NYU | STEINHARDT

AMNH RGGS MAT Earth Science Residency Program

Year 11 Impact Report

Meryle Weinstein, PhD

August 2025

Executive Summary

The American Museum of Natural History's RGGS Earth Science Residency Program (hereafter, RGGS) continues to address the critical shortage of Earth Science teachers in grades 7-12 in high-need schools in New York State (NYS). Researchers from NYU's Steinhardt School of Culture, Education, and Human Development have been working with the program since its inception to provide quantitative analyses on important program outcomes. In this report we address two research questions: 1) What are the demographic and educational characteristics of students taught by RGGS graduates in New York City; and 2) Do New York City public school students taught by RGGS graduates outperform similar students not taught by RGGS graduates on the New York State (NYS) Earth Science Regents exam?

The year 11 report continues our analysis of the students taught by RGGS graduates and their impact on student achievement in Earth Science. We use student- and teacher-level data from the New York City Department of Education along with school-level data from the New York State Department of Education to obtain a matched sample of students taught by RGGS graduates (hereafter RGGS students) and those taught by a similar set of teachers based on licensure and years of teaching experience in New York City hereafter, non-RGGS students). This report is based on 11 cohorts of RGGS graduates who have taught at least one year in New York City schools. The analysis is limited to students in New York City public schools and excludes students in District 75 schools, charter schools, and those of RGGS graduates who teach in other school districts. In any particular year, the regression results are based on between 63 and 83 percent of RGGS teachers who teach in NYC schools. Most teachers who are not included in these analyses either teach in grades 6-8 or in charter schools.

The analysis that follows continues to focus on all students in grades 9 through 12 enrolled in an Earth Science course each year; in other words, the regression sample is limited to students who take the course and Regents in the same year. Additionally, we provide separate descriptive analysis for students in grades 6 to 8 and 9 to 12, regardless of whether they took the Regents. We made one

change in the empirical methods from previous years. Since fewer students take the Intermediate Level Science (ILS) exam in 8th grade, we now provide separate analyses using the ILS, the 8th grade English Language Arts exam and no measure of past performance to increase the sample sizes.

We use the NYS Earth Science Regents results from 2014 to 2019 and 2022 to 2024, including z-scores, and passing at 65 and 85 or higher as our outcome of student achievement. In NYS, high school students are required to take five Regents exams to graduate. These end-of-course exams are typically taken in June in the year in which the course is taken. The Earth Science Regents is one of four science Regents that students can take (alongside Living Environment, Chemistry, and Physics) to fulfill graduation requirements. Unlike high school exit exams used in other states, the Regents are not taken in a particular grade but are taken at the end of the course. In some schools this means that students take the Earth Science Regents in 9th grade, while in other schools they could be taken in grade 10 or 11.

Our Year 11 analysis finds that:

- RGGS teachers continue to teach students who are disadvantaged. Throughout our study period, RGGS students are poor or Latino compared to students citywide. In 2023-24, 81.5% of students in grades 9-12 were eligible for free and reduced-price lunch, 21.4% were Black and 53.1% are Latino; the percentage of Latino students represents a small increase from 2023. The percentage of poor students is slightly lower in grades 6-8 (69.1%) compared to the higher grades, while there has been a decrease in the percentage of Black students (15.3%) and Latino students (45.3%) compared to 2023.
- RGGS graduates also continue to teach students with high educational needs. RGGS graduates continue to teach students with disabilities and English learners. In 2023-24, 21.5% were students with disabilities, 20.3% were English language learners, and 52.5% spoke a language other than English at home. There are some differences with the middle school sample, where there is a higher

percentage of students with disabilities, and lower percentages of students who are English language learners or who have a home language other than English. Among 6-8th graders, 19.6% are students with disabilities, 10.5% are English learners, and 38.5% of students speak a home language other than English, all of which are small decreases from 2023.

- Students of RGGS graduates are more likely to take the Earth Science Regents compared to other students enrolled in Earth Science courses in most years. In 2015-2019, students enrolled in Earth Science taught by an RGGS graduate were slightly more likely to take the Earth Science Regents compared to students with non-RGGS teachers. While only 48.1% of RGGS students took the exam, compared to 50.3% of non-RGGS students in 2021-22, over 60% of RGGS students took the Regents in 2022-23 and 2023-24, compared to fewer than 53.3% of non-RGGS students.
- In 2018-19, the last year in which the Regents exams were given before the Covid pandemic, RGGS students score 0.13 standard deviations (sd) higher and are 5 percentage points (pp) and 4.0pp more likely to pass at 65 and 85 and higher using the ILS as our measure of past performance. In 2024, RGGS students saw a 0.04sd increase in test scores and were 2pp less likely to pass at 65 or higher but 3pp points more likely to pass at 85 although none of these results are statistically significant. These results show an upward trend since 2022 and 2023. Using the other measures of past performance are similar in magnitude to those analyses using the ILS and again, are not statistically significant.

Table of Contents

I. Introduction

The American Museum of Natural History's RGGS Earth Science Residency Program (hereafter, RGGS) continues to address the critical shortage of Earth Science teachers in grades 7-12 in high-need schools in New York State (NYS). Researchers from New York University Steinhardt School of Culture, Education, and Human Development have worked with program staff since 2013 to provide quantitative analyses on important program outcomes. We address two questions in this report: 1) What are the demographic and educational characteristics of students taught by RGGS graduates? and 2) Do students of RGGS teachers outperform similar students not taught by RGGS graduates on the NYS Earth Science Regents exam?

The year 11 report provides results of how well students in New York City (NYC) public high schools performed on the NYS Earth Science Regents since 2014. In this report we continue to limit our analysis to public school students who were enrolled in Earth Science classes and took the Earth Science Regents exam in the same year. Our outcome of interest continues to be the scores on the NYS Earth Science Regents exam. In NYS, high school students are required to take five Regents exams to graduate. These end-of-course exams are typically taken in June of the year they've taken the course. The Earth Science Regents is one of four science Regents that students can take (alongside Living Environment, Chemistry, and Physics) to fulfill the graduation requirements. Unlike high school exit exams in other states, the Regents are not tied to a particular grade; in some schools, students will take Earth Science in grade 9, while in others they may take it in 10th or 11th grade.

Findings from the Year 11 analysis show that RGGS teachers continue to teach students who are disadvantaged. In 2023-24, almost 80% of students of RGGS teachers in grades 6-12 were eligible for free and reduced-price lunch, 21% were students with disabilities, 19% were English language learners, and 50% spoke a language other than English at home. Additionally, almost three-quarters of students were Black and Latino.

This report is organized as follows: Section II describes the data and Section III presents the methodology. The findings are in Section IV and the conclusions are in Section V. The appendices are in Section VI.

II. Data

As in prior years, we used detailed student- and teacher-level data provided by the New York City Department of Education (NYCDOE) to conduct these analyses. These data include student-teacher linkage and course files for grades 6-12, student-level demographic and educational files, NYS Regents exam results, and data on all teachers working in NYCDOE schools between 2013-14 through 2023-24. RGGS staff provide a list of schools where RGGS graduates teach by cohort and year. Each RGGS graduate is matched with a scrambled teacher ID based on assigned school, licensure field, teaching assignment field, number of years teaching at the NYCDOE, and appointment date from in the personnel file. Students are matched to teachers using the student-linkage files.

The student level files include socio-demographic characteristics (gender and race/ethnicity), educational needs (eligibility for free/reduced-price lunch, special education and English language learner (ELL) status), and school, grade, and standardized test scores (statewide English language arts and math exams in Grades 3-8, science exams in Grades 4 and 8. All of the data have unique person and school identifiers that allow us to track individual students and teachers across schools and over time.[1]

In our matching process we also used school-level data from the *New York State School Report Cards (SRC)* and *New York City Open Data*, which contain data on enrollment and demographic characteristics of students at each school in each year.

[1] All student and teacher files are de-identified and are matched using a scrambled identification number provided by NYCDOE.

For grades 9-12, NYC public school students enrolled in Earth Science courses in each year were identified and matched to their Earth Science teacher using the student-teacher linkage file. Next, RGGS graduates teaching in New York City public schools each year were matched to this file to identify RGGS and non-RGGS teachers. While Section IV presents descriptive analyses for students in grades 9-12 and students in grades 6-8 (separately), the analytic sample for the regression analysis includes only students in grades 9-12 in the 2013-14 through 2019-20 and 2021-22 through 2023-24 school years (Cohorts 1-11). Students in grades 6-8 were matched to their science teacher since science classes are not identified by subject at the middle school level.

Table II-1 describes RGGS schools (i.e. schools which had at least one RGGS graduate teaching there) compared to all other NYC public middle and high schools (excluding District 75 schools). In 2023-24, RGGS teachers continue to teach in schools with student populations that are like other NYC schools. These schools have high percentages of students who are poor or Latino, although there are lower percentages of Black students in RGGS schools compared to non-RGGS school. RGGS schools also have a higher economically disadvantaged index compared to non-RGGS schools. Finally, RGGS schools have, on average, higher enrollments compared to non-RGGS schools, which is consistent throughout the 11 years of our analysis. The set of RGGS schools in 2023-24 is similar to those in the 2022-23 school year.

Table II-1. Demographic and Educational Characteristics of RGGS Schools Compared to Other Similar NYC Schools 2023 and 2024

	2022-23		2023-24	
	RGGS	**NYC***	**RGGS**	**NYC***
% Poor	78.8	79.1	82.0	81.8
% Black	23.6	32.5	24.9	31.9
% Latino	51.5	44.9	52.5	46.4
% Asian	10.4	9.4	10.0	9.5
% White	9.7	9.1	9.5	9.2
% Multi/Other	2.0	2.2	1.1	2.5
% Female	49.0	48.7	48.9	47.8
% Students with disabilities	21.6	22.5	22.0	26.5
% English language learners	15.5	13.6	17.2	15.5
Total Enrollment	580	569	798	560
Economic Needs Index	79.3	78.1	82.3	80.7
N Schools	59	992	69[1]	1080
N RGGS Teachers	65		82	

Source: NYC Open Data

*Analysis is limited to NYC schools, including charter schools and those with any students in grades 6-12. District 75 schools are excluded.

