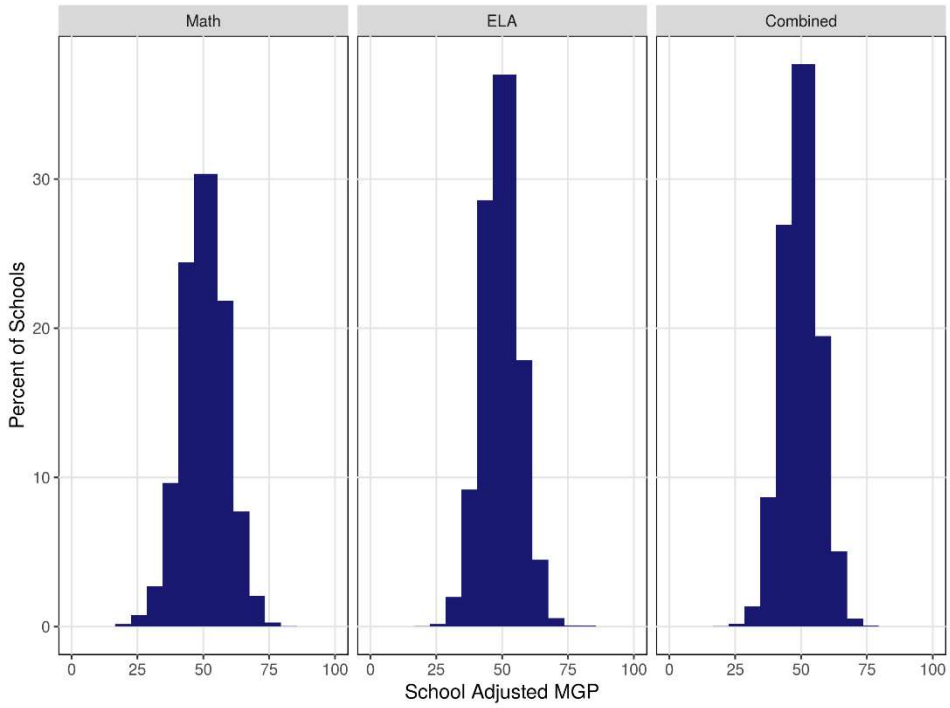


Figure 6 shows that for schools, the results are less widely distributed than for teachers.

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 2017/18 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

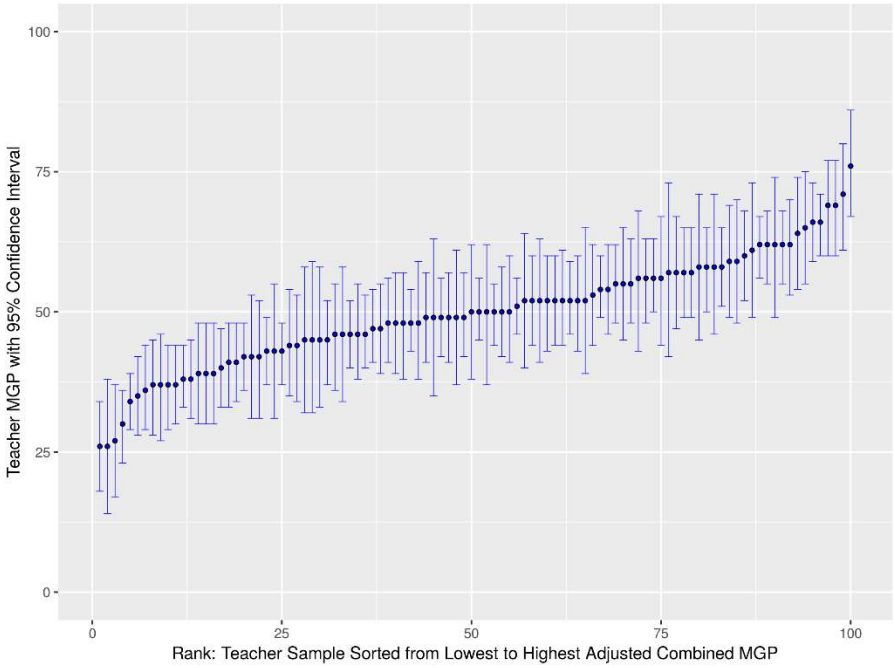


Figure 8. Grades 4—8 Overall MGP with 95% Confidence Interval Based on a Random Sample of 100 Schools

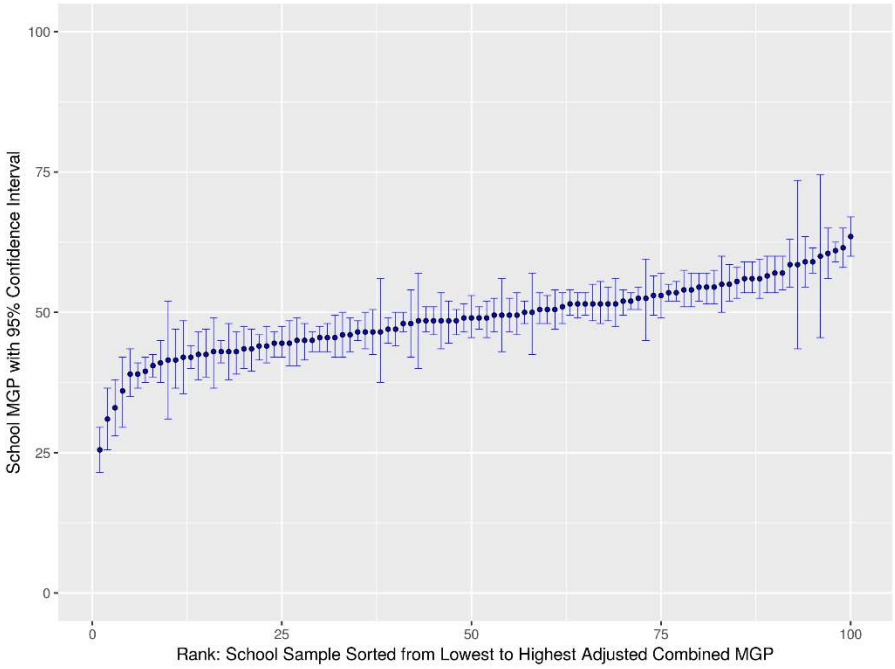


Figure 7 and Figure 8 provide a means to gauge visually the precision of MGPs. However, it also may be useful to examine a reliability statistic to assess the precision of the teacher-level MGPs, specified here as ρ:

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

where $\bar{\sigma}$ 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 11 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 11. Grades 4—8 Weighted Mean Standard Errors, Standard Deviation, and Value of ρ by Grade and Subject for Teachers and Schools, Weighted by Number of SGPs

Subject	Grade	Weighted Mean Standard Error	Weighted Standard Deviation	Weighted Reliability Statistic (ρ)
ELA (Teacher)	4	5.275	11.533	0.781
	5	4.953	9.887	0.734
	6	4.090	9.186	0.784
	7	3.814	8.635	0.789
	8	3.853	8.148	0.757
Mathematics (Teacher)	4	4.995	13.885	0.864
	5	4.437	12.218	0.859
	6	3.826	11.909	0.888
	7	3.646	11.865	0.897
	8	4.683	13.216	0.866
All (Schools)	All	1.301	5.422	0.932

Table 12 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 12. Grades 4—8 Percentage of Educator MGPs Above or Below Mean at the 95% Confidence Level

	Below Mean		Above Mean	
Level	N	%	N	%
Teacher	7,278	20%	7,706	21%
School	1,029	29%	1,040	29%

Impact Data Results for Grades 4—8

Table 13 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 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 or economic disadvantage—and the

mean prior ELA or mathematics score of the students.[16] Correlations are presented for adjusted MGPs.[17]

Table 13. Grades 4—8 Teacher MGP Correlation with Class or Course Characteristics

School Characteristics	Correlation
ELL students in class or course	0.052
Students with disabilities in class or course	0.098
Economically disadvantaged students in class or course	0.088
Mean prior ELA Z-score	-0.119
Mean prior mathematics Z-score	-0.139

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 predicted with that demographic variable and, therefore, represents results that are essentially zero. In 2017/18, all correlations of MGPs with classroom characteristics have absolute values of 0.10 or lower, except mean prior ELA Z-score (which has a correlation of -0.119 with teacher MGP).

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

[16] 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.
[17] 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.
[18] Results disaggregated by grade and subject are shown in Appendix J. The results in this section are combined across grades and subjects.

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

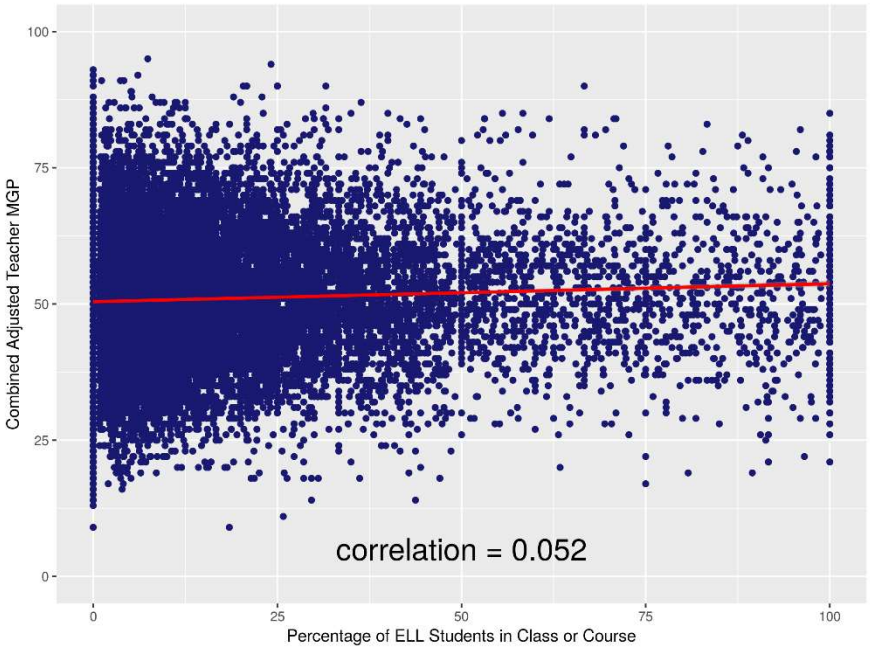


Figure 10. Grades 4—8 Teacher MGP Scores by Percentage of SWD Students in Class or Course

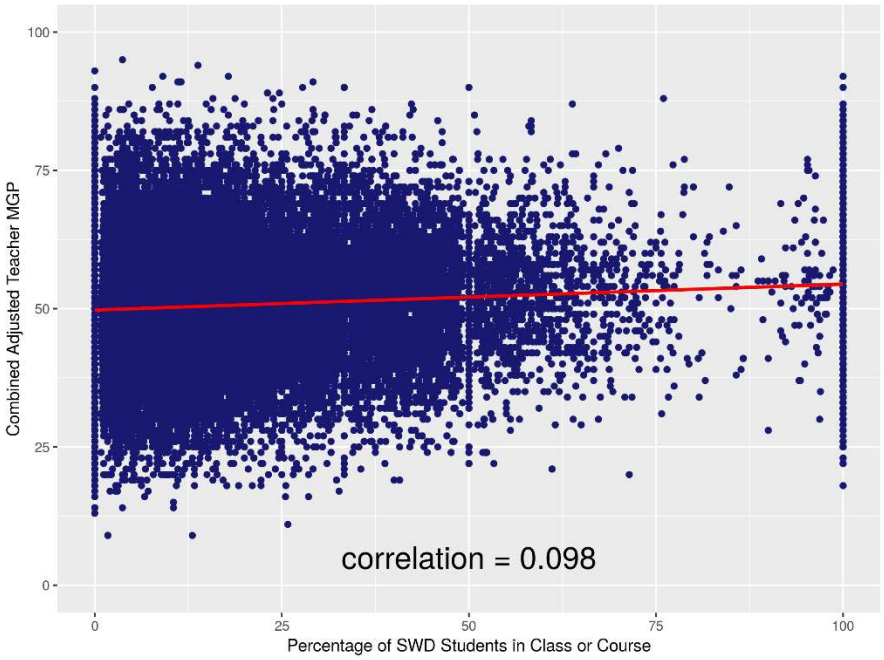


Figure 11. Grades 4—8 Teacher MGP Scores by Percentage of ED Students in Class or Course

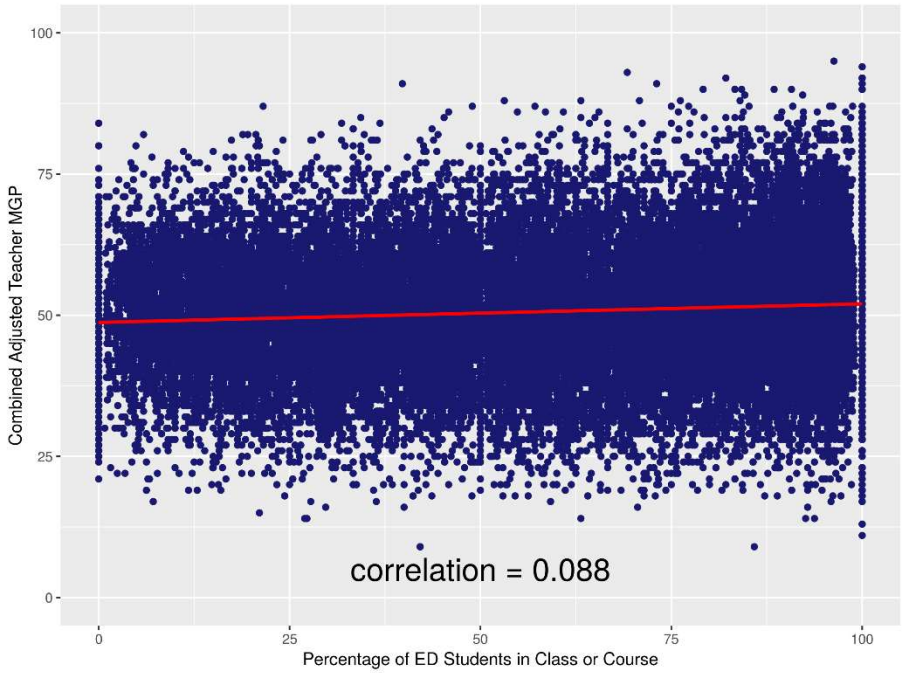


Figure 12. Grades 4—8 Teacher MGP Scores by Mean Prior ELA Z-Score Students in Class or Course

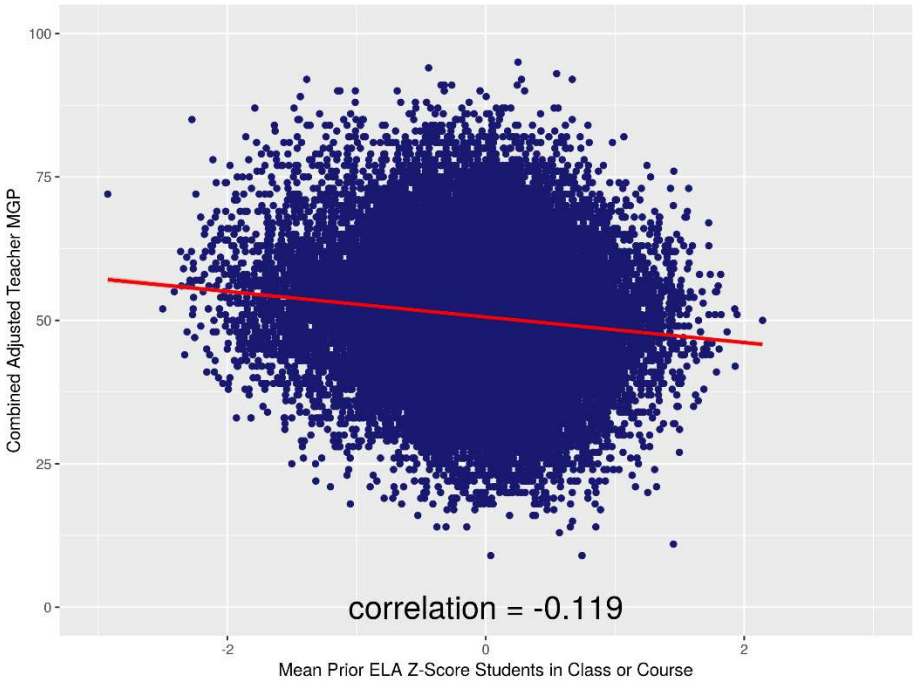


Figure 13. Grades 4—8 Teacher MGP Scores by Mean Prior Mathematics Z-Score Students in Class or Course

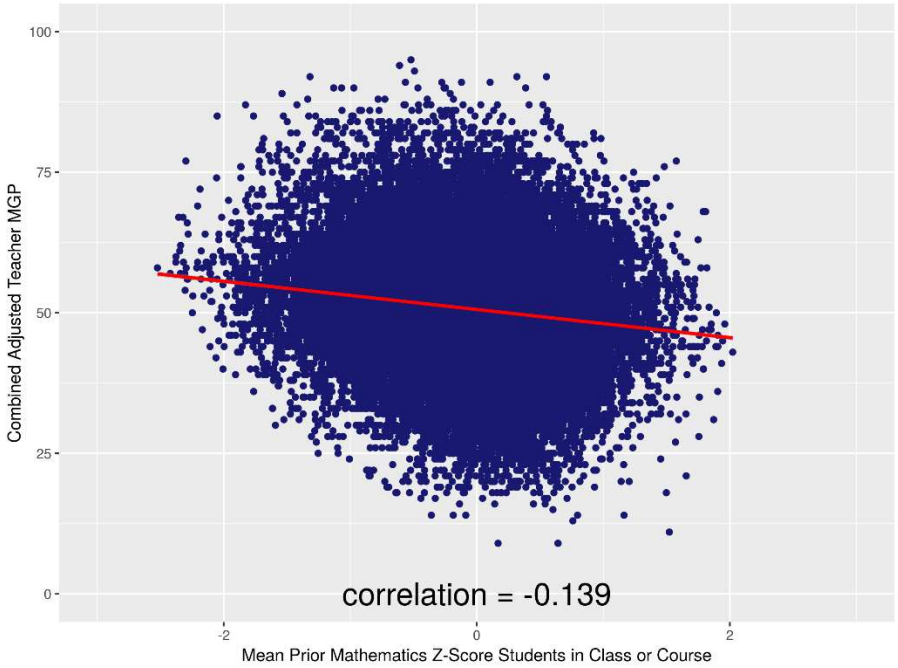


Table 14 provides the observed correlations of school MGPs with the same characteristics presented for teachers but aggregated to the school level. Appendix J contains principal-level correlations.