[1]80 RGGS schools were identified, 11 are missing school level data; 1082 non-RGGS schools were identified but 2 are missing school level data

III. Methodology

The regression analysis focuses on 9-12th grade students of RGGS teachers matched to a comparison group of students based on student, teacher, and school characteristics. The methodology is the same used in last year's report, with the addition of results using different measures of past performance. We do this because fewer students are taking the 8th grade Intermediate Level Science (ILS) exam, our main measure of past performance and therefore, provides a very small sample size especially in the post-Covid pandemic years. This year we provide results using the 8th grade English Language Arts (ELA) exam and with no measure of past performance (no PP) to expand sample size.

The sample is based on enrollment in an Earth Science course each year. We then link each student to their Earth Science teacher, along with the characteristics of teachers, including RGGS status. These files were then linked to Earth Science Regents test scores and biographic files, which contain

socio-demographic and educational data, and performance on the 8th ILS and ELA, when available and finally, to the *SRC* school-level data.

Our matching process relies on nearest neighbor (NN) and entropy balancing to create a comparison group with the same observable characteristics as the treatment group. These techniques enable us to use observational data to replicate a randomized experiment to obtain "balance on covariates" between treatment and comparison groups (Stuart, 2010; Hainmueller, 2012). Nearest neighbor matching with replacement matches control individuals to the treated group and discards controls not selected. This method is useful for when there are a small number of covariates and they are normally distributed, as is our data. Using *with replacement* allows comparison group members to be used more than once and helps to ensure the quality of the match doesn't depend on the order of the observations. We use five as the number of matches since multiple controls decreases the variance between observations. Along with nearest neighbor matching, entropy balance further reweights the observations to balance the covariates and drops observations farthest away in the covariate distribution. We use the Stata procedure *kmatch* to do the matching (Jain, 2017). We use an exact match of RGGS students on year, eligibility for free and reduced lunch, race/ethnicity, gender, English language learner and disability status, and grade. We then do a nearest neighbor match on prior performance on the 8th grade ILS exam using z-scores, teacher characteristics using license subject, assignment subject, and years at the NYCDOE, and school characteristics including borough where school is located, total enrollment, and percent of students who are Black, Latino, Asian, White, multiracial, and economically disadvantaged.

We continue to identify the Treatment on the Treated (ATT) effect used in previous analyses. Using ATT allows us to understand the impact of the RGGS program specifically on those who received the treatment, that is students who were taught Earth Science by an RGGS graduate, rather than on the entire population. The ATT is more practical since we want to know how RGGS worked for those who were taught by an RGGS graduate. Additionally, the ATT is a more policy-relevant measure when the

goal is to evaluate the effectiveness of the intervention for those who chose or were selected to receive it, rather than for a broader, hypothetical population. The Average Treatment Effect (ATE), on the other hand, tells us about the effect on everyone in the group, that is everyone who took the Earth Science Regents, regardless of whether they were taught by an RGGS graduate. For example, if we use the ATE, we're answering the question: *"On average, how much would test scores improve if* ***every single student*** *in NYC public schools were taught by an RGGS graduate?"* But because we use the ATT, we're asking: *"On average, how much did test scores improve for the students who were actually taught by an RGGS graduate?"*, in other words, the real-world effect of the RGGS program as it was implemented. By contrast, ATE would be useful if RGGS was considering expanding the program to everyone.

The analysis is limited to Earth Science teachers in New York City public schools. The majority of RGGS graduates teach in New York City schools and there are too few teachers in other districts to conduct any analysis within those districts. Although students do take the Earth Science Regents in the 8th grade there are too few to conduct a useful analysis and therefore, we limit the regression analysis to students in grades 9-12. We match a substantial number of RGGS graduates to their students each year (Table III-1), although this number has decreased over time (76.5% in 2014 to 65.8% in 2024). This most likely is due to the increased number of graduates teaching in charter schools or middle\junior high schools.

Table III-1. Teacher Match Rates, 2014-24

		RGGS graduates with Regents Scores	
	# of RGGS graduates teaching in NYC schools	N	%
2014	17	13	76.5
2015	24	20	83.3
2016	39	29	74.4
2017	39	31	79.5
2018	47	34	72.3
2019	55	40	72.7
2022	73	54	73.9
2023	76	48	63.2
2024	82	54	65.8

Note: Analysis is limited to RGGS graduates who teach in NYC schools and excludes graduates working in schools outside of New York City.

We identified almost 600,000 students who were enrolled in Earth Science between 2013-14 and 2023-24, 8.2% of whom were taught by RGGS graduates (Table III-2). Only students who were enrolled in an Earth Science course and took the Earth Science Regents in that year were used to match the treatment and comparison group (n=236,271); our final analytic sample using the ILS is 25,109 students; using ELA our final sample is 40,797 and omitting any measure of performance the sample is 53,434.

Table III-2. Percentage of Students by RGGS by Year, Grades 9-12, 2014-15 to 2023-24[2]

	Enrolled in Earth Science Course			Took Earth Science Regents			In Matched Sample		
	RGGS (%)	Not RGGS (%)	Total	RGGS (%)	Not RGGS (%)	Total	RGGS (%)	Not RGGS (%)	Total
2014	1,451	60,526		552	27,702		367	837	1204
	(2.3)	(97.7)	61,977	(2.0)	(98.0)	28,254	(30.5)	(69.5	
2015	2,281	59,361		1,079	28,183		807	1833	2640
	(3.7)	(96.3)	61,642	(3.7)	(96.3)	29,262	(30.6)	(69.4	
2016	3,252	58,220		1,577	29,515		1120	22529	3649
	(5.3)	(94.7)	61,472	(5.0)	(95.0)	31,092	(30.7)	(69.3)	
2017	4,146	58,118		1,850	30,726		1262	2620	
	(6.7)	(93.3)	62,264	(5.7)	(94.3)	32,526	(32.5)	(67.5)	3882
2018	4,519	59,751		2,152	30,056		1324	2779	
	(7.0)	93.0)	64,270	(6.7)	(93.3)	32,208	(32.3)	(67.7)	4103
2019	4,879	56,398		2,149	28,135		1610)	3311	
	(8.0)	92.0)	61,277	(7.0)	(93.0)	30,284	(32.7)	(67.28	4921
2020	4,083	57,229		NA	NA		NA	NA	
	(6.7)	(93.3)	61,312						
2021	6,071	52,494		NA	NA		NA	NA	
	(10.4)	(89.6)	58,565						
2022	6,141	45,305		2,327	23,433	25,760	175	50	225
	(11.9)	(88.1)	51,446	(9.0)	(90.1)		(77.8)	(22.2)	
2023	5764	44,340		3,468	23,367	26,835	261	155	416
	(11.5)	(88.5)	50,104	(12.9)	(87.1)		(62.7)	(37.3)	
2024	7206	47,393		4,325	24,305	28,630	1426	2643	4069
	(13.2)	(86.8)	54,599	(15.1)	(84.9)		(35.1)	(64.9)	
Total	48,342	538,609		19,479	245,222		8352	16,757	
	(8.2)	(91.8)	586,951	(7.4)	(92.6)	264,901	(33.3)	(66.7)	25,109

NA – Earth Science Regents were not given due to the COVID-19 pandemic. Sample is matched using 8th grade Intermediate Level Science exam.

Table VI-1 in the Appendix the mean differences in the demographic controls set to exact match. Table VI-2 shows the results of matching for all variables that have not been set to an exact match. A standard mean difference of 0 and a variance ratio close to one indicates a good match. We see students of RGGS graduates are well matched to students in similar schools and to teachers who have

[2] Colums 1-3 represent all students in grades 9-12 enrolled in Earth Science in each year, Columns 4-6 are all students who took the Earth Science Regents and Colums 7-9 are those in the match sample using grade 8 ILS scores as the measure of past performance

similar characteristics to RGGS graduates for most years. In 2014, however, the standard difference in the variance ratios is higher than considered acceptable for many of the school demographics, school borough, total enrollment, and teacher licensure; this is mainly attributable to the characteristics of the small number of schools where RGGS graduates went to teach in the first year of the program.

A. Measures

As in past years, our primary outcome of interest is performance on the NYS Earth Science Regents exam. We use both the standardized z-score (mean of 0 and standard deviation of 1) and the probability of passing at 65 or above and 85 or above; 65 is the passing threshold on the Regents exam while 85 indicates a high pass.

After matching, we estimate the relationship between achievement and having an RGGS graduate as an Earth Science teacher using the following model:

$$Y_{ijt} = \beta_0 + \beta_1 RGGS_j + \beta_2 (RGGS*year)_{ijt} + \beta_3 ST_{it} + \gamma_t + \varepsilon_{ijt} \quad (1)$$

In this model, Y is the outcome of interest (either passing at 65 or above, passing at 85 or above, or the z-score for the Earth Science Regents) for student *i* taught by teacher j in year *t*. *RGGS* is an indicator variable and takes a value of 1 if student *i* is taught by *RGGS* teacher *j* and 0 if they are taught by another teacher. *RGGS*year* is an interaction term that indicates whether the student had an RGGS teacher in a particular year (2014-19 and 2022-24). *ST* is a set of student characteristics that includes the socio-demographic characteristics, educational needs, and grade indicators described in the data section above. Year effects are indicated by γ and ε indicates the remaining variation due to unobservable or unobservable factors. Robust standard errors clustered by teacher are used and all analyses are weighted using the entropy balance weights. We run the same model on the three outcome variables using all three measures of past performance.

We use an ordinary least squares regression (OLS) for models in which the z-scores in the Earth Science Regents are the outcome of interest (Y); linear probability models (LPM) are used for models in which passing is the outcome of interest (an indicator for passing at either 65 or higher or 85 or higher).

We report the marginal effects of RGGS on test scores. Marginal effects measure the change in the predicted outcome (for example, z-score on the Earth Science Regents) resulting from a one-unit change in an explanatory variable (RGGS), holding all other variables constant. Marginal effects provide an intuitive interpretation of model coefficients by translating them into changes in probability or expected value, depending on the type of model.

IV. Findings

In Sections A and B we present descriptive analyses on the characteristics of students with RGGS teachers by year, for students in high school grades (Section A) and students in middle school grades (Section B). We focus on describing variation in demographic characteristics and educational needs among students taught by an RGGS teacher across time, though we also compare them to students taught by non- RGGS teachers. In Section C we present the results of our regression analysis.

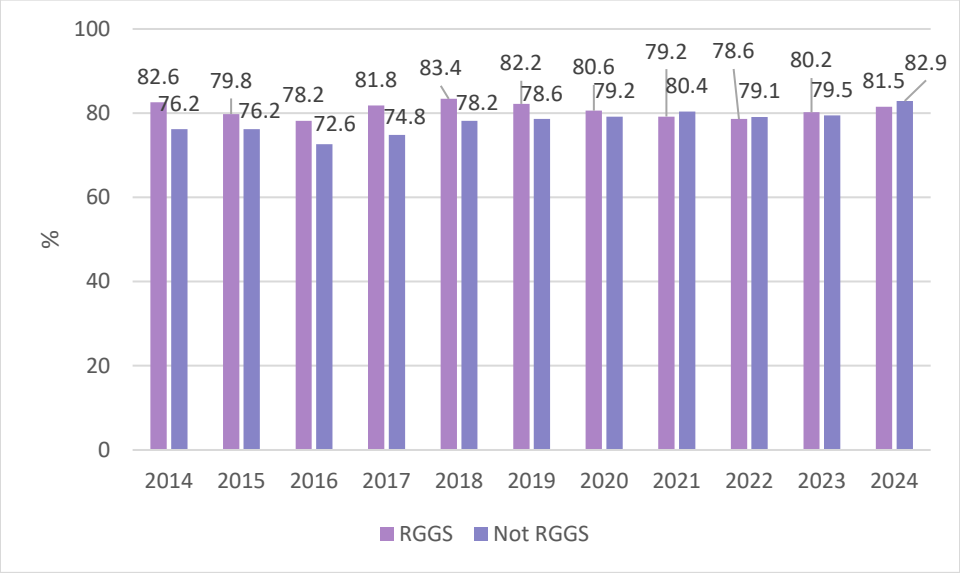
A. Descriptive Statistics: HS Students Enrolled in Earth Science Courses

Figure IV-1 to Figure IV-6 display the percentage of RGGS and non-RGGS students enrolled in high school Earth Science courses by demographic and educational characteristics over time. Overall, there has been little change in the characteristics of students taught by RGGS graduates over time. The share of students who are poor has remained relatively consistent over time with close to 80% of RGGS students eligible for free and reduced-price lunch.[3] However, the percentage of poor students RGGS

[3] We use the term "poor" to describe all students who are eligible for free and reduced-price lunch. This is a student level measured provided by the NYC DOE. Percent of economically disadvantaged students is a school-level variable provided by the NYSED and indicates the percent of students at a school who participates in, or whose family participates in, economic assistance programs, such as the Free or Reduced-Price Lunch Programs; Social Security Insurance (SSI); Supplemental Nutrition Assistance Program (SNAP); Foster Care; Refugee Assistance

students was slightly lower compared to non-RGGS students in 2023-24 (81.5 vs. 82.9%, p < 0.05). Citywide, the percentage of students in grades 9-12 who are poor is about 77.0%, up from 71.2% in 2014, an increase of approximately 7.5%.

Figure IV-1. Percent of Poor in Grades 9-12 Enrolled in Earth Science by RGGS Status and Year, 2014-24



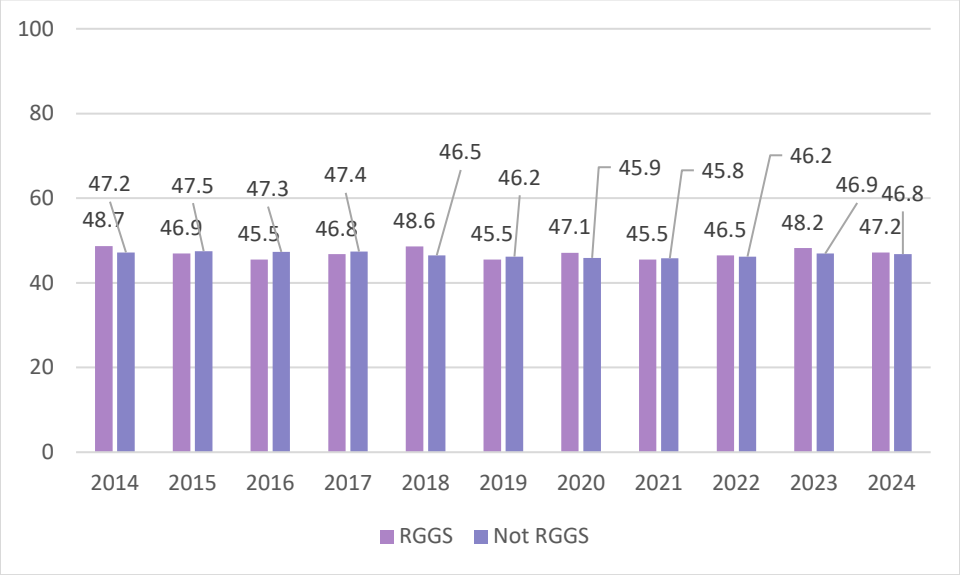
Citywide: 2024 77.0%, 2014 71.2%

Notes: All differences for Poor are statistically significant at $p < 0.05$ except for 2023.

On average, both RGGS and non-RGGS graduates teach a lower percentage of female students compared to male students (Figure IV-3). Except for 2018, none of the differences are statistically significant. The percentage of female students across the city has remained about 48% over this time period.

(cash or medical assistance); Earned Income Tax Credit (EITC); Home Energy Assistance Program (HEAP); Safety Net Assistance (SNA); Bureau of Indian Affairs (BIA); or Family Assistance: Temporary Assistance for Needy Families (TANF). If one student in a family is identified as low income, all students from that household (economic unit) may be identified as low income (https://data.nysed.gov/glossary.php?report=assessment).

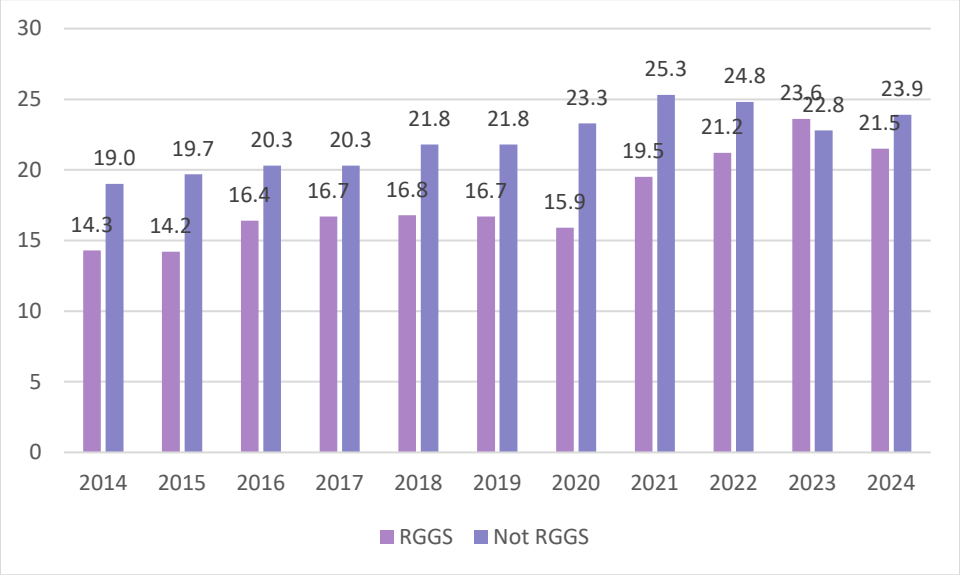
Figure IV-2. Percentage of Female Students by RGGS status and Year, Grades 9-12, 2014-2024



Citywide: 2024 47.5%; 2014 48.2%
Notes: Differences are only statistically significant in 2018.

Figure IV-3 shows the percentage of students with disabilities (SWDs) taught by RGGS graduates and non-graduates. The percentage of SWDs enrolled in Earth Science courses has increased for both groups since 2014. For RGGS graduates, the percentage of students with disabilities has increased from 14.3% in 2014 to 21.5% in 2024. For non-RGGS graduates the percentage of SWDs has increased from 19.0% to 23.9%. Annual differences between RGGS and non-RGGS students are statistically significant at $p < 0.01$ except for 2022-23. These increases mirror the percentage of 9-12th grade students who are SWDS citywide, which increased from 17.0% in 2014 to 21.0% in 2024, a 23.5% increase over this time period.

Figure IV-3. Percentage of Students with Disabilities in Grades 9-12 Enrolled in Earth Science by RGGS Status and Year, 2014-24

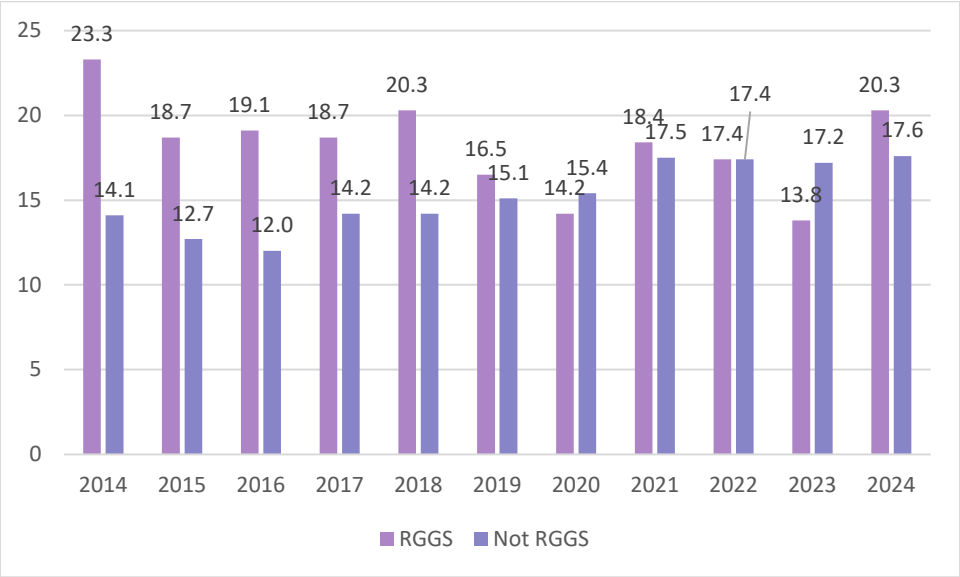


Citywide: 2024 21.0%; 2014 17.0%

Notes: Differences are statistically significant at $p < 0.01$ for all years except 2023.