Table 14. Grades 4—8 School MGP Correlation with School Characteristics

School Characteristics	Correlation
ELL students in school	0.107
Students with disabilities in school	0.153
Economically disadvantaged students in school	0.142
Mean prior ELA Z-score	-0.119
Mean prior mathematics Z-score	-0.126

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

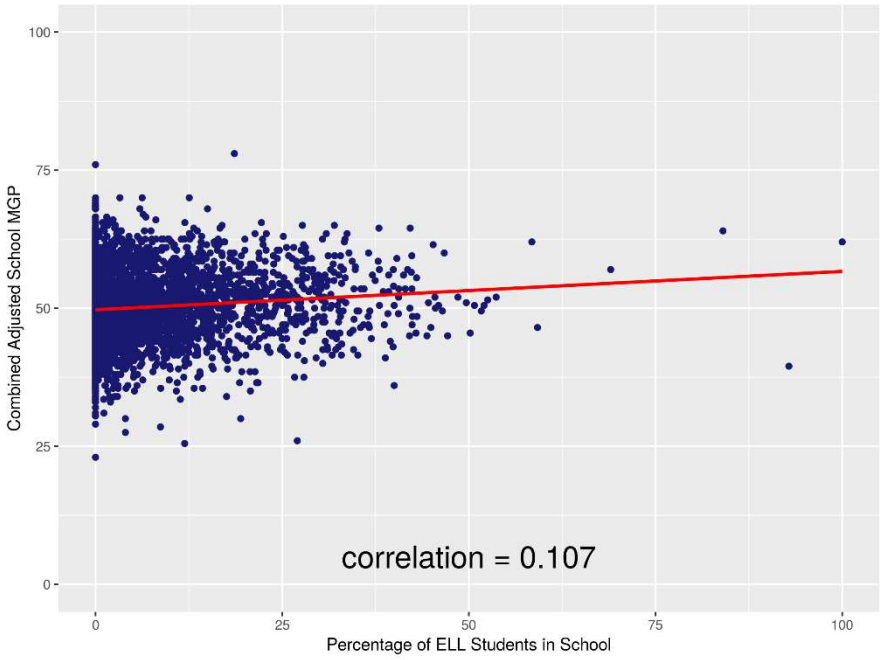


Figure 15. Grades 4—8 School MGP Scores by Percentage of SWD Students in School

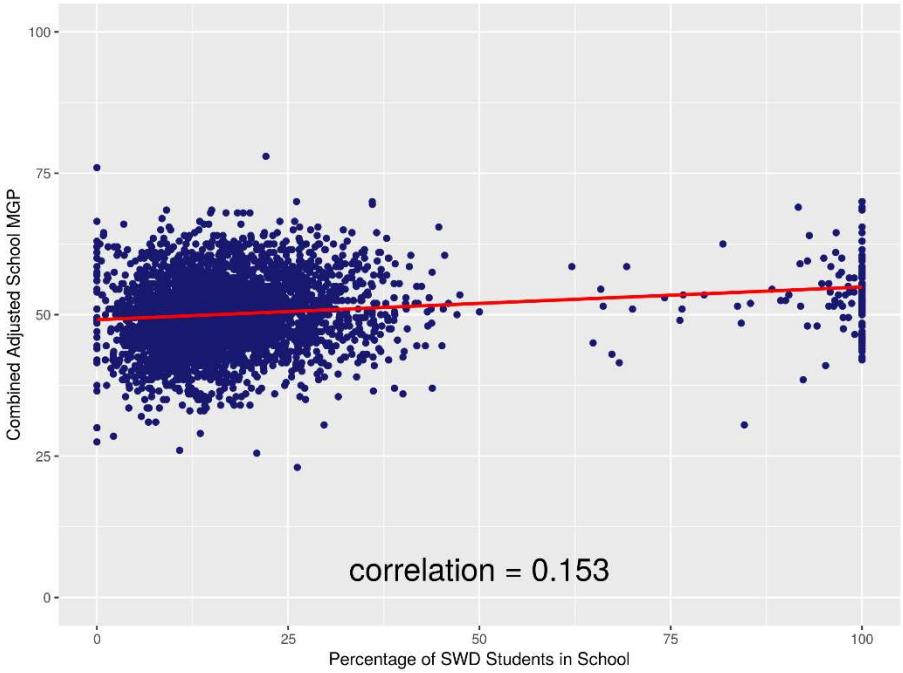


Figure 16. Grades 4—8 School MGP Scores by Percentage of ED Students in School

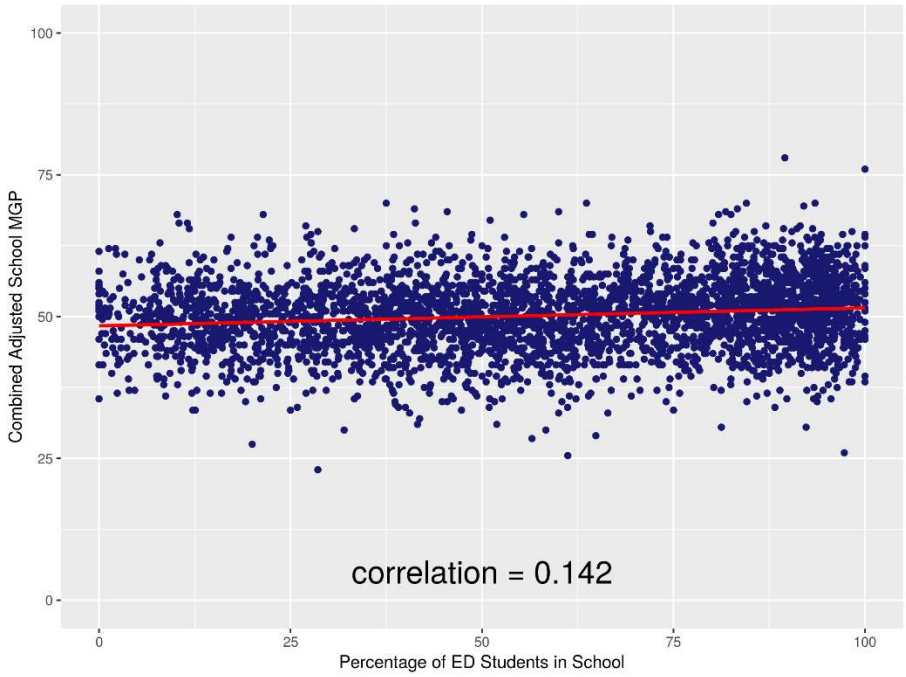


Figure 17. Grades 4—8 School MGP Scores by Mean Prior ELA Z-Score Students in School

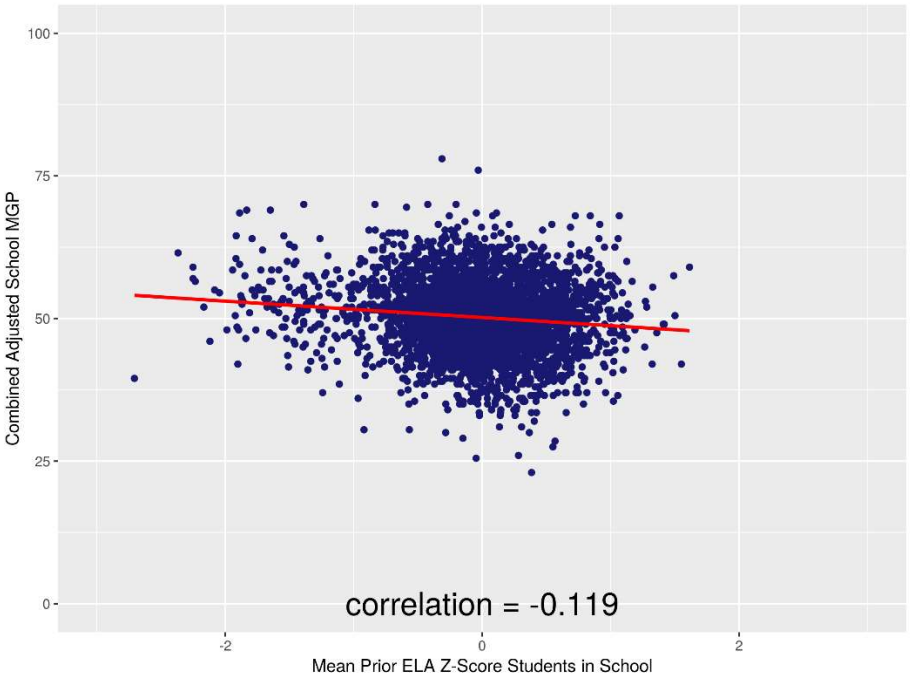
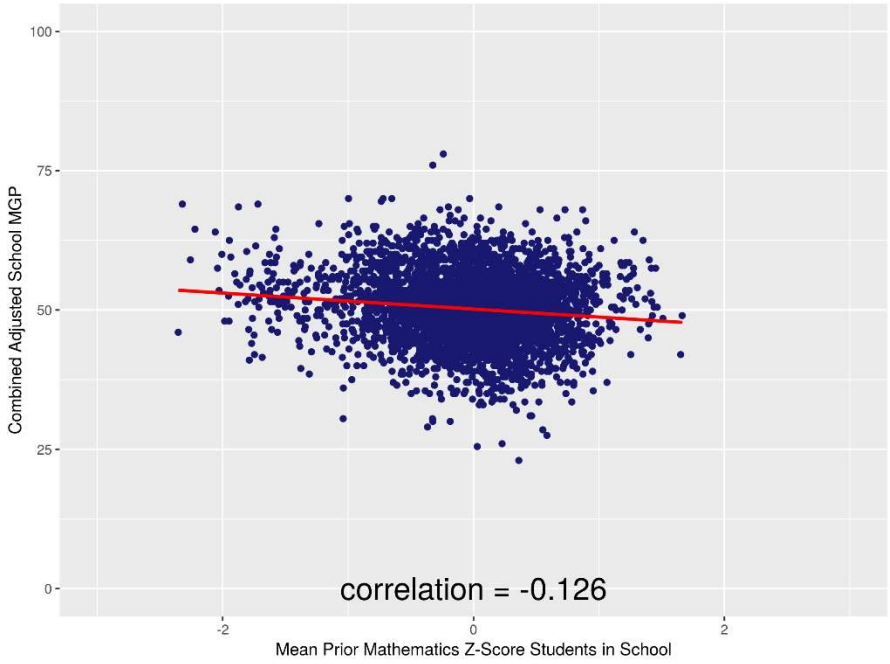


Figure 18. Grades 4—8 School MGP Scores by Mean Prior Mathematics Z-Score Students in School



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 15 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 2016/17 and 2017/18.

Table 15. Grades 4--8 Teacher, School, and Principal Growth Ratings

School Year	Level	Highly Effective	Effective	Developing	Ineffective
2016/17	Teacher	8%	77%	10%	5%
	Principal	7%	80%	8%	6%
	School	6%	81%	8%	5%
2017/18	Teacher	7%	77%	11%	5%
	Principal	7%	77%	10%	6%
	School	6%	78%	10%	6%

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

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

For teachers who had growth ratings in 2016/17 and 2017/18, Table 16 shows the relationship between ratings across years. Table 17 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 0.38 for schools between 2016/17 and 2017/18. The teacher correlation coefficient is the same as the 2016/17 correlation coefficient and the school correlation coefficient is slightly lower than the 2016/17 correlation coefficient, which was 0.42.

Table 16. Grades 4—8 Teacher Growth Ratings for Teachers Receiving Growth Ratings in Both 2016/17 and 2017/18

		2017/18				
		Highly Effective	Effective	Developing	Ineffective	Total
2016/17	Highly Effective	3%	5%	<1%	<1%	8%
	Effective	5%	63%	7%	2%	77%
	Developing	<1%	6%	2%	1%	10%
	Ineffective	<1%	3%	1%	1%	5%
	Total	8%	77%	10%	5%	100%

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

Table 17. Grades 4—8 School Growth Ratings for Schools Receiving Growth Ratings in Both 2016/17 and 2017/18

		2017/18				
		Highly Effective	Effective	Developing	Ineffective	Total
2016/17	Highly Effective	1%	4%	<1%	<1%	6%
	Effective	4%	66%	7%	3%	81%
	Developing	<1%	5%	2%	1%	8%
	Ineffective	<1%	3%	1%	1%	5%
	Total	6%	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 18 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 18. Correlation Between Adjusted Teacher and School Adjusted MGP and Average Prior Achievement Across Grades and Subjects

Measure of Prior Achievement		Correlation Between Adjusted MGP and Prior Achievement	
Subject	Grade	Teacher	School
ELA	Grade 4	-0.041	-0.068
	Grade 5	-0.066	-0.111
	Grade 6	-0.122	-0.131
	Grade 7	-0.128	-0.117
	Grade 8	-0.096	-0.110
Mathematics	Grade 4	-0.080	-0.102
	Grade 5	-0.102	-0.166
	Grade 6	-0.151	-0.173
	Grade 7	-0.190	-0.180
	Grade 8	-0.209	-0.160

Results from Growth Models for Grades 9—12

This section provides the results for the Grades 9—12 models using 2016/17 Regents Exam data.

Model Fit Statistics for Grades 9—12 Models

Table 19 shows the *R*-squared values for the MGP models based on ELA and Algebra Regents Exam data.

Table 19. Grades 9--12 Pseudo R-Squared Values

School Year	Model	ELA Common Core	Algebra 1 Common Core
2016/17	Adjusted	0.60	0.51
	Unadjusted	0.53	0.44
2017/18	Adjusted	0.60	0.48
	Unadjusted	0.51	0.41

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 2017/18, the correlation between a school's combined MGP and GRE results was 0.40, 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 20 shows the percentages of students included in each measure.

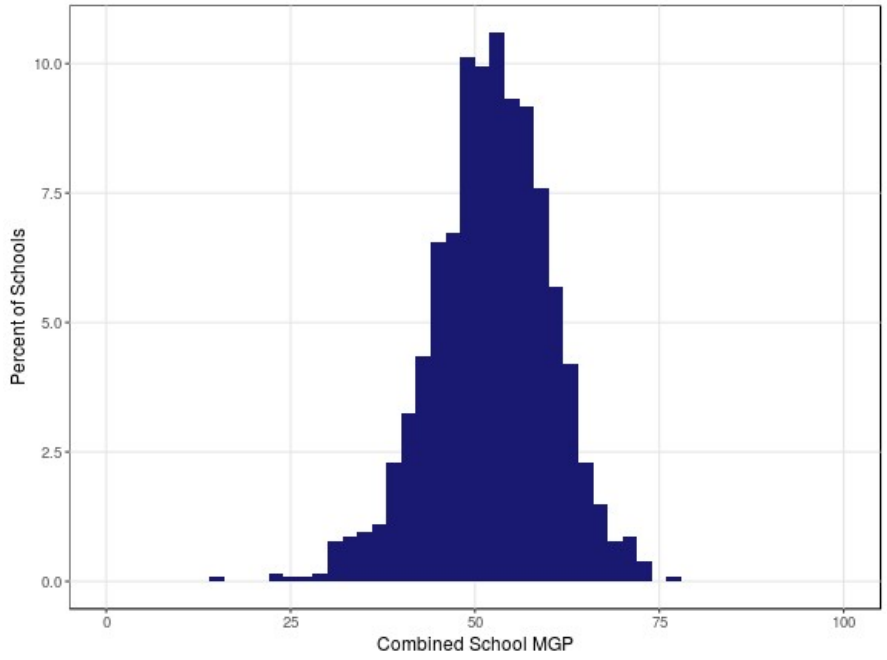
Table 20. Grades 9—12 Weighted Average Percentage of Students Included, weight is number of students attributed to each school.

Measure	Weighted Mean Fraction of Students in a School Included
MGP (ELA/Algebra 1 Common Core)	37%
GRE	73%

Distribution of MGPs and GRE Scores for Grades 9—12

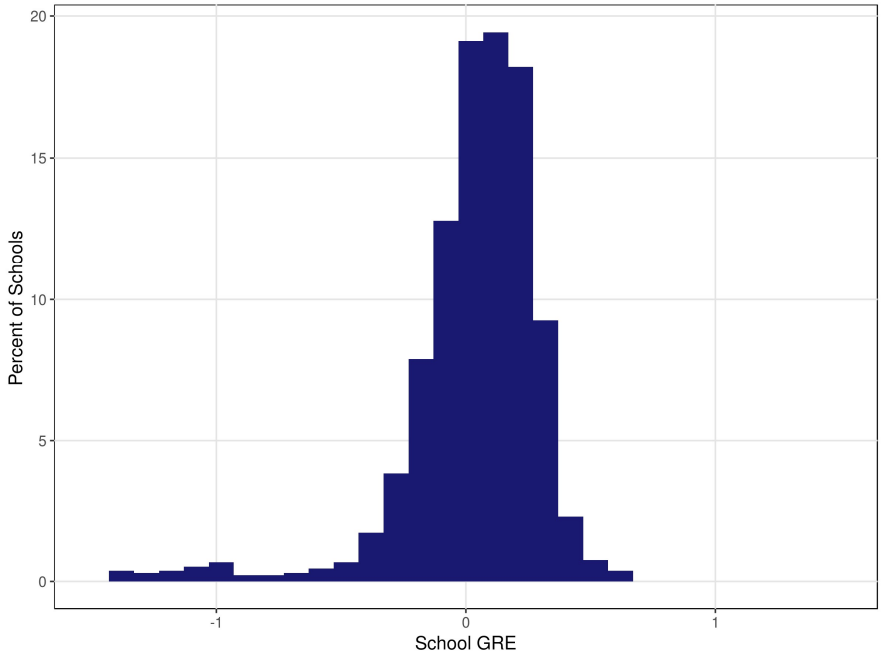
Figure 19 shows the distribution of combined school MGPs for Grades 9—12—that is, MGPs that combine information across SGPs in Algebra and ELA. The distribution is approximately normal.

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 4 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

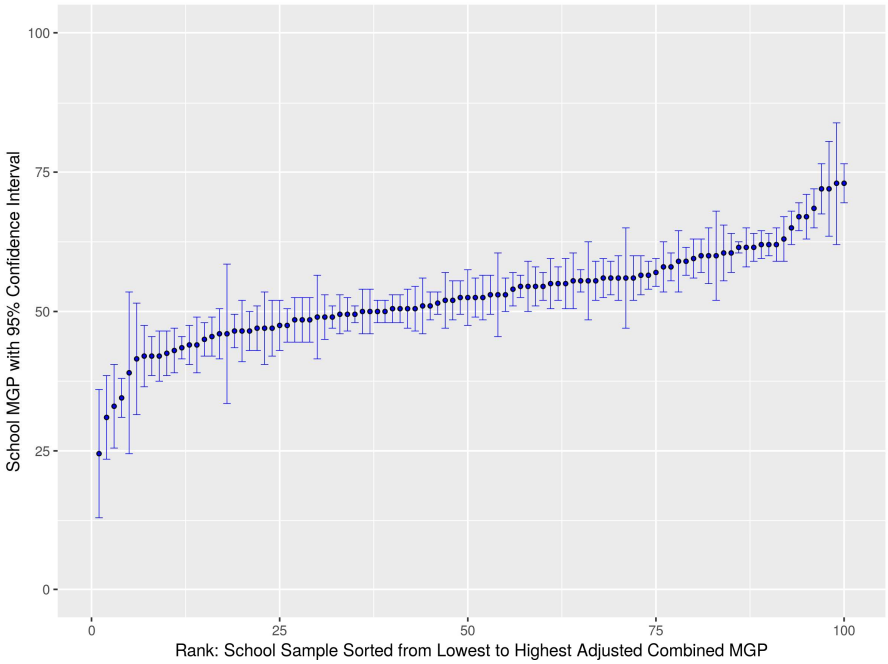


Figure 22. Grades 9—12 Caterpillar Plot of School GRE Scores

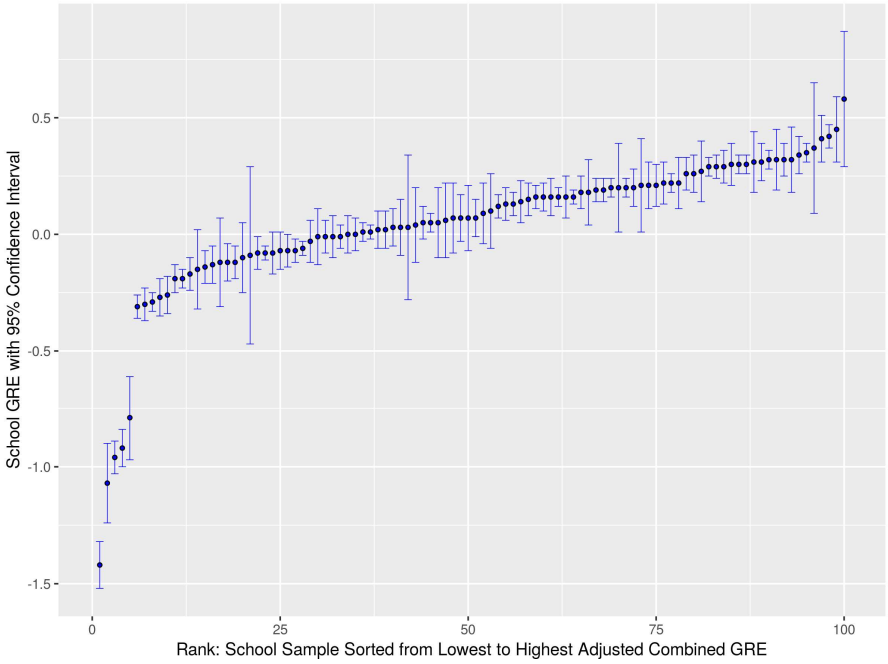


Table 21 shows the share of Grades 9–12 schools whose scores are significantly different from the mean (their confidence intervals on the caterpillar plot do not cross the average value).

Once again, the share exceeds what would be expected by chance alone, indicating that the model is able to distinguish among schools.

Table 21. Percentage of Grades 9—12 School Measures Above or Below the Mean at the 95% Confidence Interval

Measure	Below Mean	Above Mean
MGP	27%	32%
GRE	25%	41%

The weighted reliability (ρ) statistic, which was introduced earlier as a measure of the precision of the MGP measure, is shown in Table 22 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 22. 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	1.508	6.972	0.942
GRE	0.031	0.223	0.974

Impact Data Results for Grades 9—12

Table 23 shows the correlations for the MGP and GRE adjusted models with several school-level demographic variables.[19] Several correlations for the GRE model are larger than 0.10 in absolute value. For example, schools that have a higher percentage of students with disabilities or lower achieving students receive lower GRE scores on average. For the MGP model, the correlation between the school MGP and Grade 8 student test scores is between 0.2 and 0.3, suggesting between 4 and 9 percent of the variation in MGPs is explained by students' prior scores (the percent of variation explained is equal to the square of the correlation in Table 23). Appendix J shows correlations of school characteristics with principal-level MGPs.

[19] 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.

Table 23. Grades 9--12 School MGP Correlation with Demographic Characteristics

	MGP	GRE
ELL students in school	-0.021	-0.045
Students with disabilities in school	-0.131	-0.102
Economically disadvantaged students in school	-0.010	-0.006
Mean Grade 8 ELA score	0.282	0.170
Mean Grade 8 mathematics score	0.200	0.172

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

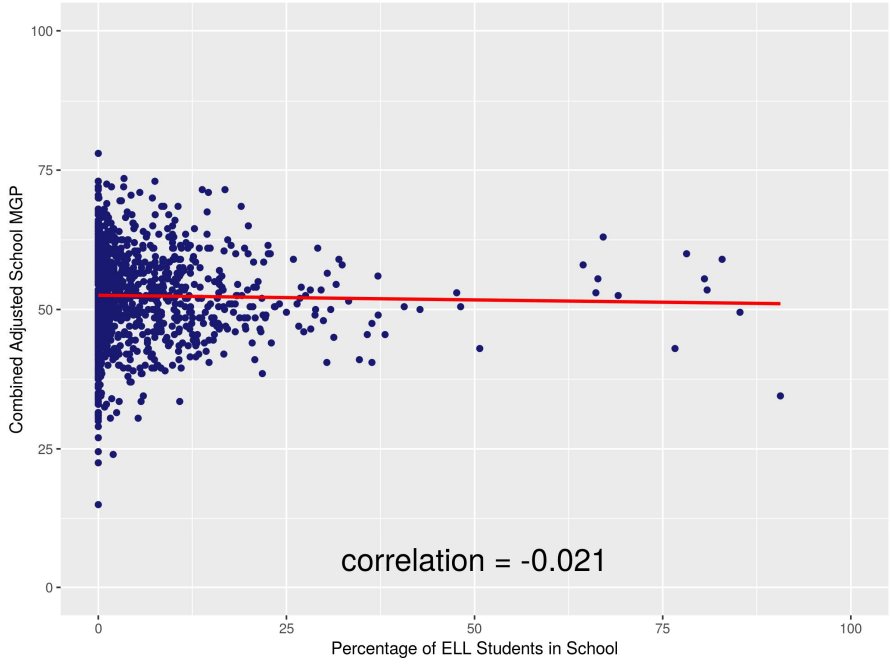


Figure 24. Grades 9—12 School MGP Scores by Percentage of SWD Students in School

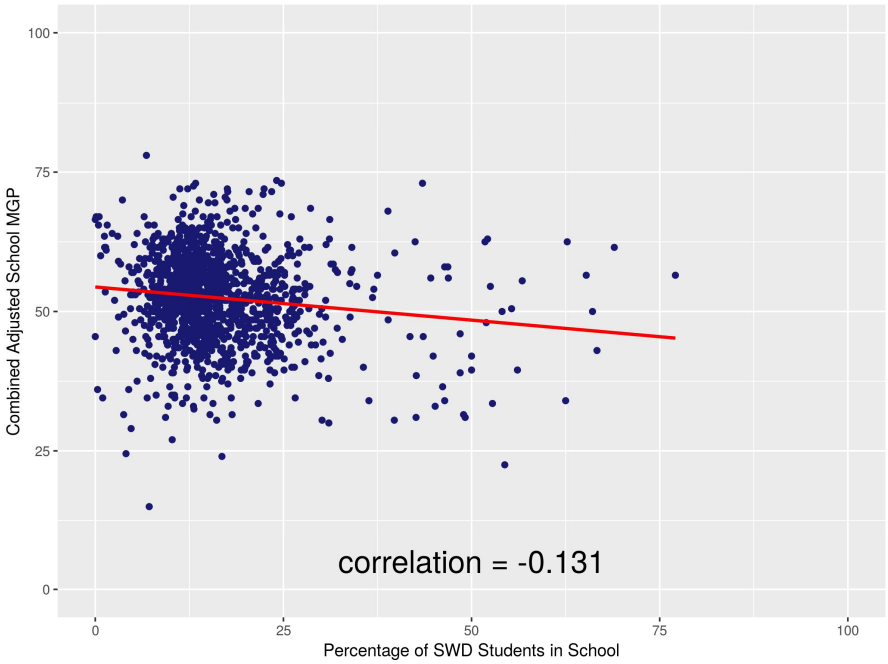


Figure 25. Grades 9—12 School MGP Scores by Percentage of ED Students in School

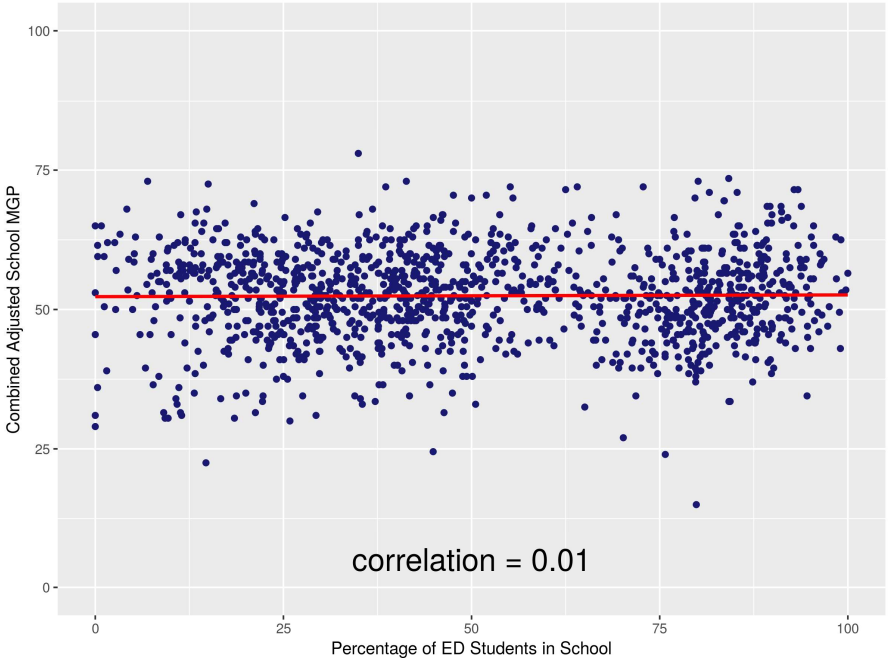


Figure 26. Grades 9—12 School MGP Scores by Mean Grade 8 ELA Z-Score in School

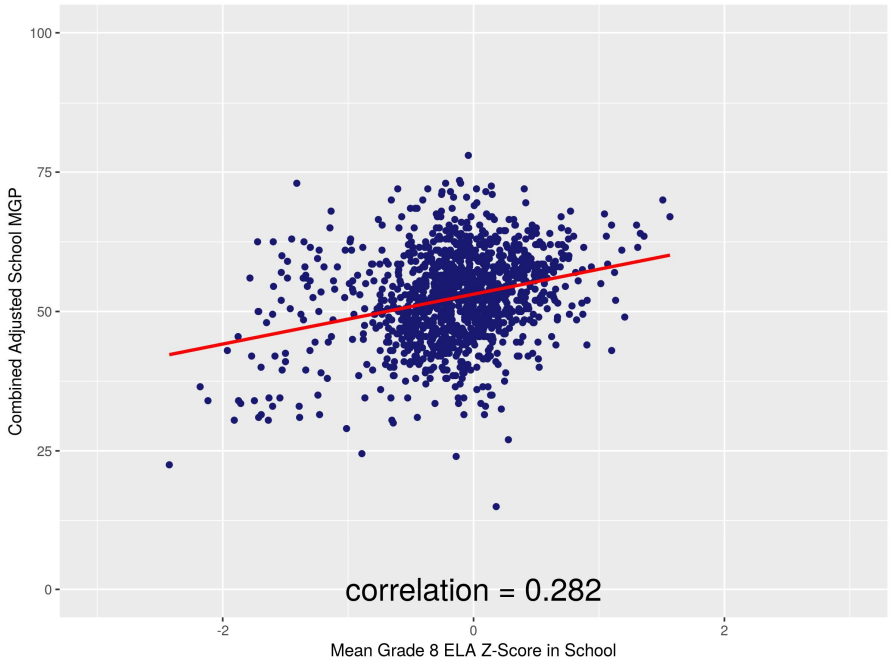


Figure 27. Grades 9—12 School MGP Scores by Mean Grade 8 Mathematics Z-Score in School