Since 2014, the percentage of ELLs taught by RGGS graduates has decreased from 23.3% to 20.3% in 2024, while the percentage taught by non-graduates has increased from 14.1% to 17.6% (Figure IV-4). The differences in the percentage of ELL students between the two groups are not statistically significant in 2020, 2021, or 2022. Citywide, the percentage of ELLs has also increased from 12.9% in 2014 to 17% in 2024, a 31.8% increase.

Figure IV-4. Percentage of Students by ELL Status in Grades 9-12 Enrolled in Earth Science by RGGS Status and Year, 2014-23

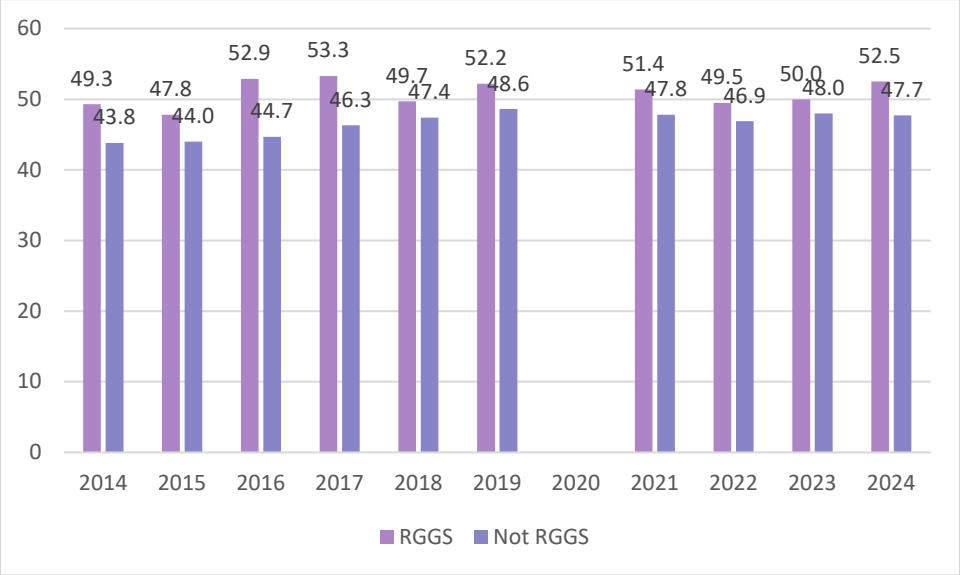


Citywide: 2024 17.0%; 2014 12.9%

Notes: All differences are statistically significant for ELL at $p < 0.05$ except for 2020, 2021, and 2022.

The percentage of students who speak a language other than English at home (Figure IV-5) is higher among RGGS graduates than non-graduates (in 2024, 52.5% vs. 47.7%). This percentage has been relatively stable and the differences are statistically significant for all years. The citywide percentage has also been stable with 44.6% in 2014 to 47.0% in 2024, increasing just 5% over this time.

Figure IV-5. Percentage of Students by Home Language Not English in Grades 9-12 Enrolled in Earth Science by RGGS Status and Year, 2014-24

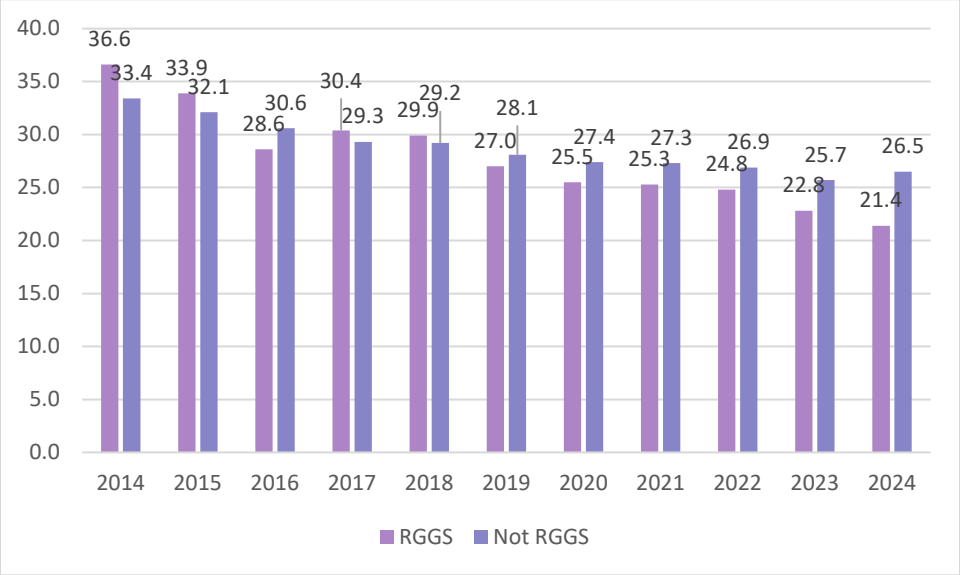


Citywide: 2024 47.0%; 2014 44.0%

Differences for Home Language are statistically significant at $p < 0.001$ for all years. Home language other than English is unavailable for 2020.

As shown in Figure IV-6 the percentage of Black students enrolled in Earth Science courses has decreased since 2014, which is reflective of the 30% decrease Black students enrolled in New York City public schools since 2014, from 31.1% in 2014 to 22% in 2024. In 2024, the percentage of Black students taught by RGGS graduates was 21.4%, compared to 26.5% for non-RGGS graduates ($p < 0.05$). However, as the percentage of Black students decreased, the percentage of Latino students has increased (Figure IV-7). In 2024, 53.1% of students taught by RGGS graduates were Latino, compared to 48.4% taught by non-RGGS graduates. This difference is statistically significant. The percentage of Latino students has increased slightly from 40% in 2014 to 43% in 2024, an increase of 7.5%.

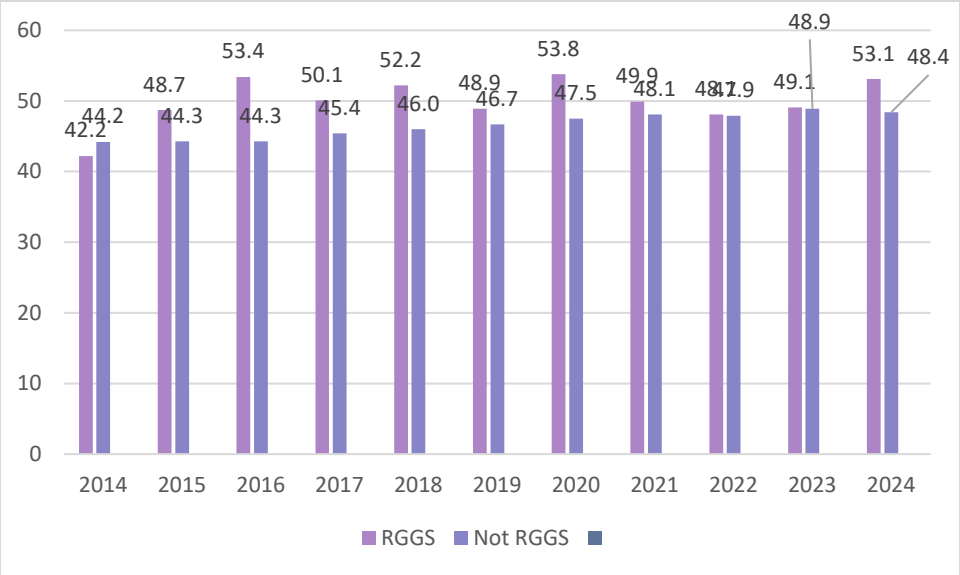
Figure IV-6. Percentage of Black Students in Grades 9-12 Enrolled in Earth Science by RGGS Status and Year, 2014-2024



Citywide: 2024 22.0%; 2014 31.0%

Notes: Differences for Black are statistically significant at $p < 0.05$ for 2016 and 2020-2024.

Figure IV-7. Percentage of Latino Students in Grades 9-12 Enrolled in Earth Science by RGGS Status and Year, 2014-2024

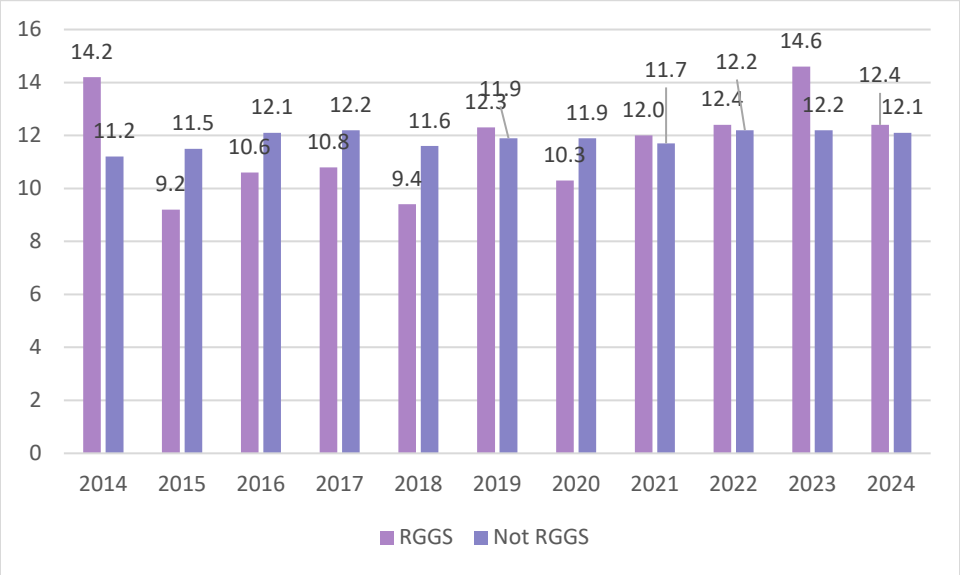


Citywide: 2024 43.0%; 2014 40.0%

Differences for Latino are statistically significant at $p < 0.05$ for all years except 2014, 2022, and 2023.