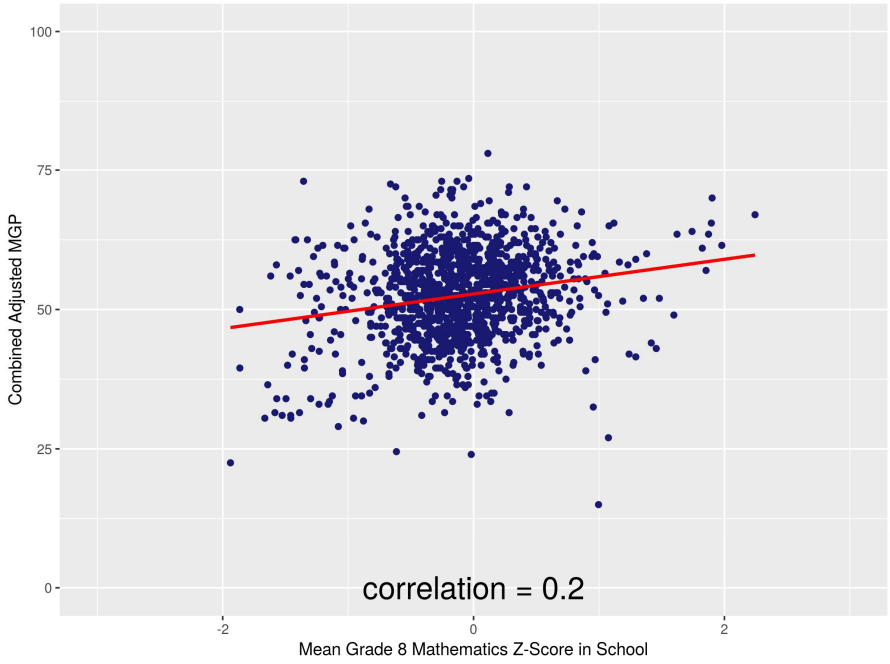


Figure 28. Grades 9—12 School GRE Scores by Percentage of ELL Students in School

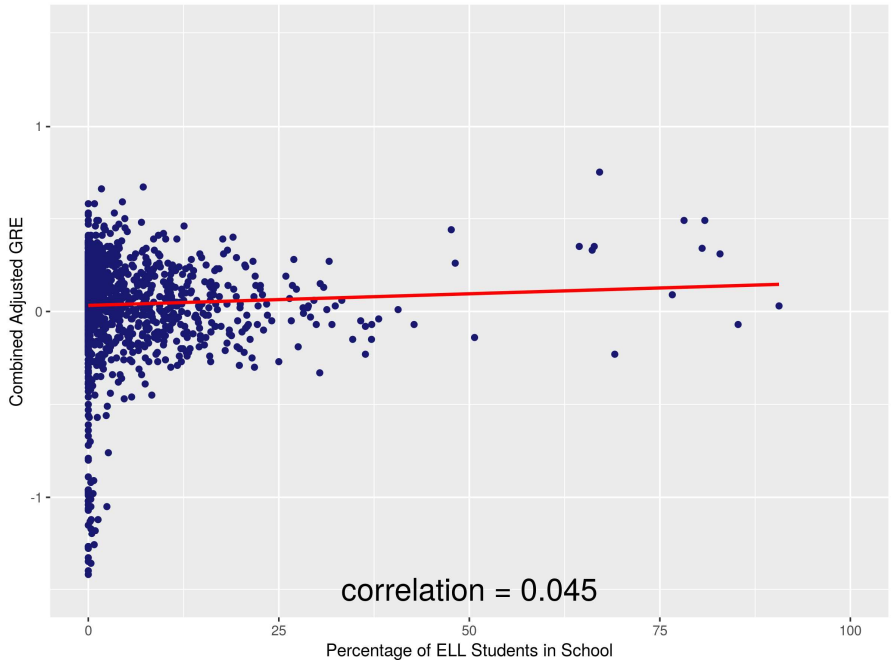


Figure 29. Grades 9—12 School GRE Scores by Percentage of SWD Students in School

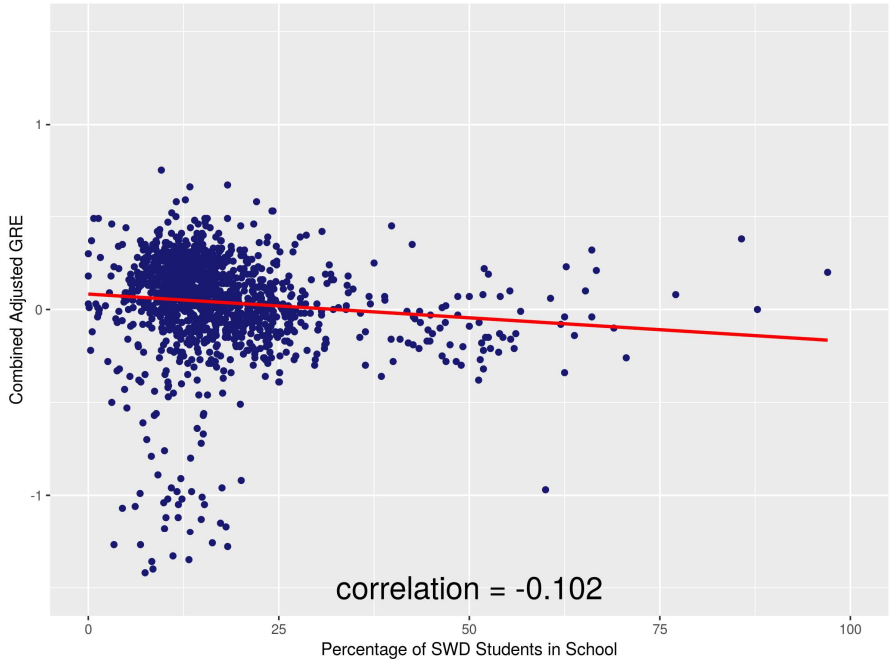


Figure 30. Grades 9—12 School GRE Scores by Percentage of ED Students in School

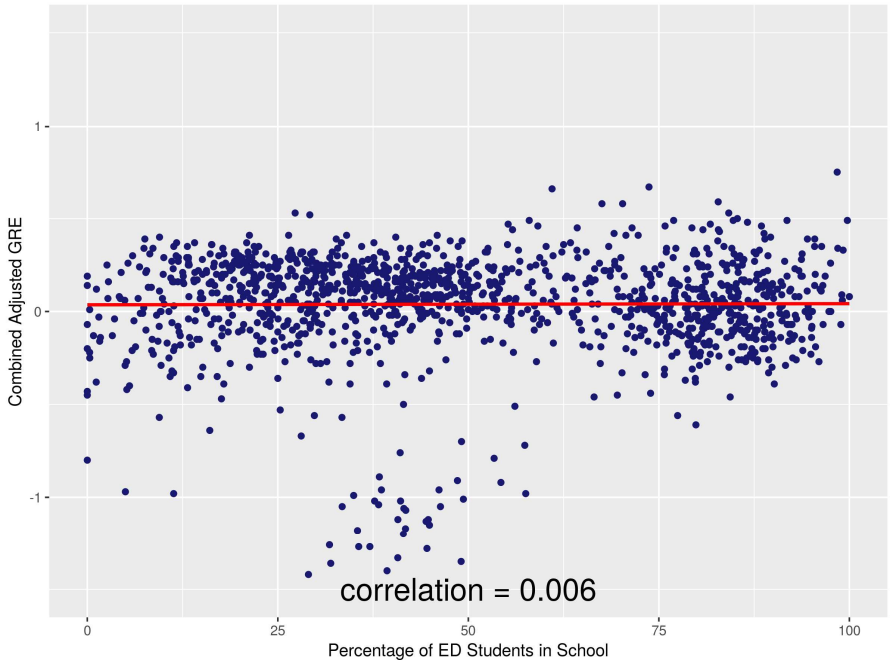


Figure 31. Grades 9—12 School GRE Scores by Mean Grade 8 ELA Z-Score in School

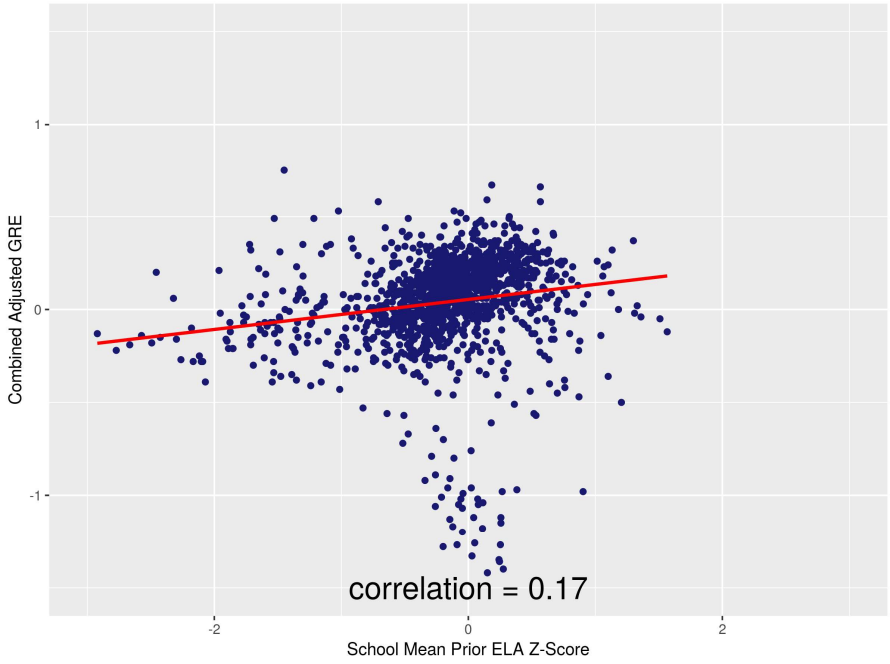
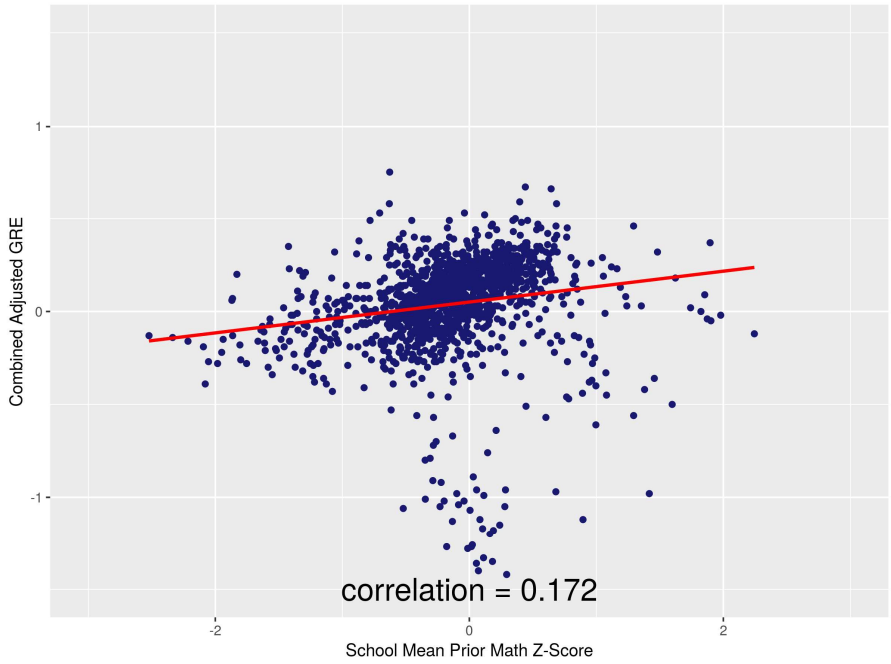


Figure 32. Grades 9—12 School GRE Scores by Mean Grade 8 Mathematics Z-Score in School



Growth Ratings for Schools with Grades 9—12

Table 24 shows the distribution of growth ratings for schools and principals of all schools serving Grades 9—12 (including schools that may serve other grades, such as Grades 4—8) for 2016/17 and 2017/18.

Table 24. Grades 9—12 School and Principal Growth Ratings

School Year	Level	Highly Effective	Effective	Developing	Ineffective
2016/17	Principal	3%	76%	17%	4%
	School	3%	81%	13%	3%
2017/18	Principal	1%	84%	11%	3%
	School	2%	85%	11%	3%

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

Table 25 shows the relationship between school ratings across years. The results show that the ratings are stable, with 80% of schools remaining in the same growth rating category from year to year.

Table 25. Grades 9—12 School Growth Ratings for Schools Receiving Growth Ratings in Both 2016/17 and 2017/18

		2017/18				
		Highly Effective	Effective	Developing	Ineffective	Total
2016/17	Highly Effective	<1%	3%	<1%	<1%	3%
	Effective	1%	74%	4%	2%	81%
	Developing	<1%	8%	4%	<1%	12%
	Ineffective	<1%	1%	2%	<1%	3%
	Total	2%	86%	10%	3%	101%

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 26 shows growth ratings for schools that serve only Grades 4—8 (4—8 only), schools that serve Grades 9—12 only (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 27 shows similar information for principals.

Table 26. Growth Ratings for Schools

	Model	Highly Effective	Effective	Developing	Ineffective	Number of Schools
4—8 Growth Rating	4—8 Only	7%	78%	10%	5%	3,183
	4—8 and 9—12	6%	74%	12%	8%	408
	All schools	6%	78%	10%	6%	3,591
9—12 Growth Rating	9—12 only	1%	85%	11%	2%	921
	4—8 and 9—12	3%	84%	10%	4%	408
	All schools	2%	85%	11%	3%	1,329
Overall Growth Rating	4—8 and 9—12	0%	86%	12%	1%	408
	All schools	5%	80%	10%	4%	4,512

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

Table 27. Growth Ratings for Principals

	Model	Highly Effective	Effective	Developing	Ineffective	Number of Principals
4—8 Growth Rating	4—8 Only	7%	78%	10%	5%	3,262
	4—8 and 9—12	6%	73%	13%	8%	441
	All principals	7%	77%	10%	6%	3,703
9—12 Growth Rating	9—12 only	1%	87%	10%	2%	900
	4—8 and 9—12	2%	84%	10%	4%	441
	All principals	1%	86%	10%	3%	1,341
Overall Growth Rating	4—8 and 9—12	0%	86%	13%	1%	441
	All principals	5%	80%	10%	4%	4,603

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 3 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 Grades 9—12 growth measures, scores from 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 7 or Grade 8 in the same subject (for the Common Core Algebra Regents model, from the Grade 7 or Grade 8 mathematics test; for the ELA Regents models, from the 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 7 or Grade 8 score in either mathematics or ELA.
- **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 2016/17 and 2017/18 were not included in the model (e.g., students with data from Grade 6 in 2016/17 and Grade 6 in 2017/18). This variable was computed based on students' tested grade in the assessment score file.
- **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 Common

Core Algebra Regents model, from the Grade 8 mathematics test; for the Common Core ELA Regents model, from the Grade 8 ELA test) was used. For the GRE measure, average Grade 8 achievement at the school level in mathematics and ELA 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 Nonarticulation 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 2017/18 was compared with their prior tested school and the range of grades served in the school. For Grades 9—12 models, enrollment data from 2016/17 and 2017/18 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 Common Core Algebra 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 ninth 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 in the five traditionally required subject areas[20] that students have passed before the current year (in this case, 2017/18) for Grades 9—12 MGP models. To compute this variable, we reviewed Regents assessment score files back to 2009/10.

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.

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. Three versions of NYSESLAT scores are used in Grades 9—12 models.

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

Separate predictor variables were included for NYSESLAT scores from 2011/12 and earlier (when two separate scale scores for Listening/Speaking and Reading/Writing were used); 2012/13 and 2013/14 (when there was a single scale score); and another, different single scale score version for 2014/15. For Grades 4—8 models, NYSESLAT scores from the immediate prior year (in this case, 2014/15 single scale scores) 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 Grades 4—8 growth measures and the percentage of students identified as ELL in the school for 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 Grades 4—8 growth measures and percentage of students identified as economically disadvantaged in the school for 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 at 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 and 2013.

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 (2017/18, 2016/17, 2015/16, and 2014/15)** – 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 (Algebra 8 Continuous Enrollment and BOCES Enrollment)** –Students that 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 that 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, HOSS/LOSS, 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 D 1 shows the records used for growth model analysis. Students enrolled in Algebra I (course code 02052CC), Geometry (course code 02072CC), or Algebra II (course code 02056CC) who take Grades 6—8 mathematics assessments are included in the analysis.

Table D 1. Relevant Grades 4—8 Item Descriptions

Item Descriptions
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

Appendix E. Model Derivation

The following describes a general case of the growth model described in this report. In New York State in 2014–15, there were no indicator variables included for specific educators, so the Z and D matrix in the following are always zero in every entry.

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 $W = \{X, y_{t-1}, y_{t-2}, \dots, y_{t-L}\}$, $W^* = \{X, y_{t-1}^*, y_{t-2}^*, \dots, y_{t-L}^*\}$, and $\delta' = \{\beta', \gamma'\}$. Label the matrix of measurement variance disturbances U for disturbances associated with $y_{t-1}, y_{t-2}, \dots, y_{t-L}$ and label the vector of measurement disturbances with the dependent variable, y_t, v, hence $y_t = y_t^* + v$. Let U have the same dimensions as W, but only the final L columns of U are nonzero, so $W = W^* + U$. 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 $m = \sum_{q=1}^{Q} J_q$.

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

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

We also have $Z'\Omega^{-1}W^* = E(Z'\Omega^{-1}W)$, 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:

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

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

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

where S is a diagonal "correction" matrix with dimensions $p \times p$ 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 $E(U'\Omega^{-1}U)$ based on the following justification. Recall that we previously defined Ω as $diag(\sigma_{t1}^2, \sigma_{t2}^2, \dots, \sigma_{tN}^2)$, 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:

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

The theoretical result is limited only because we do not observe u_{ip} because it is latent. However, $E(u_{ip}u_{ip}) = \sigma_{ip}^2$, 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: $E(u_{ip}u_{ip'}) = 0$ 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

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

where $\sigma_{u,j(i)}^2$ 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 9—12 runs through the same six standardized processes outlined in Appendix C for 4—8. The raw data files used to produce the 9—12 results are explained in greater detail below.

Raw Data

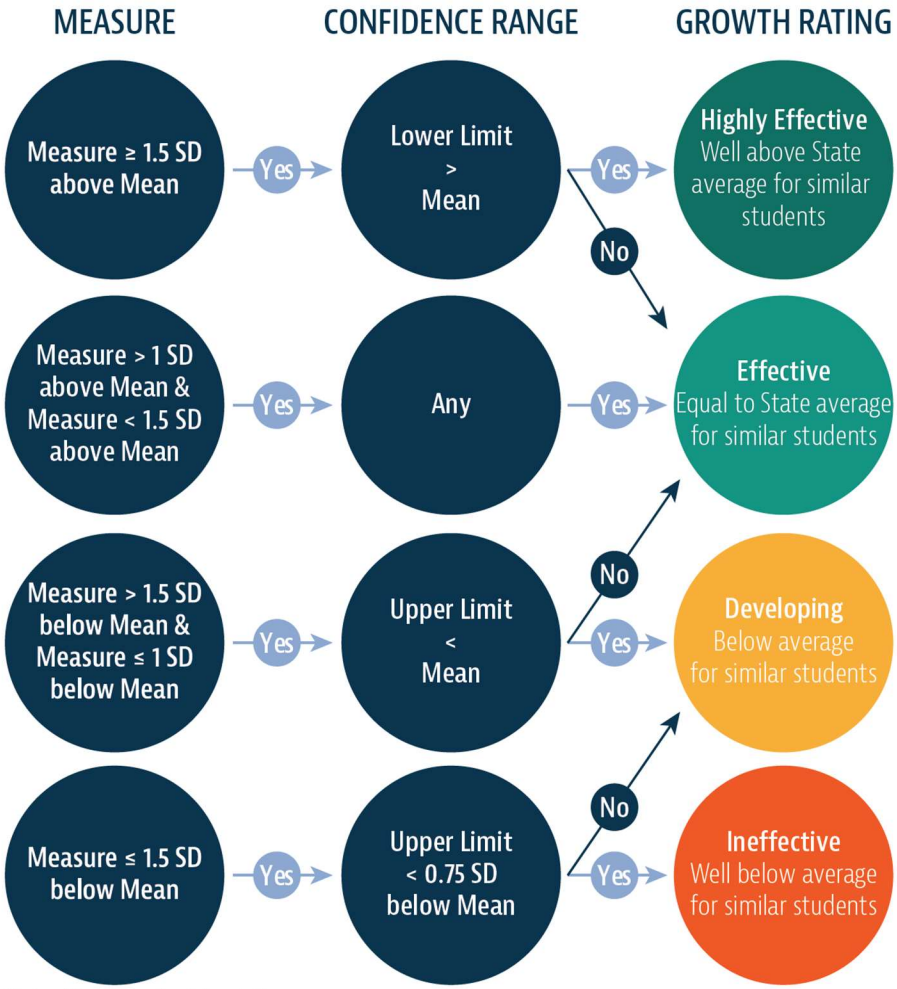
The raw data files that were used in the production of 9—12 growth results this year include:

1. **Regents Assessment Files (2009/10 – 2017/18)** – Student-level results on the Regents Examinations.
2. **Assessment and CSEM (2008/09 – 2017/18)** – Student-level results on the state 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 (2014/15 – 2017/18)** – 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 H 1, shown in the body of the report but repeated here for reference.

Figure H 1. HEDI Rating Rules



Note: SD = Standard Deviation
Values are rounded to the nearest 0.5 for MGP & 0.1 for GRE.

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), and in Grades 9—12 for the GRE model. Values used in 2017/18 to assign HEDI ratings for teachers are shown in Figure H 1; for schools, in Table H 2; and for principals, in Table H 3.

Table H 1. Teacher HEDI Rating Values

Measure	Grades 4 8 Growth Model
Mean	50.750
Standard Deviation	10.913
Highly Effective	67 ≤ MGP and confidence range lower limit > 51
Effective	67 ≤ MGP and confidence range lower limit ≤ 51
Effective	40 < MGP < 67
Effective	34 < MGP ≤ 40 and confidence range upper limit ≥ 51
Developing	34 < MGP ≤ 40 and confidence range upper limit < 51
Developing	MGP ≤ 34 and confidence range upper limit ≥ 43
Ineffective	MGP ≤ 34 and confidence range upper limit < 43

Table H 2. School HEDI Rating Values

Measure	Grades 4 8 Growth Model	Grades 9 12 Growth Model	Grades 9 12 GRE Model
Mean	50.211	52.462	0.039
Standard Deviation	6.307	8.044	0.272
Highly Effective	60.0 ≤ MGP and confidence range lower limit > 50.0	65.0 ≤ MGP and confidence range lower limit > 52.0	0.45 ≤ GRE and confidence range lower limit > 0.04
Effective	60.0 ≤ MGP and confidence range lower limit ≤ 50.0	65.0 ≤ MGP and confidence range lower limit ≤ 52.0	0.45 ≤ GRE and confidence range lower limit ≤ 0.04
Effective	44.0 < MGP < 60.0	44.0 < MGP < 65.0	-0.22 < GRE < 0.45
Effective	41.0 < MGP ≤ 44.0 and confidence range upper limit ≥ 50.0	40.0 < MGP ≤ 44.0 and confidence range upper limit ≥ 52.0	-0.36 < GRE ≤ -0.22 and confidence range upper limit ≥ 0.04
Developing	41.0 < MGP ≤ 44.0 and confidence range upper limit < 50.0	40.0 < MGP ≤ 44.0 and confidence range upper limit < 53	-0.36 < GRE ≤ -0.22 and confidence range upper limit < 0.04
Developing	MGP ≤ 41.0 and confidence range upper limit ≥ 45.0	MGP ≤ 40.0 and confidence range upper limit ≥ 46.0	GRE ≤ -0.36 and confidence range upper limit ≥ -0.16
Ineffective	MGP ≤ 41.0 and confidence range upper limit < 45.0	MGP ≤ 40.0 and confidence range upper limit < 46.0	GRE ≤ -0.362 and confidence range upper limit < -0.16

Table H 3. Principal HEDI Rating Values

Measure	Grades 4 8 Growth Model	Grades 9 12 Growth Model	Grades 9 12 GRE Model
Mean	50.200	52.522	0.040

Measure	Grades 4 8 Growth Model	Grades 9 12 Growth Model	Grades 9 12 GRE Model
Standard Deviation	6.361	8.052	0.276
Highly Effective	60.0 ≤ MGP and confidence range lower limit > 50	65.0 ≤ MGP and confidence range lower limit > 52.5	0.45 ≤ GRE and confidence range lower limit > 0.04
Effective	60.0 ≤ MGP and confidence range lower limit ≤ 50	65.0 ≤ MGP and confidence range lower limit ≤ 52.0	0.45 ≤ GRE and confidence range lower limit ≤ 0.04
Effective	44.0 < MGP < 60.0	44.0 < MGP < 65.0	-0.23 < GRE < 0.45
Effective	41.0 < MGP ≤ 44.0 and confidence range upper limit ≥ 50	40.0 < MGP ≤ 44.0 and confidence range upper limit ≥ 52.0	-0.37 < GRE ≤ -0.23 and confidence range upper limit ≥ 0.04
Developing	41.0 < MGP ≤ 44.0 and confidence range upper limit < 50	40.0 < MGP ≤ 44.0 and confidence range upper limit < 52.0	-0.37 < GRE ≤ -0.23 and confidence range upper limit < 0.04
Developing	MGP ≤ 41.0 and confidence range upper limit ≥ 45	MGP ≤ 40.0 and confidence range upper limit ≥ 46.0	GRE ≤ -0.37 and confidence range upper limit ≥ -0.16
Ineffective	MGP ≤ 41.0 and confidence range upper limit < 45	MGP ≤ 40.0 and confidence range upper limit < 46.0	GRE ≤ -0.37 and confidence range upper limit < -0.16

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. The HEDI growth scores associated with HEDI ratings are shown in Table H 4.

Table H 4. Cut points for HEDI Scores

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

a: Based on the arguments presented in the NYC arbitration proceeding held on May 30–31, 2014, and pursuant to his authority in Education Law §3012-c(2)(a), the Commissioner imposed new proportional scoring ranges for use in NYC for the 2013/14, 2014/15, 2015/16, 2016/17, and 2017/18 school years. Please see http://usny.nysed.gov/rttt/teachers-leaders/plans/districts/new-york-city.html for additional information. Pursuant to Education Law §3012-d and Subpart 30-3 of the Rules of the Board of Regents, all districts will use the same scoring ranges, determined by the Commissioner, for evaluations conducted pursuant to this subpart.

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 H 5. Grades 4—8 Teacher, School, and Principal MGP HEDI Point Distribution

	Teacher		School		Principal	
HEDI Points	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
0	9	21	23	32	23	32
1	22	23	33	34.5	33	34.5
2	24	24	35	35	35	35.5
3	25	25	35.5	36	36	36
4	26	26	36.5	36.5	36.5	36.5
5	27	27	37	37	37	37
6	28	28	37.5	37.5	37.5	37.5
7	29	29	38	38	38	38
8	30	30	38.5	38.5	38.5	38.5
9	31	31	39	39	39	39
10	32	32	39.5	39.5	39.5	39.5
11	33	33	40	40	40	40
12	34	34	40.5	41	40.5	41
13	28	36	37	42	37	42
14	37	40	42.5	44	42.5	44
15	35	47	41.5	48.5	41.5	48.5
16	48	54	49	52.5	49	52.5
17	55	67	53	63	53	62.5
18	67	68	60	60.5	60	60.5
19	69	72	61	62.5	61	62.5
20	73	95	63	78	63	78

Table H 6. Grades 9—12 School and Principal MGP HEDI Point Distribution

	School		Principal	
HEDI Points	Minimum	Maximum	Minimum	Maximum
0	15	27	15	24.5
1	29	30.5	27	29.5
2	31	31	30.5	31
3	31.5	33	31.5	33
4	33.5	34	33.5	33.5
5	34.5	34.5	34.5	35
6	35	36.5	36	36.5
7	37	37.5	37	37.5
8	38	38	38	38
9	38.5	38.5	38.5	38.5
10	39	39	39	39
11	39.5	39.5	39.5	39.5
12	40	40	40	40
13	31.5	41.5	31.5	42
14	42	44	42.5	44
15	42	50.5	42	50
16	51	56	50.5	56
17	56.5	68	56.5	68
18	65	66	65	66
19	66.5	69	66.5	68.5
20	69.5	78	69	78

Table H 7. Grades 9—12 School and Principal GRE HEDI Point Distribution

	School		Principal	
HEDI Points	Minimum	Maximum	Minimum	Maximum
0	-1.42	-1.35	-1.42	-1.33
1	-1.33	-1.26	-1.28	-1.20
2	-1.20	-1.13	-1.18	-1.13
3	-1.12	-1.06	-1.12	-1.06

HEDI Points	School		Principal	
	Minimum	Maximum	Minimum	Maximum
4	-1.05	-1.01	-1.05	-1.02
5	-0.99	-0.97	-1.01	-0.97
6	-0.96	-0.89	-0.96	-0.91
7	-0.80	-0.70	-0.89	-0.76
8	-0.67	-0.57	-0.72	-0.64
9	-0.56	-0.50	-0.61	-0.57
10	-0.47	-0.45	-0.52	-0.47
11	-0.44	-0.40	-0.46	-0.43
12	-0.39	-0.37	-0.42	-0.38
13	-0.39	-0.28	-0.39	-0.29
14	-0.27	-0.23	-0.28	-0.24
15	-0.28	0.01	-0.28	0.01
16	0.02	0.16	0.02	0.16
17	0.17	0.44	0.17	0.44
18	0.45	0.47	0.45	0.46
19	0.48	0.52	0.47	0.50
20	0.53	0.75	0.52	0.75

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, and 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 principals and schools have multiple HEDI ratings and scores (Grades 9—12 MGP and Grades 9—12 GRE), and some principals and schools may have multiple HEDI ratings and scores if they serve students in Grades 4—8 and 9—12. HEDI ratings and scores from the 9—12 MGP and 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 H 4.

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* principals and schools, assign a final HEDI rating by using the cut points table, assigning the HEDI rating associated with each school or principal'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 I 2, 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 0.402. 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 I 2, 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 -1.692 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 I 29, because the coefficient is positive, an increase in the Grade 8 ELA scale scores from 2012/13 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 I 1. Grade 4 ELA Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	444.361	0.329	0.000
Prior-Grade ELA Scale Score	0.505	0.001	0.000

Table I 2. Grade 4 ELA Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	423.961	1.313	0.000
Prior-Grade ELA Scale Score	0.402	0.002	0.000
Prior-Grade Mathematics Scale Score	0.079	0.002	0.000
Missing Flag: Prior-Grade Mathematics Scale Score	22.815	0.058	0.000
Mean Prior Score	0.060	0.003	0.000
Range Around Prior Score	0.000	0.003	0.899
New to School	-0.386	0.112	0.001
Students with Disabilities	-1.692	0.110	0.000
General Education <40% (LRE3)	-1.219	0.231	0.000
Percentage of Students with Disabilities	0.032	0.002	0.000
ELLs	0.224	0.286	0.434
Percentage of ELLs	0.026	0.002	0.000
Missing Flag: Percentage Variables	20.255	0.901	0.000
Grades 3—4 NYSESLAT Scale Score	0.031	0.004	0.000
Missing Flag: Grades 3—4 NYSESLAT Scale Scores	8.353	1.101	0.000
Economically Disadvantaged	-0.630	0.080	0.000
Percentage of Economically Disadvantaged	0.011	0.002	0..000

Table I 3. Grade 5 ELA Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	437.257	0.317	0.000
Prior-Grade ELA Scale Score	0.381	0.002	0.000
Two-Grades-Prior ELA Scale Score	0.150	0.002	0.000
Missing Flag: Two-Grades-Prior ELA Scale Score	45.430	0.670	0.000

Table I 4. Grade 5 ELA Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	415.122	1.384	0.000
Prior-Grade ELA Scale Score	0.323	0.003	0.000
Two-Grades-Prior ELA Scale Score	0.134	0.002	0.000
Missing Flag: Two-Grades-Prior ELA Scale Score	40.722	0.682	0.000
Prior-Grade Mathematics Scale Score	0.058	0.002	0.000
Missing Flag: Prior-Grade Mathematics Scale Score	16.776	0.503	0.000
Mean Prior Score	0.011	0.002	0.000
Range Around Prior Score	-0.003	0.003	0.281
Retained in Grade	0.158	0.245	0.520
New to School	0.320	0.114	0.005
Students with Disabilities	-1.096	0.104	0.000
General Education <40% (LRE3)	-1.317	0.210	0.000
Percentage of Students with Disabilities	0.013	0.002	0.000
ELLs	1.444	0.290	0.000
Percentage of ELLs	0.018	0.003	0.000
Missing Flag: Percentage Variables	3.720	0.831	0.000
Grades 3—4 NYSESLAT Scale Score	0.081	0.004	0.000
Missing Flag: Grades 3—4 NYSESLAT Scale Scores	23.847	1.174	0.000
Economically Disadvantaged	-0.217	0.074	0.003
Percentage of Economically Disadvantaged	-0.002	0.001	0.214