The percentage of Asian and White students taught by RGGS and non-graduates is shown in Figures IV-8 and IV-9. The percentage of Asian students taught by RGGS graduates was 12.4% in 2024 compared to 12.1% for students of non-RGGS graduates. The percentage of White students taught by RGGS graduates increased to 10.6% in 2024 from 6.3% in 2014, while the percentage of White students taught by non-RGGS graduates has consistently remained about 10%. All differences between RGGS and non-RGGS students are statistically significant at $p < 0.01$, except for 2021 and 2023. The percentage of Asian students citywide has increased slightly from 15.6% in 2014 to 18% in 2024, a 15% increase while the percentage of White students citywide has remained stable at about 13% during the same period.

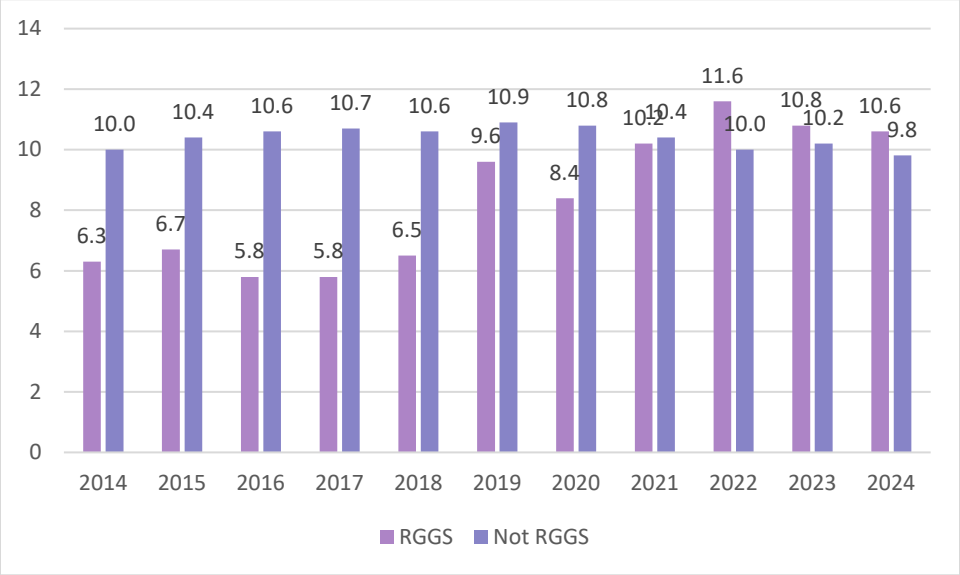
Figure IV-8. Percentage of Asian Students in Grades 9-12 Enrolled in Earth Science by RGGS Status and Year, 2014-2023



Citywide: 2024 18.0%; 2014 15.6%

Notes: Differences for Asian are statistically significant at $p < 0.05$ for all years except 2019 and 2022.

Figure IV-9. Percentage of White Students in Grades 9-12 Enrolled in Earth Science by RGGS Status and Year, 2014-2024

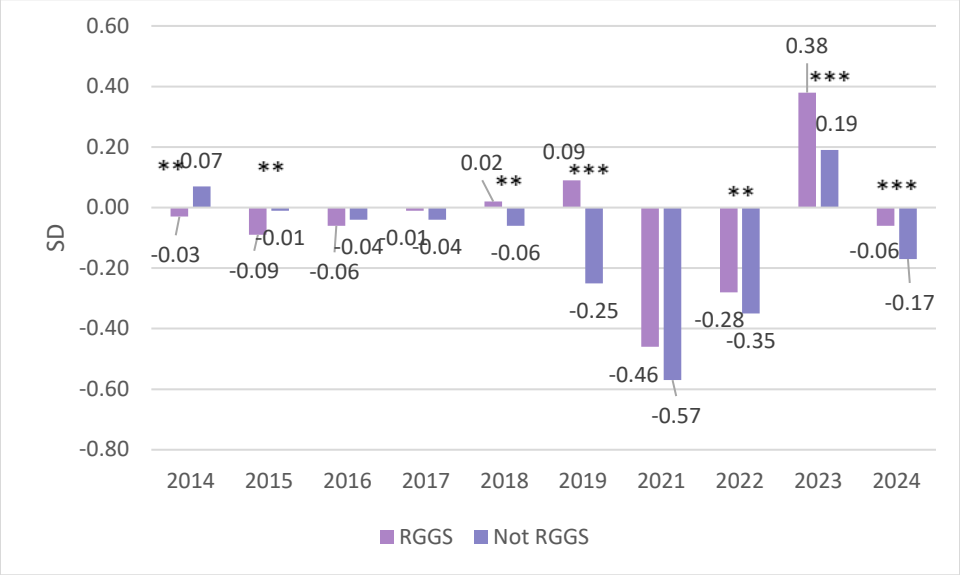


Citywide: 2014-24 approximately 13%

Note: Differences for White are statistically significant at $p < 0.001$ for all years except 2021 and 2023.

Our measure of past performance are z-scores on the 8th Grade ILS Exam, given in the spring of 8th grade. As Figure IV-10 shows, in most years, on average, all students who enrolled in Earth Science courses in high school scored below the citywide average. In some years, for example, 2015 and 2016, students of RGGS graduates scored lower than those of non-RGGS graduates (although these differences are not statistically significant), while in other years, for example, 2019 and 2021, students of RGGS graduates scored higher. RGGS students in 2023 scored 0.38 standard deviations (sd) higher compared to 0.20sd for non-RGGS students, although the sample size is small (only 2452 students enrolled in Earth Science in 2023 have ILS scores). In 2024, the number of those in Earth Science classes with 2023 8th grade ILS exam results increased to over 10,000 with 8th grade ILS scores. The z-scores look more like the previous years than to 2023 results. While RGGS students performed better on the 8th grade ILS (-0.06sd) compared to non-RGGS students (-0.17sd) both groups still perform below the citywide average.

Figure IV-10. Z-score on 8th Grade Intermediate Level Science exam by RGGS status and Year, Grades 9-12, 2014-2024



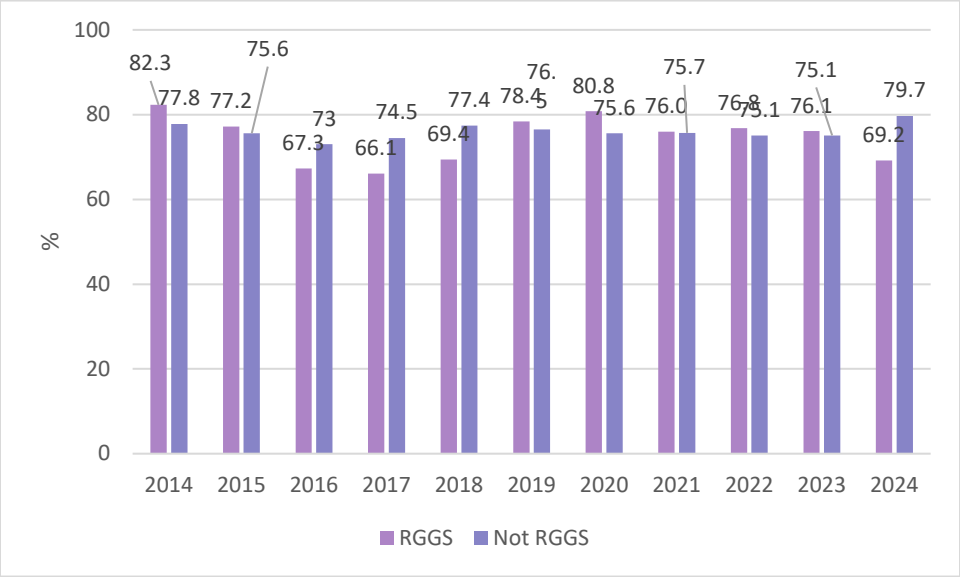
Notes: The 8th grade ILS was not administered in 2020. The number of total students with ILS scores is small in 2022 and 2023.
Year is the year the student was enrolled in Earth Science.
$^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

B. Descriptive Statistics: Students in Grades 6-8

A separate descriptive analysis of students in grades 6-8 was conducted since it is harder to identify an appropriate comparison group for these grades since most middle school RGGS teachers teach general science courses, rather than a specific course. To find a similar group of students we limited our comparison group to non-RGGS teachers with similar years of experience in each year to our RGGS graduates and those who taught similar courses. For example, for 2024 we included students of all non-RGGS teachers who taught Earth Science or General Science in grades 6-8 and had fewer than 9.2 years of experience at the DOE.

Figure IV-11 shows the percentage of students who are poor by RGGS status and year. We see that the percentage of poor students taught by RGGS graduates decreased over time to 69.2% in 2024 from 82.4% in 2014. In 2024, RGGS graduates taught a lower percentage of poor students compared to non-RGGS graduates (69.2% vs 79.7%, $p < 0.05$). The citywide average for students in grades 6-8 was 76.3% in 2014 and showed a small increase to 77.8% in 2024.

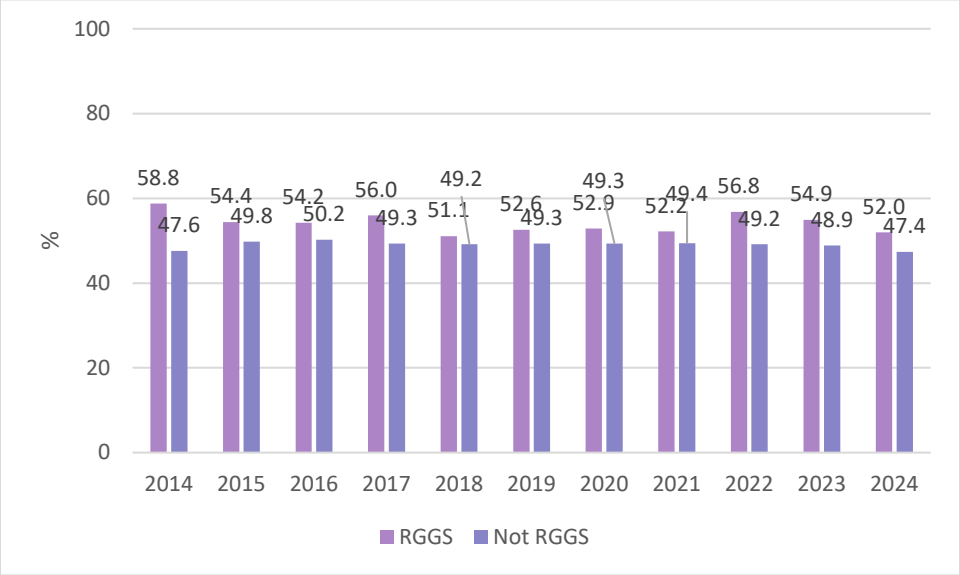
Figure IV-11. Percentage of Poor Students in Grades 6-8 by RGGS Status and Year, 2014-2024



Notes: In 2024, 77.8% of students in grades 6-8 were eligible for free and reduced price lunch. Differences for Poor are statistically significant at $p < 0.05$ for all years except 2015 and 2021-2023.