Table I 5. Grade 6 ELA Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	446.873	0.331	0.000
Prior-Grade ELA Scale Score	0.335	0.002	0.000
Two-Grades-Prior ELA Scale Score	0.119	0.003	0.000
Missing Flag: Two-Grades-Prior ELA Scale Score	35.100	0.838	0.000
Three-Grades-Prior ELA Scale Score	0.054	0.002	0.000
Missing Flag: Three-Grades-Prior ELA Scale Score	15.864	0.609	0.000

Table I 6. Grade 6 ELA Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	417.477	1.534	0.000
Prior-Grade ELA Scale Score	0.286	0.002	0.000
Two-Grades-Prior ELA Scale Score	0.100	0.003	0.000
Missing Flag: Two-Grades-Prior ELA Scale Score	29.674	0.848	0.000
Three-Grades-Prior ELA Scale Score	0.048	0.002	0.000
Missing Flag: Three-Grades-Prior ELA Scale Score	14.265	0.607	0.000
Prior-Grade Mathematics Scale Score	0.062	0.002	0.000
Missing Flag: Prior-Grade Mathematics Scale Score	17.893	0.535	0.000
Mean Prior Score	0.030	0.002	0.000
Range Around Prior Score	0.005	0.003	0.089
Retained in Grade	-0.248	0.314	0.430
New to School	-0.262	0.126	0.038
Students with Disabilities	-1.095	0.103	0.000
General Education <40% (LRE3)	0.003	0.213	0.099
Percentage of Students with Disabilities	0.008	0.002	0.001
ELLs	0.532	0.347	0.126
Percentage of ELLs	0.020	0.003	0.000
Missing Flag: Percentage Variables	10.316	0.823	0.000
Grades 5—6 NYSESLAT Scale Score	0.083	0.004	0.000
Missing Flag: Grades 5—6 NYSESLAT Scale Scores	22.717	1.325	0.000
Economically Disadvantaged	-0.480	0.075	0.000
Percentage of Economically Disadvantaged	0.006	0.002	0.000

Table I 7. Grade 7 ELA Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	448.533	0.294	0.000
Prior-Grade ELA Scale Score	0.383	0.002	0.000
Two-Grades-Prior ELA Scale Score	0.080	0.002	0.000
Missing Flag: Two-Grades-Prior ELA Scale Score	22.520	0.654	0.000
Three-Grades-Prior ELA Scale Score	0.045	0.002	0.000
Missing Flag: Three-Grades-Prior ELA Scale Score	13.132	0.605	0.000

Table I 8. Grade 7 ELA Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	395.101	1.491	0.000
Prior-Grade ELA Scale Score	0.313	0.003	0.000
Two-Grades-Prior ELA Scale Score	0.073	0.002	0.000
Missing Flag: Two-Grades-Prior ELA Scale Score	20.845	0.635	0.000
Three-Grades-Prior ELA Scale Score	0.046	0.002	0.000
Missing Flag: Three-Grades-Prior ELA Scale Score	13.756	0.606	0.000
Prior-Grade Mathematics Scale Score	0.063	0.002	0.000
Missing Flag: Prior-Grade Mathematics Scale Score	17.057	0.475	0.000
Mean Prior Score	0.092	0.003	0.000
Range Around Prior Score	-0.018	0.003	0.000
Retained in Grade	-1.679	0.315	0.000
New to School	-0.477	0.114	0.000
Students with Disabilities	-0.392	0.099	0.000
General Education <40% (LRE3)	-1.294	0.214	0.000
Percentage of Students with Disabilities	0.050	0.002	0.000
ELLs	1.393	0.311	0.000
Percentage of ELLs	0.042	0.003	0.000
Missing Flag: Percentage Variables	31.551	0.860	0.000
Grades 5—6 NYSESLAT Scale Score	0.092	0.004	0.000
Missing Flag: Grades 5—6 NYSESLAT Scale Scores	26.141	1.276	0.000
Economically Disadvantaged	-0.215	0.072	0.003
Percentage of Economically Disadvantaged	0.048	0.002	0.000

Table I 9. Grade 8 ELA Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	433.378	0.340	0.000
Prior-Grade ELA Scale Score	0.414	0.003	0.000
Two-Grades-Prior ELA Scale Score	0.097	0.003	0.000
Missing Flag: Two-Grades-Prior ELA Scale Score	27.374	0.793	0.000
Three-Grades-Prior ELA Scale Score	0.034	0.002	0.000
Missing Flag: Three-Grades-Prior ELA Scale Score	10.116	0.622	0.000

Table I 10. Grade 8 ELA Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	389.395	1.604	0.000
Prior-Grade ELA Scale Score	0.351	0.003	0.000
Two-Grades-Prior ELA Scale Score	0.087	0.003	0.000
Missing Flag: Two-Grades-Prior ELA Scale Score	24.474	0.791	0.000
Three-Grades-Prior ELA Scale Score	0.039	0.002	0.000
Missing Flag: Three-Grades-Prior ELA Scale Score	11.619	0.627	0.000
Prior-Grade Mathematics Scale Score	0.071	0.002	0.000
Missing Flag: Prior-Grade Mathematics Scale Score	21.148	0.668	0.000
Mean Prior Score	0.064	0.003	0.000
Range Around Prior Score	-0.004	0.004	0.025
Retained in Grade	-3.961	0.528	0.000
New to School	-0.765	0.147	0.000
Students with Disabilities	-0.353	0.108	0.001
General Education <40% (LRE3)	-0.088	0.231	0.702
Percentage of Students with Disabilities	0.021	0.002	0.000
ELLs	1.236	0.342	0.000
Percentage of ELLs	0.027	0.003	0.000
Missing Flag: Percentage Variables	24.646	0.990	0.000
Grades 7—8 NYSESLAT Scale Score	0.071	0.004	0.000
Missing Flag: Grades 7—8 NYSESLAT Scale Scores	19.827	1.351	0.000
Economically Disadvantaged	0.067	0.077	0.383
Percentage of Economically Disadvantaged	0.059	0.002	0.000

Table I 11. Grade 4 Mathematics Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	458.903	0.265	0.000
Prior-Grade Mathematics Scale Score	0.457	0.001	0.000

Table I 12. Grade 4 Mathematics Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	449.31	1.027	0.000
Prior-Grade Mathematics Scale Score	0.400	0.002	0.000
Prior-Grade ELA Scale Score	0.052	0.002	0.000
Missing Flag: Prior-Grade ELA Scale Score	15.913	0.586	0.000
Mean Prior Score	0.031	0.002	0.000
Range Around Prior Score	-0.009	0.002	0.000
New to School	-1.156	0.104	0.000
Students with Disabilities	-1.874	0.101	0.000
General Education <40% (LRE3)	-2.019	0.217	0.000
Percentage of Students with Disabilities	0.013	0.002	0.000
ELLs	0.044	0.253	0.863
Percentage of ELLs	0.008	0.002	0.000
Missing Flag: Percentage Variables	9.700	0.696	0.000
Grades 3—4 NYSESLAT Scale Score	0.014	0.003	0.000
Missing Flag: Grades 3—4 NYSESLAT Scale Scores	3.228	0.827	0.000
Economically Disadvantaged	-0.697	0.074	0.000
Percentage of Economically Disadvantaged	-0.013	0.001	0.000

Table I 13. Grade 5 Mathematics Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	455.280	0.247	0.000
Prior-Grade Mathematics Scale Score	0.356	0.002	0.000
Two-Grades-Prior Mathematics Scale Score	0.117	0.002	0.000
Missing Flag: Two-Grades-Prior Mathematics Scale Score	35.605	0.510	0.000

Table I 14. Grade 5 Mathematics Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	452.775	1.032	0.000
Prior-Grade Mathematics Scale Score	0.329	0.002	0.000
Two-Grades-Prior Mathematics Scale Score	0.108	0.002	0.000
Missing Flag: Two-Grades-Prior Mathematics Scale Score	32.715	0.526	0.000
Prior-Grade ELA Scale Score	0.038	0.002	0.000
Missing Flag: Prior-Grade ELA Scale Score	11.094	0.533	0.000
Mean Prior Score	0.013	0.002	0.000
Range Around Prior Score	0.011	0.002	0.000
Retained in Grade	-1.093	0.227	0.000
New to School	-0.014	0.107	0.897
Students with Disabilities	-1.059	0.095	0.000
General Education <40% (LRE3)	-0.271	0.201	0.178
Percentage of Students with Disabilities	0.009	0.002	0.000
ELLs	-1.019	0.254	0.000
Percentage of ELLs	0.020	0.002	0.000
Missing Flag: Percentage Variables	3.795	0.627	0.000
Grades 3—4 NYSESLAT Scale Score	0.001	0.003	0.698
Missing Flag: Grades 3—4 NYSESLAT Scale Scores	-2.002	0.834	0.016
Economically Disadvantaged	-0.234	0.069	0.001
Percentage of Economically Disadvantaged	-0.011	0.001	0.000

Table I 15. Grade 6 Mathematics Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	441.461	0.291	0.000
Prior-Grade Mathematics Scale Score	0.368	0.002	0.000
Two-Grades-Prior Mathematics Scale Score	0.082	0.002	0.000
Missing Flag: Two-Grades-Prior Mathematics Scale Score	24.685	0.645	0.000
Three-Grades-Prior Mathematics Scale Score	0.065	0.002	0.000
Missing Flag: Three-Grades-Prior Mathematics Scale Score	19.917	0.582	0.000

Table I 16. Grade 6 Mathematics Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	433.521	1.222	0.000
Prior-Grade Mathematics Scale Score	0.335	0.002	0.000
Two-Grades-Prior Mathematics Scale Score	0.071	0.002	0.000
Missing Flag: Two-Grades-Prior Mathematics Scale Score	21.387	0.647	0.000
Three-Grades-Prior Mathematics Scale Score	0.061	0.002	0.000
Missing Flag: Three-Grades-Prior Mathematics Scale Score	18.783	0.586	0.000
Prior-Grade ELA Scale Score	0.026	0.002	0.000
Missing Flag: Prior-Grade ELA Scale Score	7.432	0.488	0.000
Mean Prior Score	0.019	0.002	0.000
Range Around Prior Score	0.021	0.003	0.000
Retained in Grade	-2.097	0.300	0.000
New to School	0.072	0.121	0.553
Students with Disabilities	-1.709	0.097	0.000
General Education <40% (LRE3)	0.105	0.219	0.632
Percentage of Students with Disabilities	-0.017	0.002	0.000
ELLs	0.219	0.312	0.482
Percentage of ELLs	0.012	0.003	0.000
Missing Flag: Percentage Variables	6.222	0.749	0.000
Grades 5—6 NYSESLAT Scale Score	0.040	0.003	0.000
Missing Flag: Grades 5—6 NYSESLAT Scale Scores	9.837	1.000	0.000
Economically Disadvantaged	-0.455	0.071	0.000
Percentage of Economically Disadvantaged	-0.021	0.002	0.000

Table I 17. Grade 7 Mathematics Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	457.200	0.270	0.000
Prior-Grade Mathematics Scale Score	0.380	0.002	0.000
Two-Grades-Prior Mathematics Scale Score	0.053	0.002	0.000
Missing Flag: Two-Grades-Prior Mathematics Scale Score	16.024	0.678	0.000
Three-Grades-Prior Mathematics Scale Score	0.034	0.002	0.000
Missing Flag: Three-Grades-Prior Mathematics Scale Score	10.098	0.572	0.000

Table I 18. Grade 7 Mathematics Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	429.656	1.165	0.000
Prior-Grade Mathematics Scale Score	0.326	0.002	0.000
Two-Grades-Prior Mathematics Scale Score	0.048	0.002	0.000
Missing Flag: Two-Grades-Prior Mathematics Scale Score	14.482	0.664	0.000
Three-Grades-Prior Mathematics Scale Score	0.035	0.002	0.000
Missing Flag: Three-Grades-Prior Mathematics Scale Score	10.923	0.568	0.000
Prior-Grade ELA Scale Score	0.058	0.002	0.000
Missing Flag: Prior-Grade ELA Scale Score	16.438	0.525	0.000
Mean Prior Score	0.042	0.002	0.000
Range Around Prior Score	0.007	0.003	0.008
Retained in Grade	-2.076	0.315	0.000
New to School	-0.982	0.112	0.000
Students with Disabilities	-1.363	0.096	0.000
General Education <40% (LRE3)	-1.796	0.225	0.000
Percentage of Students with Disabilities	0.018	0.002	0.000
ELLs	0.343	0.284	0.227
Percentage of ELLs	0.019	0.003	0.000
Missing Flag: Percentage Variables	16.357	0.656	0.000
Grades 5—6 NYSESLAT Scale Score	0.051	0.003	0.000
Missing Flag: Grades 5—6 NYSESLAT Scale Scores	13.608	0.959	0.000
Economically Disadvantaged	0.076	0.069	0.272
Percentage of Economically Disadvantaged	0.015	0.002	0.000

Table I 19. Grade 8 Mathematics Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	431.316	0.439	0.000
Prior-Grade Mathematics Scale Score	0.502	0.004	0.000
Two-Grades-Prior Mathematics Scale Score	0.045	0.004	0.000
Missing Flag: Two-Grades-Prior Mathematics Scale Score	12.927	1.034	0.000
Three-Grades-Prior Mathematics Scale Score	0.014	0.003	0.000
Missing Flag: Three-Grades-Prior Mathematics Scale Score	4.265	0.756	0.000

Table I 20. Grade 8 Mathematics Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	411.502	1.546	0.000
Prior-Grade Mathematics Scale Score	0.469	0.005	0.000
Two-Grades-Prior Mathematics Scale Score	0.041	0.004	0.000
Missing Flag: Two-Grades-Prior Mathematics Scale Score	11.950	1.048	0.000
Three-Grades-Prior Mathematics Scale Score	0.013	0.003	0.000
Missing Flag: Three-Grades-Prior Mathematics Scale Score	4.359	0.767	0.000
Prior-Grade ELA Scale Score	0.038	0.003	0.000
Missing Flag: Prior-Grade ELA Scale Score	11.674	0.768	0.000
Mean Prior Score	0.022	0.003	0.000
Range Around Prior Score	0.013	0.004	0.002
Retained in Grade	-2.716	0.378	0.000
New to School	-1.419	0.173	0.000
Students with Disabilities	-1.098	0.123	0.000
General Education <40% (LRE3)	-1.531	0.299	0.000
Percentage of Students with Disabilities	-0.003	0.003	0.361
ELLs	0.607	0.358	0.090
Percentage of ELLs	0.012	0.003	0.000
Missing Flag: Percentage Variables	8.618	1.040	0.000
Grades 7—8 NYSESLAT Scale Score	0.045	0.004	0.000
Missing Flag: Grades 7—8 NYSESLAT Scale Scores	10.934	1.231	0.000
Economically Disadvantaged	0.753	0.090	0.000
Percentage of Economically Disadvantaged	0.015	0.002	0.000

Table I 21. Grades 9—12, Algebra Common Core Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	-137.051	19.268	0.000
Grade 8 Mathematics Scale Score 2011/12 and Prior	0.052	0.024	0.031
Missing Flag: Grade 8 Mathematics Scale Score 2011/12 and Prior	44.582	15.380	0.004
Grade 8 Mathematics Scale Score 2012/13 and Subsequent	0.196	0.002	0.000
Missing Flag: Grade 8 Mathematics Scale Score 2012/13 and Subsequent	3.588	0.473	0.000
Grade 7 Mathematics Scale Score 2011/12 and Prior	0.026	0.009	0.004
Missing Flag: Grade 7 Mathematics Scale Score 2011/12 and Prior	21.470	5.833	0.000
Grade 7 Mathematics Scale Score 2012/13 and Subsequent	0.149	0.002	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2012/13 and Subsequent	44.258	0.585	0.000
Grade 8 ELA Scale Score 2011/12 and Prior	0.064	0.038	0.095
Missing Flag: Grade 8 ELA Scale Score 2011/12 and Prior	36.801	24.201	0.128
Grade 8 ELA Scale Score 2012/13 and Subsequent	0.008	0.002	0.000
Missing Flag: Grade 8 ELA Scale Score 2012/13 and Subsequent	3.588	0.473	0.000

Table I 22. Grades 9—12, Algebra Common Core Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p* value
Grade 8 Mathematics Scale Score 2011/12 and Prior	0.053	0.027	0.054
Missing Flag: Grade 8 Mathematics Scale Score 2011/12 and Prior	-1.395	0.747	0.062
Grade 8 Mathematics Scale Score 2012/13 and Subsequent	0.180	0.002	0.000
Missing Flag: Grade 8 Mathematics Scale Score 2012/13 and Subsequent	49.068	0.691	0.000
Grade 7 Mathematics Scale Score 2011/12 and Prior	0.011	0.012	0.362
Missing Flag: Grade 7 Mathematics Scale Score 2011/12 and Prior	9.824	7.163	0.017
Grade 7 Mathematics Scale Score 2012/13 and Subsequent	0.116	0.002	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2012/13 and Subsequent	30.670	0.661	0.000
Grade 8 ELA Scale Score 2011/12 and Prior	-0.001	0.044	0.985
Missing Flag: Grade 8 ELA Scale Score 2011/12 and Prior	-2.757	27.681	0.921
Grade 8 ELA Scale Score 2012/13 and Subsequent	-0.010	0.002	0.000
Missing Flag: Grade 8 ELA Scale Score 2012/13 and Subsequent	-1.925	0.587	0.001
Grade 7 ELA Scale Score 2011/12 and Prior	0.022	0.021	0.031

Effect Name	Effect	Standard Error	*p* value
Missing Flag: Grade 7 ELA Scale Score 2011/12 and Prior	13.957	13.456	0.300
Grade 7 ELA Scale Score 2012/13 and Subsequent	0.108	0.002	0.000
Missing Flag: Grade 7 ELA Scale Score 2012/13 and Subsequent	6.104	0.583	0.000
Mean Prior Grade 8 Mathematics 2011/12 and Prior	-0.003	0.001	0.011
Missing Flag: Mean Prior Grade 8 Mathematics 2011/12 and Prior	40.050	17.423	0.022
Mean Prior Grade 8 Mathematics 2012/13 and subsequent	-0.012	0.002	0.000
Missing Flag: Mean Prior Grade 8 Mathematics 2012/13 and subsequent	-0.242	2.580	0.925
Count of Prior Required Regents Exams = 0	-97.644	26.278	0.000
Count of Prior Required Regents Exams = 1	-95.003	26.279	0.000
Count of Prior Required Regents Exams = 2	-94.614	26.283	0.000
Count of Prior Required Regents Exams = 3	-93.578	26.284	0.000
Count of Prior Required Regents Exams = 4	-93.074	26.295	0.000
Count of Prior Required Regents Exams = 5	-92.617	26.294	0.000
Cohort 1	2.540	0.605	0.000
Cohort 2	2.424	0.603	0.000
Cohort 3	0.919	0.602	0.127
Cohort 4	0.988	0.590	0.094
Students with Disabilities	-3.173	0.077	0.000
General Education <40% (LRE3)	-2.971	0.259	0.000
School Percentage of Students with Disabilities	-0.116	0.004	0.000
ELLs	-0.613	0.207	0.003
School Percentage of ELLs	0.015	0.003	0.000
NYSESLAT LS Scale Score 2011/12 and Prior	0.010	0.035	0.776
NYSESLAT RW Scale Score 2011/12 and Prior	0.024	0.040	0.553
Missing Flag: NYSESLAT Scale Scores 2011/12 and Prior	23.167	18.123	0.201
NYSESLAT Scale Score 2012/13 and 2013/14	-0.001	0.008	0.853
Missing Flag: NYSESLAT Scale Score 2012/13 and 2013/14	-2.813	6.297	0.655
NYSESLAT Scale Score 2012/13 and 2014-15	0.039	0.002	0.000
Missing Flag: NYSESLAT Scale Scores 2014/15 and Later	10.794	0.752	0.000
Economically Disadvantaged	-0.638	0.065	0.000
School Percentage of Economically Disadvantaged	-0.097	0.002	0.000

Effect Name	Effect	Standard Error	*p* value
Missing Flag: School Percentage Variables	-15.101	2.514	0.000
New to School After Grade 9	-0.347	0.145	0.016

Table I 23. Grades 9—12, ELA Common Core Model Coefficients, Unadjusted Model

Effect Name	Effect	Standard Error	*p* value
Constant Term	-460.910	24.408	0.000
Grade 8 ELA Scale Score 2011/12 and Prior	0.316	0.046	0.000
Missing Flag: Grade 8 ELA Scale Score 2011/12 and Prior	218.302	29.090	0.000
Grade 8 ELA Scale Score 2012/13 and Subsequent	0.111	0.002	0.000
Missing Flag: Grade 8 ELA Scale Score 2012/13 and Subsequent	34.665	0.576	0.000
Grade 7 ELA Scale Score 2011/12 and Prior	0.198	0.017	0.000
Missing Flag: Grade 7 ELA Scale Score 2011/12 and Prior	135.119	10.603	0.000
Grade 7 ELA Scale Score 2012/13 and Subsequent	0.236	0.002	0.000
Missing Flag: Grade 7 ELA Scale Score 2012/13 and Subsequent	74.121	0.499	0.000
Grade 8 Mathematics Scale Score 2011/12 and Prior	0.077	0.025	0.002
Missing Flag: Grade 8 Mathematics Scale Score 2011/12 and Prior	45.349	16.605	0.006
Grade 8 Mathematics Scale Score 2012/13 and Subsequent	0.095	0.002	0.000
Missing Flag: Grade 8 Mathematics Scale Score 2012/13 and Subsequent	30.262	0.497	0.000

Table I 24. Grades 9—12, ELA Common Core Model Coefficients, Adjusted Model

Effect Name	Effect	Standard Error	*p* value
Grade 8 ELA Scale Score 2011/12 and Prior	0.231	0.051	0.000
Missing Flag: Grade 8 ELA Scale Score 2011/12 and Prior	158.125	32.020	0.000
Grade 8 ELA Scale Score 2012/13 and Subsequent	0.099	0.002	0.000
Missing Flag: Grade 8 ELA Scale Score 2012/13 and Subsequent	30.323	0.551	0.000
Grade 7 ELA Scale Score 2011/12 and Prior	0.127	0.002	0.000
Missing Flag: Grade 7 ELA Scale Score 2011/12 and Prior	85.089	12.611	0.000
Grade 7 ELA Scale Score 2012/13 and Subsequent	0.183	0.002	0.000
Missing Flag: Grade 7 ELA Scale Score 2012/13 and Subsequent	51.923	0.581	0.000
Grade 8 Mathematics Scale Score 2011/12 and Prior	0.038	0.026	0.144
Missing Flag: Grade 8 Mathematics Scale Score 2011/12 and Prior	19.473	17.338	0.261

Effect Name	Effect	Standard Error	*p* value
Grade 8 Mathematics Scale Score 2012/13 and Subsequent	0.017	0.002	0.000
Missing Flag: Grade 8 Mathematics Scale Score 2012/13 and Subsequent	4.984	0.546	0.000
Grade 7 Mathematics Scale Score 2011/12 and Prior	0.027	0.011	0.018
Missing Flag: Grade 7 Mathematics Scale Score 2011/12 and Prior	18.888	7.057	0.007
Grade 7 Mathematics Scale Score 2012/13 and Subsequent	0.023	0.002	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2012/13 and Subsequent	8.063	0.594	0.000
Mean Prior Grade 8 ELA 2011/12 and Prior	0.011	0.001	0.000
Missing Flag: Mean Prior Grade 8 ELA 2011/12 and Prior	6.113	0.915	0.000
Mean Prior Grade 8 ELA 2012/13 and subsequent	0.049	0.003	0.000
Missing Flag: Mean Prior Grade 8 ELA 2012/13 and subsequent	12.215	4.878	0.012
Count of Prior Required Regents Exams = 0	-425.871	29.705	0.000
Count of Prior Required Regents Exams = 1	-421.184	29.705	0.000
Count of Prior Required Regents Exams = 2	-416.449	29.706	0.000
Count of Prior Required Regents Exams = 3	-411.119	29.706	0.000
Count of Prior Required Regents Exams = 4	-412.506	29.708	0.000
Count of Prior Required Regents Exams = 5	-410.482	29.718	0.000
Cohort 1	-2.397	0.716	0.001
Cohort 2	1.433	0.673	0.033
Cohort 3	1.792	0.666	0.007
Cohort 4	1.159	0.662	0.080
Students with Disabilities	-5.791	0.090	0.000
General Education <40% (LRE3)	-3.230	0.384	0.000
School Percentage of Students with Disabilities	-0.002	0.005	0.718
ELLs	-2.172	0.270	0.000
School Percentage of ELLs	0.099	0.004	0.000
NYSESLAT LS Scale Score 2011/12 and Prior	0.006	0.042	0.891
NYSESLAT RW Scale Score 2011/12 and Prior	0.030	0.048	0.525
Missing Flag: NYSESLAT Scale Scores 2011/12 and Prior	23.836	23.340	0.307
NYSESLAT Scale Score 2012/13 and 2013/14	0.050	0.008	0.000
Missing Flag: NYSESLAT Scale Score 2012/13 and 2013/14	41.375	6.618	0.000

Effect Name	Effect	Standard Error	*p* value
NYSESLAT Scale Score 2012/13 and 2014-15	0.104	0.004	0.000
Missing Flag: NYSESLAT Scale Scores 2014/15 and Later	28.483	1.277	0.000
Economically Disadvantaged	-0.970	0.064	0.000
School Percentage of Economically Disadvantaged	-0.035	0.002	0.000
Missing Flag: School Percentage Variables	-2.600	4.830	0.590
New to School After Grade 9	0.092	0.152	0.546

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 I 25. Grades 9—12, GRE, Year in School 1 Model Coefficients, Unadjusted Model

Effect Name	Estimate	Standard Error
Intercept 1	-12.895	0.074
Intercept 2	-14.305	0.076
Intercept 3	-18.939	0.084
Intercept 4	-21.275	0.097
Intercept 5	-24.036	0.220
Intercept 6	-27.214	1.003
Grade 8 ELA Scale Score 2012/13 and Subsequent	0.008	0.000
Missing Flag: Grade 8 ELA Scale Score 2012/13 and Subsequent	2.510	0.083
Grade 7 ELA Scale Score 2012/13 and Subsequent	0.011	0.000
Missing Flag: Grade 7 ELA Scale Score 2012/13 and Subsequent	3.249	0.083
Grade 8 Mathematics Scale Score 2012/13 and Subsequent	0.015	0.000
Missing Flag: Grade 8 Mathematics Scale Score 2012/13 and Subsequent	4.369	0.068
Grade 7 Mathematics Scale Score 2012/13 and Subsequent	0.014	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2012/13 and Subsequent	4.130	0.073

Table I 26. Grades 9—12, GRE, Year in School 1 Model Coefficients, Adjusted Model

Effect Name	Estimate	Standard Error
Intercept 1	-17.384	0.469
Intercept 2	-18.892	0.470
Intercept 3	-23.636	0.471
Intercept 4	-25.978	0.474
Intercept 5	-28.738	0.513
Intercept 6	-31.916	1.105
Grade 8 ELA Scale Score 2012/13 and Subsequent	0.009	0.000
Missing Flag: Grade 8 ELA Scale Score 2012/13 and Subsequent	2.708	0.086
Grade 7 ELA Scale Score 2012/13 and Subsequent	0.011	0.000
Missing Flag: Grade 7 ELA Scale Score 2012/13 and Subsequent	3.334	0.089
Grade 8 Mathematics Scale Score 2012/13 and Subsequent	0.016	0.000

Effect Name	Estimate	Standard Error
Missing Flag: Grade 8 Mathematics Scale Score 2012/13 and Subsequent	4.348	0.071
Grade 7 Mathematics Scale Score 2012/13 and Subsequent	0.014	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2012/13 and Subsequent	3.992	0.000
Mean Prior Grade 8 ELA 2012/13 and Subsequent	0.031	0.001
Missing Flag: Mean Prior Grade 8 ELA 2012/13 and Subsequent	1.558	63.623
Mean Prior Grade 8 Mathematics 2012/13 and Subsequent	-0.033	0.001
Missing Flag: Mean Prior Grade 8 Mathematics 2012/13 and Subsequent	-14.886	43.525
Mean Prior Grade 8 ELA 2011/12 and Prior	-0.003	0.000
Missing Flag: Mean Prior Grade 8 ELA 2011/12 and Prior	-1.706	0.258
Mean Prior Grade 8 Mathematics 2011/12 and Prior	0.001	0.000
Missing Flag: Mean Prior Grade 8 Mathematics 2011/12 and Prior	1.028	0.182
Count of Prior Regents Exams = 0	1.712	0.300
Count of Prior Regents Exams = 1	1.588	0.300
Count of Prior Regents Exams = 2	1.559	0.300
Count of Prior Regents Exams = 3	1.057	0.303
Count of Prior Regents Exams = 4	1.402	0.331
Count of Prior Regents Exams = 5	—	—
Students with Disabilities	0.035	0.017
General Education < 40% (LRE3)	-0.554	0.059
Percentage of Students with Disabilities	-0.022	0.001
ELLs	-0.032	0.055
Percentage of ELLs	-0.007	0.001
NYSESLAT LS Scale Score 2012/13 and Prior	—	—
NYSESLAT RW Scale Score 2012/13 and Prior	—	—
Missing Flag: NYSESLAT Scale Scores 2012/13 and Prior	—	—
NYSESLAT Scale Score 2012/13 to 2014/15	0.016	0.001
Missing Flag: NYSESLAT Scale Score 2014/15 and Later	4.849	0.217
NYSESLAT Scale Score 2015/16	—	—
Missing Flag: NYSESLAT Scale Score 2015/16	—	—
Economically Disadvantaged	-0.352	0.014
Percentage of Economically Disadvantaged	-0.007	0.000

Effect Name	Estimate	Standard Error
Missing Flag: School Percent Variables	—	—
New to School After Grade 9	—	—

Table I 27. Grades 9—12, GRE, Year in School 2 Model Coefficients, Unadjusted Model

Effect Name	Estimate	Standard Error
Intercept 1	-6.440	0.059
Intercept 2	-8.204	0.060
Intercept 3	-10.645	0.063
Intercept 4	-12.915	0.069
Intercept 5	-15.576	0.132
Intercept 6	-18.494	0.504
Intercept 7	—	—
Grade 8 ELA Scale Score 2012/13 and Subsequent	0.003	0.000
Missing Flag: Grade 8 ELA Scale Score 2012/13 and Subsequent	1.181	0.077
Grade 7 ELA Scale Score 2012/13 and Subsequent	0.004	0.000
Missing Flag: Grade 7 ELA Scale Score 2012/13 and Subsequent	1.314	0.068
Grade 8 Mathematics Scale Score 2012/13 and Subsequent	0.014	0.000
Missing Flag: Grade 8 Mathematics Scale Score 2012/13 and Subsequent	3.612	0.065
Grade 7 Mathematics Scale Score 2012/13 and Subsequent	0.005	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2012/13 and Subsequent	1.701	0.069

Table I 28. Grades 9—12, GRE, Year in School 2 Model Coefficients, Adjusted Model

Effect Name	Estimate	Standard Error
Intercept 1	-16.008	5.734
Intercept 2	-17.828	5.734
Intercept 3	-20.287	5.734
Intercept 4	-22.551	5.735
Intercept 5	-25.212	5.736
Intercept 6	-28.130	5.756
Intercept 7	—	—
Grade 8 ELA Scale Score 2012/13 and Subsequent	0.002	0.000