RGGS graduates also taught a higher percentage of female students (Figure IV-19) in 2023-24, compared to non-RGGS graduates (52.0% vs. 47.4%, $p < 0.5$). Citywide, the percentage of female students in grades 6-8 has not changed since 2014 and is approximately 49.0%.

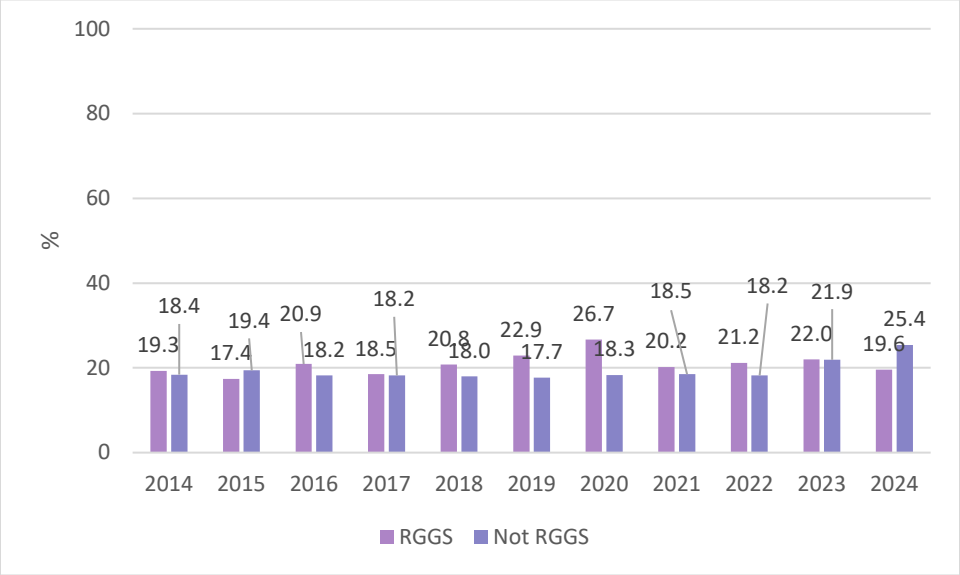
Figure IV-12. Percentage of Female Students in Grades 6-8 by RGGS Status and Year, 2014-2024



Notes: Notes: In 2024, 49.0% of students in grades 6-8 were female.
All years are statistically significant at $p < 0.05$ except for 2015 and 2018.

Figure IV-12 presents the percentage of SWDs by RGGS status and year. In most years RGGS graduates taught a higher percentage of students with disabilities compared to non-RGGS graduates, although the differences are not statistically significant in all years. The percentage of SWDs taught by RGGS graduates decreased from 22.0% in 2023 to 19.6% in 2024, while the percentage of SWDs taught by non-RGGS graduates increased to 25.4% from 21.9%. The difference is statistically significant for 2024 but not for 2023. Citywide, the percentage of SWDs has increased from 20.4% in 2014 to 23.0% in 2024, a 12% increase.

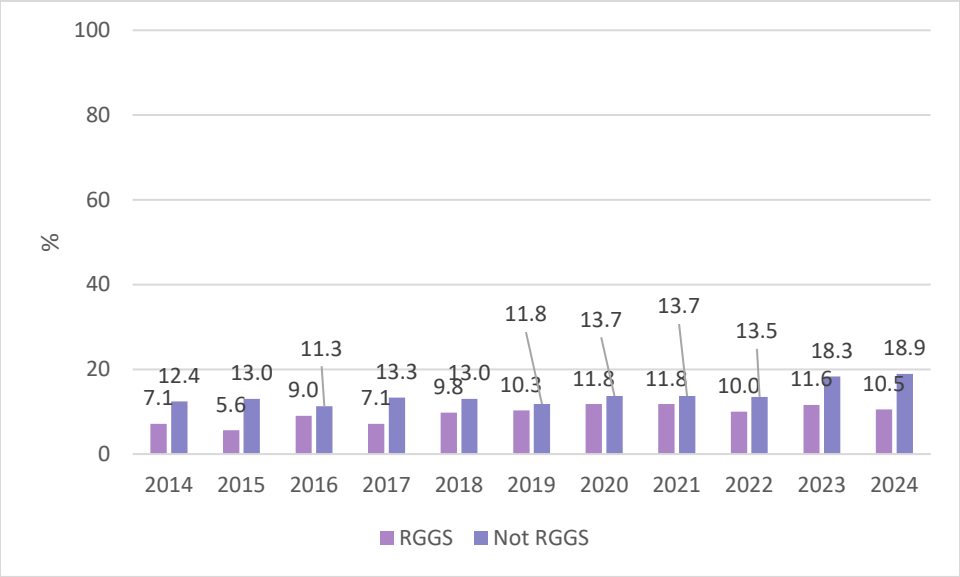
Figure IV-13. Percentage of Students with Disabilities in Grades 6-8 by RGGS Status and Year, 2014-24



Notes: In 2024, 23.0% of students in grades 6-8 were a student with disability.
Differences are statistically significant at $p < 0.01$ for 2018-20, 2022, and 2024.

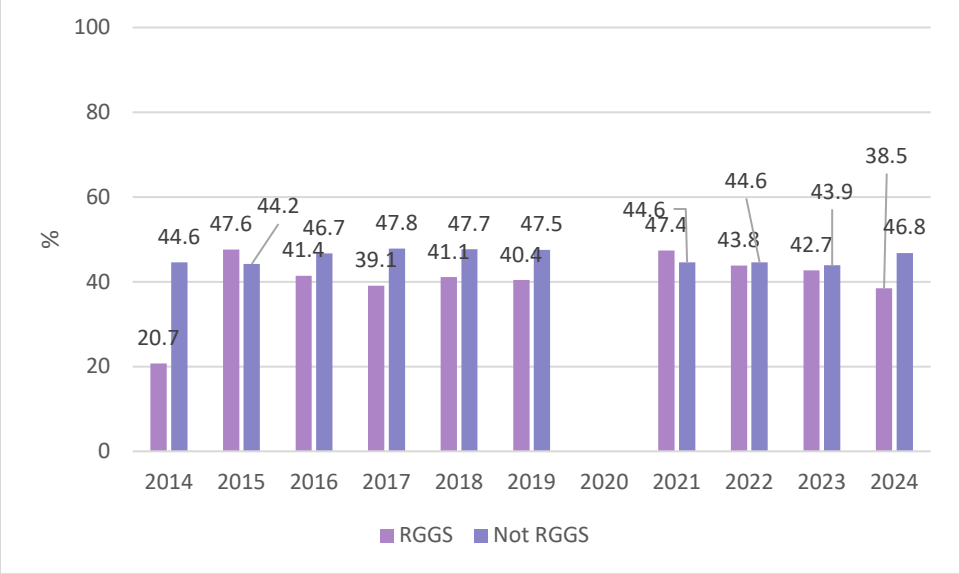
The percentage of ELLs taught by RGGS graduates is lower in each year when compared to non-RGGS graduates (Figure IV-13). In 2014, 7.1% of students of RGGS students were ELLs compared to 12.4% of non-RGGS students ($p < 0.01$), while in 2024, 10.5% of RGGS students were ELL compared to 18.9% for non-RGGS students ($p < 0.001$). The percentage of RGGS students whose home language is other than English (Figure IV-14) also decreased from 2023 (42.7%) to 38.5% in 2024, while the percentage for non-RGGS students increased from 43.9% to 46.8%. The percentage of ELLs in grades 6-8 has increased by 42.7%, from 12.4% in 2014 to 17.7% in 2024, while the percentage of students whose home language is not English increased almost 8%, from 42.1% to 45.4%.

Figure IV-14. Percentage of ELLs by RGGS Status and Year, Grades 6-8, 2014-24



Notes: In 2024, 17.7% of students in grades 6-8 were English language learners.
All differences for ELL are statistically significant at $p < 0.05$, except for 2016 and 2019.

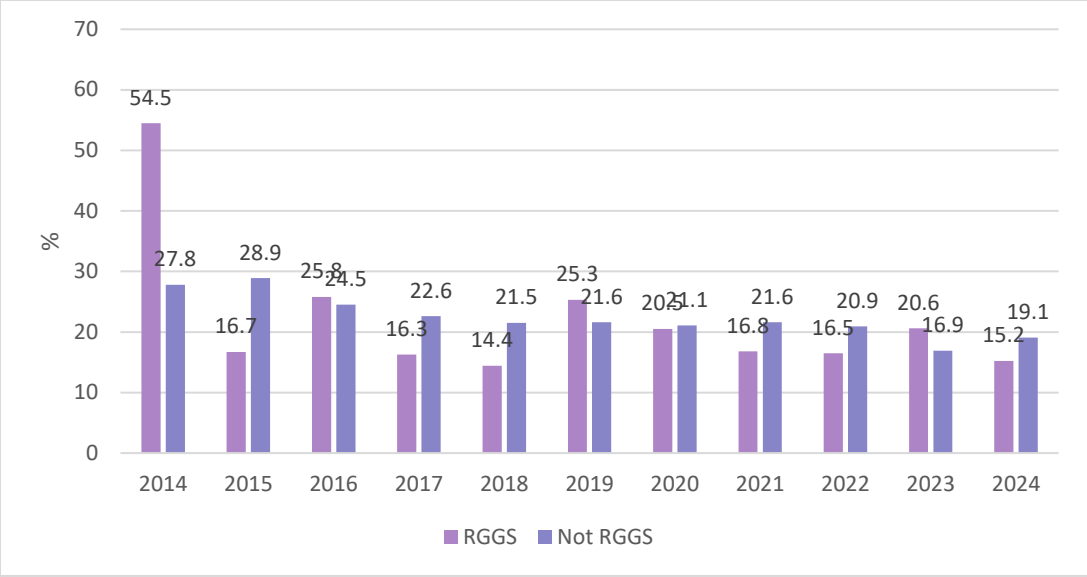
Figure IV-15. Percentage of Students whose Home Language is not English by RGGS Status and Year, Grades 6-8, 2014-24



Notes: In 2024, 44.5% of students in grades 6-8 had a home language other than English.
Differences for Home Language Other than English are statistically significant at $p < 0.05$ for all years except for 2015, 2022 and 2023. Home Language was not available for 2019-20.