Effect Name	Estimate	Standard Error
Missing Flag: Grade 8 ELA Scale Score 2012/13 and Subsequent	0.964	0.078
Grade 7 ELA Scale Score 2012/13 and Subsequent	0.003	0.000
Missing Flag: Grade 7 ELA Scale Score 2012/13 and Subsequent	0.961	0.072
Grade 8 Mathematics Scale Score 2012/13 and Subsequent	0.012	0.000
Missing Flag: Grade 8 Mathematics Scale Score 2012/13 and Subsequent	2.933	0.069
Grade 7 Mathematics Scale Score 2012/13 and Subsequent	0.004	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2012/13 and Subsequent	1.096	0.072
Mean Prior Grade 8 ELA 2012/13 and Subsequent	0.005	0.001
Missing Flag: Mean Prior Grade 8 ELA 2012/13 and Subsequent	—	—
Mean Prior Grade 8 Mathematics 2012/13 and Subsequent	-0.007	0.001
Missing Flag: Mean Prior Grade 8 Mathematics 2012/13 and Subsequent	—	—
Mean Prior Grade 8 ELA 2011/12 and Prior	-0.002	0.000
Missing Flag: Mean Prior Grade 8 ELA 2011/12 and Prior	-1.165	0.200
Mean Prior Grade 8 Mathematics 2011/12 and Prior	0.001	0.000
Missing Flag: Mean Prior Grade 8 Mathematics 2011/12 and Prior	0.462	0.149
Count of Prior Regents Exams = 0	0.564	0.156
Count of Prior Regents Exams = 1	1.059	0.156
Count of Prior Regents Exams = 2	0.925	0.155
Count of Prior Regents Exams = 3	1.103	0.157
Count of Prior Regents Exams = 4	0.415	0.166
Count of Prior Regents Exams = 5	—	—
Students with Disabilities	-0.186	0.016
General Education < 40% (LRE3)	-0.352	0.067
Percentage of Students with Disabilities	-0.027	0.001
ELLs	-0.194	0.049
Percentage of ELLs	-0.010	0.001
NYSESLAT LS Scale Score 2012/13 and Prior	—	—
NYSESLAT RW Scale Score 2012/13 and Prior	—	—
Missing Flag: NYSESLAT Scale Scores 2012/13 and Prior	—	—
NYSESLAT Scale Score 2012/13 and 2013/14	0.011	0.007
Missing Flag: NYSESLAT Scale Score 2012/13 to 2013/14	9.899	5.714

Effect Name	Estimate	Standard Error
NYSESLAT Scale Score 2012/13 and 2014/15	0.010	0.001
Missing Flag: NYSESLAT Scale Score 2014/15 and Later	2.617	0.183
Economically Disadvantaged	-0.150	0.012
Percentage of Economically Disadvantaged	-0.002	0.000
Missing Flag: School Percent Variables	—	—
New to School After Grade 9	-0.181	0.022

Table I 29. Grades 9—12, GRE, Year in School 3 Model Coefficients, Unadjusted Model

Effect Name	Estimate	Standard Error
Intercept 1	-4.161	0.056
Intercept 2	-5.331	0.057
Intercept 3	-7.338	0.058
Intercept 4	-9.526	0.059
Intercept 5	-12.067	0.072
Intercept 6	-14.609	0.163
Intercept 7	-16.984	0.503
Grade 8 ELA Scale Score 2012/13 and Subsequent	0.002	0.000
Missing Flag: Grade 8 ELA Scale Score 2012/13 and Subsequent	1.284	0.068
Grade 7 ELA Scale Score 2012/13 and Subsequent	0.005	0.000
Missing Flag: Grade 7 ELA Scale Score 2012/13 and Subsequent	1.206	0.070
Grade 8 Mathematics Scale Score 2012/13 and Subsequent	0.012	0.000
Missing Flag: Grade 8 Mathematics Scale Score 2012/13 and Subsequent	3.226	0.067
Grade 7 Mathematics Scale Score 2012/13 and Subsequent	0.002	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2012/13 and Subsequent	0.608	0.070

Table I 30. Grades 9—12, GRE, Year in School 3 Model Coefficients, Adjusted Model

Effect Name	Estimate	Standard Error
Intercept 1	-15.067	1.705
Intercept 2	-16.644	1.705
Intercept 3	-19.072	1.705
Intercept 4	-21.344	1.705

Effect Name	Estimate	Standard Error
Intercept 5	-23.889	1.706
Intercept 6	-26.431	1.712
Intercept 7	-28.806	1.777
Grade 8 ELA Scale Score 2012/13 and Subsequent	0.001	0.000
Missing Flag: Grade 8 ELA Scale Score 2012/13 and Subsequent	0.735	0.071
Grade 7 ELA Scale Score 2012/13 and Subsequent	0.002	0.000
Missing Flag: Grade 7 ELA Scale Score 2012/13 and Subsequent	0.669	0.074
Grade 8 Mathematics Scale Score 2012/13 and Subsequent	0.009	0.000
Missing Flag: Grade 8 Mathematics Scale Score 2012/13 and Subsequent	2.142	0.072
Grade 7 Mathematics Scale Score 2012/13 and Subsequent	-0.003	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2012/13 and Subsequent	-0.822	0.074
Mean Prior Grade 8 ELA 2012/13 and Subsequent	0.015	0.001
Missing Flag: Mean Prior Grade 8 ELA 2012/13 and Subsequent	—	—
Mean Prior Grade 8 Mathematics 2012/13 and Subsequent	-0.008	0.001
Missing Flag: Mean Prior Grade 8 Mathematics 2012/13 and Subsequent	-1.463	1.445
Mean Prior Grade 8 ELA 2011/12 and Prior	0.000	0.000
Missing Flag: Mean Prior Grade 8 ELA 2011/12 and Prior	0.027	0.184
Mean Prior Grade 8 Mathematics 2011/12 and Prior	0.001	0.000
Missing Flag: Mean Prior Grade 8 Mathematics 2011/12 and Prior	0.892	0.134
Count of Prior Regents Exams = 0	0.729	0.046
Count of Prior Regents Exams = 1	2.276	0.046
Count of Prior Regents Exams = 2	3.444	0.043
Count of Prior Regents Exams = 3	3.863	0.041
Count of Prior Regents Exams = 4	1.655	0.042
Count of Prior Regents Exams = 5	—	—
Students with Disabilities	-0.450	0.016
General Education < 40% (LRE3)	-0.384	0.073
Percentage of Students with Disabilities	-0.006	0.001
ELLs	-0.394	0.052
Percentage of ELLs	0.011	0.001
NYSESLAT LS Scale Score 2012/13 and Prior	—	—

Effect Name	Estimate	Standard Error
NYSESLAT RW Scale Score 2012/13 and Prior	—	—
Missing Flag: NYSESLAT Scale Scores 2012/13 and Prior	—	—
NYSESLAT Scale Score 2012/13 to 2013/14	0.009	0.002
Missing Flag: NYSESLAT Scale Score 2012/13 to 2013/14	7.282	1.652
NYSESLAT Scale Score 2012-13 and 2014-15	0.007	0.001
Missing Flag: NYSESLAT Scale Score 2014/15 and Later	1.597	0.200
Economically Disadvantaged	-0.069	0.011
Percentage of Economically Disadvantaged	-0.004	0.000
Missing Flag: School Percent Variables	—	—
New to School After Grade 9	0.018	0.036

Table I 31. Grades 9—12, GRE, Year in School 4 Model Coefficients, Unadjusted Model

Effect Name	Estimate	Standard Error
Intercept 1	1.982	0.083
Intercept 2	0.449	0.083
Intercept 3	-0.990	0.085
Intercept 4	-2.630	0.096
Intercept 5	-4.807	0.170
Intercept 6	-7.515	0.583
Intercept 7	-8.614	1.003
Grade 8 ELA Scale Score 2012/13 and Subsequent	-0.004	0.000
Missing Flag: Grade 8 ELA Scale Score 2012/13 and Subsequent	-1.085	0.103
Grade 7 ELA Scale Score 2012/13 and Subsequent	-0.005	0.000
Missing Flag: Grade 7 ELA Scale Score 2012/13 and Subsequent	-0.873	0.108
Grade 8 Mathematics Scale Score 2012/13 and Subsequent	-0.002	0.000
Missing Flag: Grade 8 Mathematics Scale Score 2012/13 and Subsequent	-0.690	0.096
Grade 7 Mathematics Scale Score 2012/13 and Subsequent	0.000	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2012/13 and Subsequent	-0.188	0.106

Table I 32. Grades 9—12, GRE, Year in School 4 Model Coefficients, Adjusted Model

Effect Name	Estimate	Standard Error
Intercept 1	-3.559	14.799
Intercept 2	-5.565	14.799
Intercept 3	-7.162	14.799
Intercept 4	-8.832	14.799
Intercept 5	-11.011	14.800
Intercept 6	-13.720	14.811
Intercept 7	-14.818	14.833
Grade 8 ELA Scale Score 2012/13 and Subsequent	0.001	0.000
Missing Flag: Grade 8 ELA Scale Score 2012/13 and Subsequent	0.425	0.120
Grade 7 ELA Scale Score 2012/13 and Subsequent	0.001	0.000
Missing Flag: Grade 7 ELA Scale Score 2012/13 and Subsequent	0.224	0.119
Grade 8 Mathematics Scale Score 2012/13 and Subsequent	0.003	0.000
Missing Flag: Grade 8 Mathematics Scale Score 2012/13 and Subsequent	0.746	0.111
Grade 7 Mathematics Scale Score 2012/13 and Subsequent	0.002	0.000
Missing Flag: Grade 7 Mathematics Scale Score 2012/13 and Subsequent	0.333	0.126
Mean Prior Grade 8 ELA 2012/13 and Subsequent	0.016	0.001
Missing Flag: Mean Prior Grade 8 ELA 2012/13 and Subsequent	4.485	1.475
Mean Prior Grade 8 Mathematics 2012/13 and Subsequent	-0.009	0.001
Missing Flag: Mean Prior Grade 8 Mathematics 2012/13 and Subsequent	-3.882	1.316
Mean Prior Grade 8 ELA 2011/12 and Prior	0.000	0.001
Missing Flag: Mean Prior Grade 8 ELA 2011/12 and Prior	-0.138	0.393
Mean Prior Grade 8 Mathematics 2011/12 and Prior	0.000	0.000
Missing Flag: Mean Prior Grade 8 Mathematics 2011/12 and Prior	0.275	0.250
Count of Prior Regents Exams = 0	1.156	0.040
Count of Prior Regents Exams = 1	2.633	0.038
Count of Prior Regents Exams = 2	3.479	0.027
Count of Prior Regents Exams = 3	3.492	0.027
Count of Prior Regents Exams = 4	2.515	0.021
Count of Prior Regents Exams = 5	—	—
Students with Disabilities	0.003	0.023

Effect Name	Estimate	Standard Error
General Education < 40% (LRE3)	-0.241	0.092
Percentage of Students with Disabilities	-0.001	0.001
ELLs	-0.403	0.058
Percentage of ELLs	0.010	0.001
NYSESLAT LS Scale Score 2011/12 and Prior	0.017	0.015
NYSESLAT RW Scale Score 2011/12 and Prior	-0.011	0.021
Missing Flag: NYSESLAT Scale Scores 2011/12 and Prior	5.305	14.441
NYSESLAT Scale Score 2012/13 and 2013/14	-0.004	0.001
Missing Flag: NYSESLAT Scale Score 2012/13 and 2013/14	-3.902	0.825
NYSESLAT Scale Score 2013/14 and 2014/15	-0.015	0.013
Missing Flag: NYSESLAT Scale Score 2014/15 and Later	-4.552	3.045
Economically Disadvantaged	0.030	0.019
Percentage of Economically Disadvantaged	0.003	0.000
Missing Flag: School Percent Variables	—	—
New to School After Grade 9	0.708	0.054

Table I 33. Grades 9—12, GRE, Year in School 5+ Model Coefficients, Unadjusted Model

Effect Name	Estimate	Standard Error
Intercept 1	-2.797	0.891
Intercept 2	-4.029	0.892
Intercept 3	-5.436	0.894
Intercept 4	-6.983	0.905
Intercept 5	-.8704	0.968
Grade 8 ELA Scale Score 2012/13 and Subsequent	-0.006	0.001
Missing Flag: Grade 8 ELA Scale Score 2012/13 and Subsequent	-1.574	0.312
Grade 7 ELA Scale Score 2012/13 and Prior	0.003	0.002
Missing Flag: Grade 7 ELA Scale Score 2012/13 and Prior	2.424	1.096
Grade 8 Mathematics Scale Score 2012/13 and Subsequent	0.000	0.001
Missing Flag: Grade 8 Mathematics Scale Score 2012/13 and Subsequent	-0.759	0.315
Grade 7 Mathematics Scale Score 2012/13 and Prior	0.002	0.001
Missing Flag: Grade 7 Mathematics Scale Score 2012/13 and Prior	1.108	0.623

Table I 34. Grades 9—12, GRE, Year in School 5+ Model Coefficients, Adjusted Model

Effect Name	Estimate	Standard Error
Intercept 1	-8.299	3.415
Intercept 2	-9.654	3.416
Intercept 3	-11.105	3.416
Intercept 4	-12.660	3.419
Intercept 5	-14.381	3.436
Grade 8 ELA Scale Score 2012/13 and Subsequent	-0.001	0.001
Missing Flag: Grade 8 ELA Scale Score 2012/13 and Subsequent	-0.598	0.346
Grade 7 ELA Scale Score 2011/12 and Prior	0.005	0.002
Missing Flag: Grade 7 ELA Scale Score 2011/12 and Prior	3.638	1.310
Grade 8 Mathematics Scale Score 2012/13 and Subsequent	0.001	0.001
Missing Flag: Grade 8 Mathematics Scale Score 2012/13 and Subsequent	-0.072	0.347
Grade 7 Mathematics Scale Score 2011/12 and Prior	0.001	0.001
Missing Flag: Grade 7 Mathematics Scale Score 2011/12 and Prior	0.767	0.683
Mean Prior Grade 8 ELA 2012/13 and Subsequent	0.003	0.004
Missing Flag: Mean Prior Grade 8 ELA 2012/13 and Subsequent	-4.851	27.052
Mean Prior Grade 8 Mathematics 2012/13 and Subsequent	0.001	0.003
Missing Flag: Mean Prior Grade 8 Mathematics 2012/13 and Subsequent	-5.811	25.962
Mean Prior Grade 8 ELA 2011/12 and Prior	0.000	0.002
Missing Flag: Mean Prior Grade 8 ELA 2011/12 and Prior	0.467	1.396
Mean Prior Grade 8 Mathematics 2011/12 and Prior	0.001	0.001
Missing Flag: Mean Prior Grade 8 Mathematics 2011/12 and Prior	0.211	0.952
Count of Prior Regents Exams = 0	2.309	0.196
Count of Prior Regents Exams = 1	3.095	0.192
Count of Prior Regents Exams = 2	3.732	0.187
Count of Prior Regents Exams = 3	3.751	0.184
Count of Prior Regents Exams = 4	3.347	0.182
Count of Prior Regents Exams = 5	—	—
Students with Disabilities	0.381	0.067
General Education < 40% (LRE3)	-0.591	0.171
Percentage of Students with Disabilities	0.009	0.004

Effect Name	Estimate	Standard Error
ELLs	-0.092	0.135
Percentage of ELLs	0.009	0.003
NYSESLAT LS Scale Score 2011/12 and Prior	0.002	0.003
NYSESLAT RW Scale Score 2011/12 and Prior	-0.001	0.004
Missing Flag: NYSESLAT Scale Scores 2011/12 and Prior	0.609	1.677
NYSESLAT Scale Score 2012-13 and 2013-14	-0.003	0.003
Missing Flag: NYSESLAT Scale Score 2012-13 and 2013-14	-2.562	2.340
NYSESLAT Scale Score 2015/16	—	—
Missing Flag: NYSESLAT Scale Score 2015/16	—	—
Economically Disadvantaged	0.174	0.066
Percentage of Economically Disadvantaged	-0.006	0.001
Missing Flag: School Percent Variables	—	—
New to School After Grade 9	0.705	0.126

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

Table J 1. Principal Impact Correlations by Grade for ELA[21]

Grade	Percent ELL	Percent SWD	Percent ED	Mean Prior Scale Score
4	0.029	0.108	0.062	-0.070
5	0.055	0.092	0.063	-0.126
6	0.082	-0.028	0.063	-0.131
7	0.077	0.152	0.092	-0.127
8	0.080	0.019	0.068	-0.100

Table J 2. Principal Impact Correlations by Grade for Mathematics[18]

Grade	Percent ELL	Percent SWD	Percent ED	Mean Prior Scale Score
4	0.050	0.068	0.077	-0.110
5	0.089	0.093	0.075	-0.168
6	0.054	0.044	0.111	-0.171
7	0.090	0.088	0.118	-0.176
8	0.084	0.012	0.110	-0.155

Table J 3. Principal Impact Correlations[18]

Model	Percent ELL	Percent SWD	Percent ED	Mean Prior ELA[22]	Mean Prior Mathematics[19]
4—8 MGP	0.070	0.077	0.105	-0.053	-0.062
9—12 MGP	-0.011	-0.176	0.022	0.282	0.206
9—12 GRE	0.046	-0.115	0.028	0.202	0.197

[21] Correlations for 4—8 models were calculated between principals' 4—8 MGPs and school-level percent demographics and mean prior scores.
[22] Values in this column represent the correlation between the measure and the average prior grade achievement for Grades 4—8 measures and the correlation between the measure and the average prior Grade 8 achievement for Grades 9—12 measures.