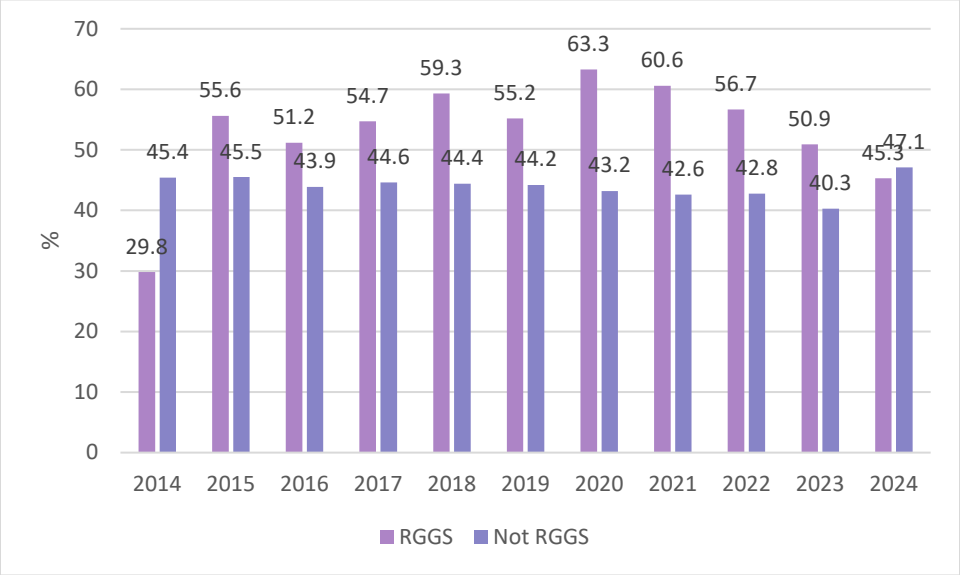
The percentage of Black students in grades 6-8 has decreased over time for both groups. While over half of RGGS students were Black in 2014, compared to 27.8% for non-RGGS students; the percentage of Black students has decreased in 2024 to 15.2% for RGGS students while it increased from 16.9% to 19.1% for non-RGGS students ($p < 0.05$), respectively. (Figure IV-15). It is the opposite for Latino students (Figure IV-16). In 2014, 29.8% of RGGS students were Latino, compared to 45.4% for non-RGGS students ($p < 0.001$). In 2024, the percentage of RGGS students who were Latino was 45.3%, a decrease from 2023 and 47.1% for non-RGGS students, an increase from 40.3% in 2023. The difference in 2024 is not statistically significant. Similar to students in grades 9-12, the percentage of Black students citywide has decreased 35%, from 29.3% in 2014 to 19.1% in 2024, while the percentage of Latino students has increased 9%, from 40.2% in 2014 to 43.9% in 2024.

Figure IV-16. Percentage of Black Students by RGGS Status and Year, Grades 6 to 8, 2014-2024



Notes: In 2024, 19.1% of students in grades 6-8 were Black.
All differences for Black are statistically significant at $p < 0.05$, except for 2016 and 2020.

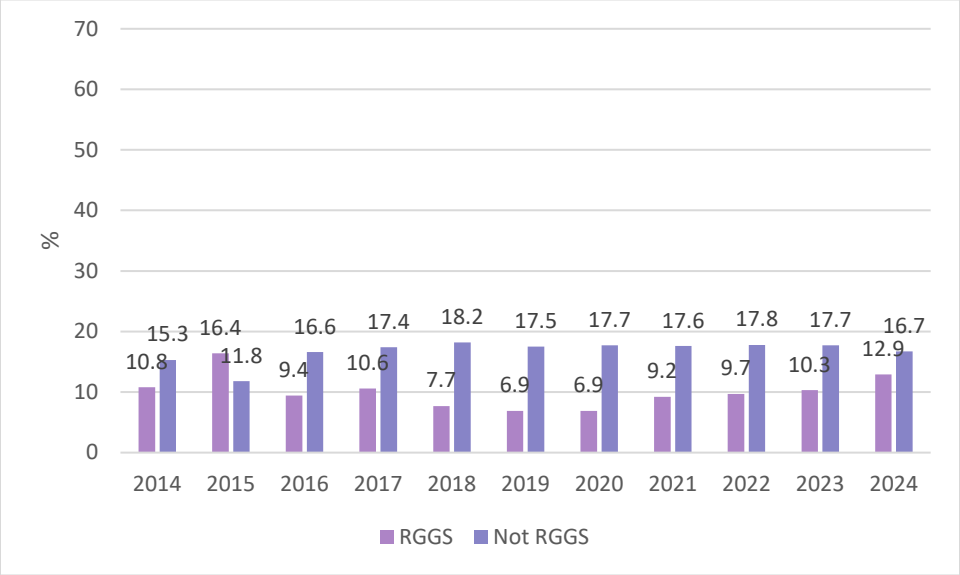
Figure IV-17. Percentage of Latino Students by RGGS Status and Year, Grades 6 to 8, 2014-2024



Notes: In 2024, 43.9% of students in grades 6-8 were Latino.
All differences for Latino are statistically significant for all years at p < 0.001, except for 2024.

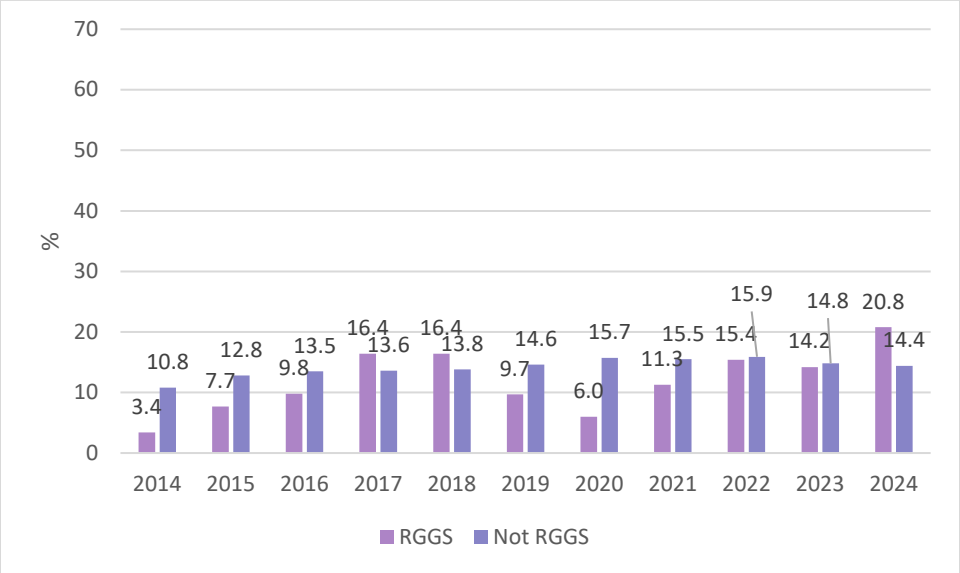
In general, RGGS graduates teach a lower percentage of Asian and White students compared to non-RGGS graduates (Figure IV-17 and IV-18). In 2014, 10.8% of RGGS students s were Asian compared to 15.3% of non-RGGS students ($p < 0.05$). In 2024, the percentages were 12.9% and 16.7% respectively ($p < 0.05$). For White students, the percentage of RGGS students varies by year from a low of 3.4% in 2014, to a high of 20.8% in 2024, while the percentage of White students taught by non-RGGS graduates ranged from 10.8% to 15.9% in 2022; in 2024, 14.4% of non-RGGS students were White. The percentage of Asian students citywide in grades 6-8 has increased by 23%, from 15.2% in 2014 to 18.7% in 2024, while the percentage of white students has remained stable at around 15%.

Figure IV-18. Percentage of Asian Students by RGGS Status and Year, Grades 6 to 8, 2014-2024



Notes: In 2024, 18.7% of students in grades 6-8 were Asian.
All differences for Asian are statistically significant at $p < 0.05$.

Figure IV-19. Percentage of White Students by RGGS Status and Year, Grades 6 to 8, 2014-2024



Note: In 2024, 15.0% of students in grades 6-8 were eligible for White.
All differences for White are statistically significant for all years at $p < 0.01$ except for 2017, 2018, 2022, and 2023.

One percent of 8th graders in our sample took the Earth Science Regents in 2024. Eighth grade RGGS students were more likely to take the Earth Science Regents than non-RGGS students (2.6% vs.

1.0%, p < 001). There were no statistically significant differences in the z-score, although RGGS students did score lower than non-RGGS students (0.29sd vs 0.46sd) and had lower rates of passing at 65 or higher (65.7% vs. 69.7%). They also had lower rates of passing at 85 or higher (13.2% vs. 35.3&, p < 0.01). Students of RGGS teachers also scored lower on the 8th grade ILS exam (-0.24sd vs -0.03sd, p < 0.01), however, these numbers should be taken with caution since only 161 students of RGGS teachers took the exam (approximately one percent of 8th graders in our sample).

C. Regression Analyses

In this section, we present the regression analyses of the impact of having an RGGS teacher on Earth Science Regents outcomes for 2014 through 2019 and 2022 to 2024. Table IV-1 summarizes the data used for the regression analyses.

Table IV-1. Summary of Regression Analyses

	Outcome Variables
Cohorts	1-11
# years student data	1-9
Includes Student Characteristics	Yes
Includes Prior Performance	Yes
Includes Year Effects	Yes

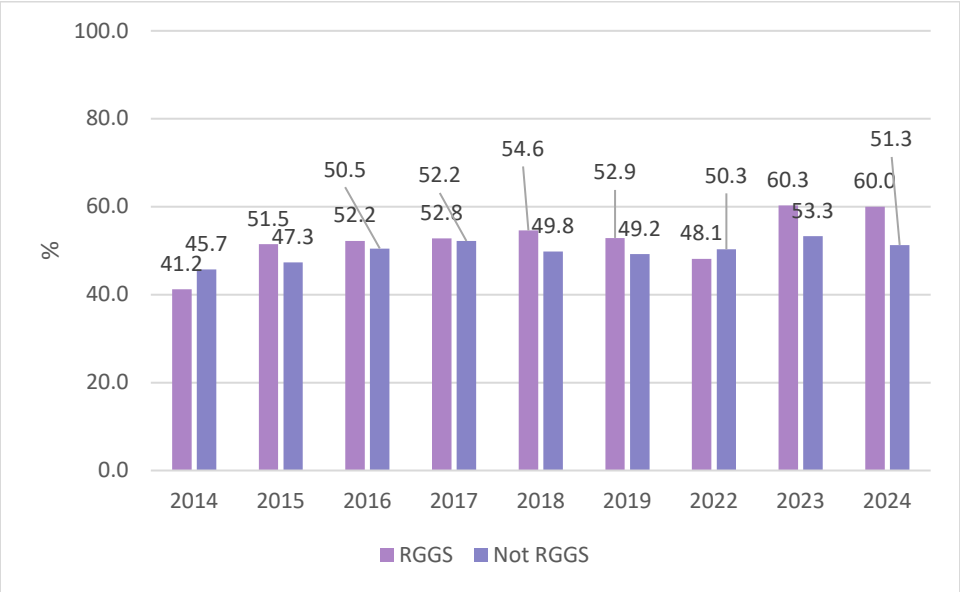
Notes: Earth Science Regents were not given in 2019-20 and 2020-21 because of the COVID-19 pandemic

We show the marginal results using the treatment on the treated (ATT) sample in Figures IV-20 to IV-22. As mentioned previously, this analysis compares NYC public school students of RGGS teachers to similar students not taught by an RGGS teacher and who are matched on observable student, teacher, and school characteristics.

Figure IV-20 shows the percentage of students in each group who take the Earth Science Regents, before the match. Between 2016 and 2019, over half of students enrolled in Earth Science courses take the Regents, regardless of RGGS status. We see that students of RGGS graduates are more

likely to have taken the Earth Science Regents than other students, except in 2014 and 2022. These differences are statistically significant ($p < 0.01$) for 2015, 2018, 2019 and 2022 through 2024.

Figure IV-20. Percentage of Students Enrolled in Earth Science Course in Grades 9-12 who Take the Earth Science Regents, 2014-19 and 2022-2024



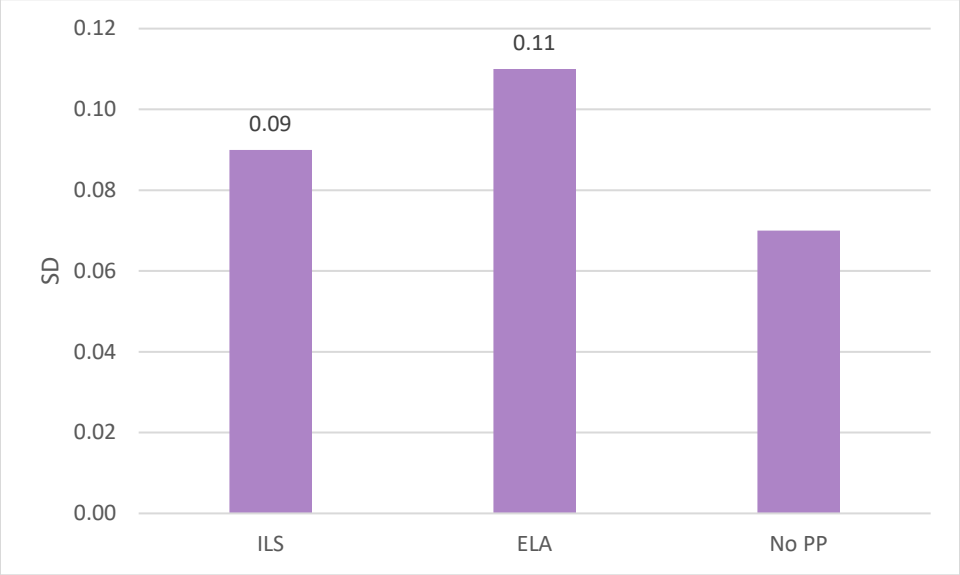
Citywide: in 2024 52.2% of those enrolled in Earth Science took the Regents; in 2014, it was 46.7%

Notes: Differences are statistically significant at p < 0.01 except for 2016 and 2017.

Figures IV-21 and IV-22 show the overall impact of RGGS on performance on Earth Science Regents. The marginal effect indicates the difference between RGGS students and non-RGGS students in each year, holding all other variables constant. The analyses contain results using the z-scores of different measures of past performance: 8th grade Intermediate Level Science (ILS), English Language Arts (ELA), or no measure of past performance.

Overall, the RGGS program has had a statistically significant positive impact on Earth Science Regents test scores (Figure IV-21), increasing scores by 0.09sd (ILS) and 0.11sd (ELA). While the analysis using no past performance was also positive (0.07sd) it is not statistically significant.

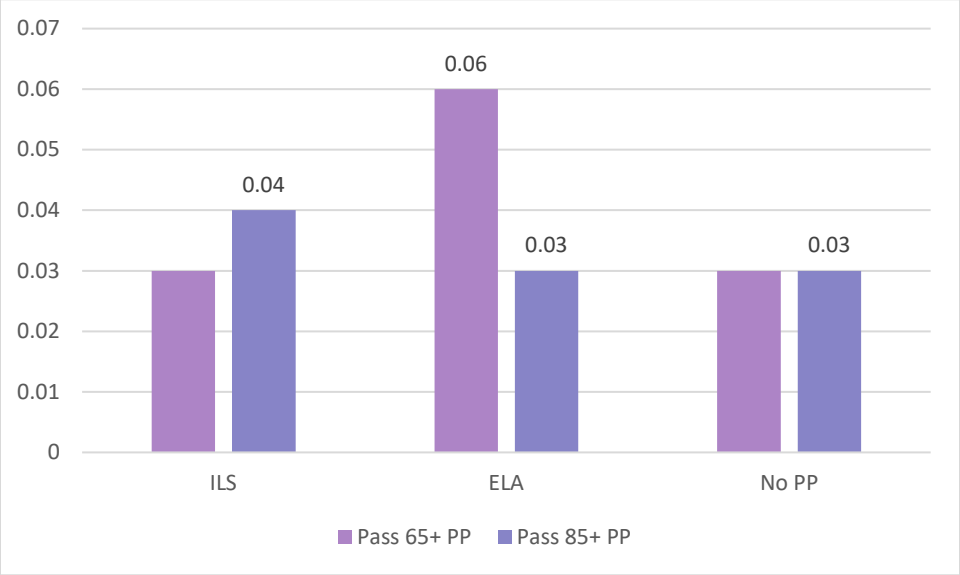
Figure IV-21. Overall Marginal Effects for Students of RGGS Graduates on Earth Science Regents Z-Score, 2014-24



Coefficients shown are statistically significant for ILS at $p < 0.10$ and ELA at $p < 0.05$

Figures IV-22 show the overall results of passing at 65 or higher and 85 or higher by year and measure of past performance. We see a positive and statistically significant increase ($p < 0.05$) in the share of RGGS students passing at 85 for all three measures of past performance and for passing at 65 for ELA, although results for passing at 65 are positive but not statistically significant for ILS and no past performance.

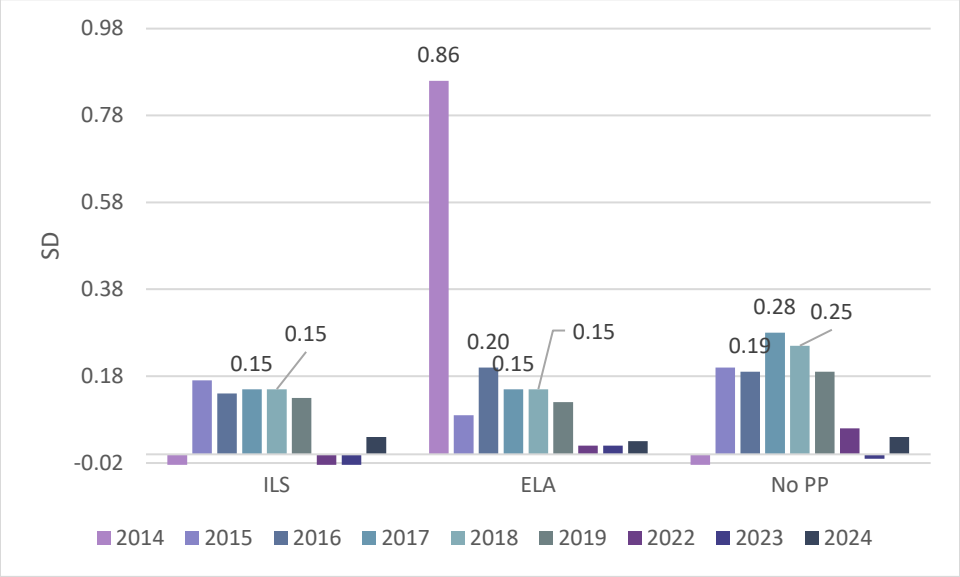
Figure IV-22. Overall Marginal Effects for Students of RGGS Graduates on Earth Science Regents Pass at 65+ or 85+, 2014-24



Coefficients shown are statistically significant for ILS at $p < 0.10$ and ELA at $p < 0.05$

Next, we break down the results by year. Again, the coefficients shown are statistically significant at $p < 0.05$ (Figure IV-23; also see Appendix Figure VI-1-3 for means by year and confidence intervals for z-science as the control; results for ELA and no past performance are similar). While none of the coefficients for the z-score for the Earth Science Regents are statistically significant, we begin to see an increase in performance for RGGS students, compared to 2022 and 2023. RGGS students scored 0.04sd higher in 2024, holding all other variables constant. From 2015 through 2019, RGGS students scored higher than non-RGGS students on the z-score in each year ($p < 0.10$). In these years, students scored between 0.13sd and 0.17sd higher than non-RGGS students. This is comparable to a score increase of between 2.1 and 2.8 points on the exam, which, if it entails movement around the passing thresholds, will enable students to pass. In 2024, a 0.04sd increase equates to a 0.74 increase on their test score.

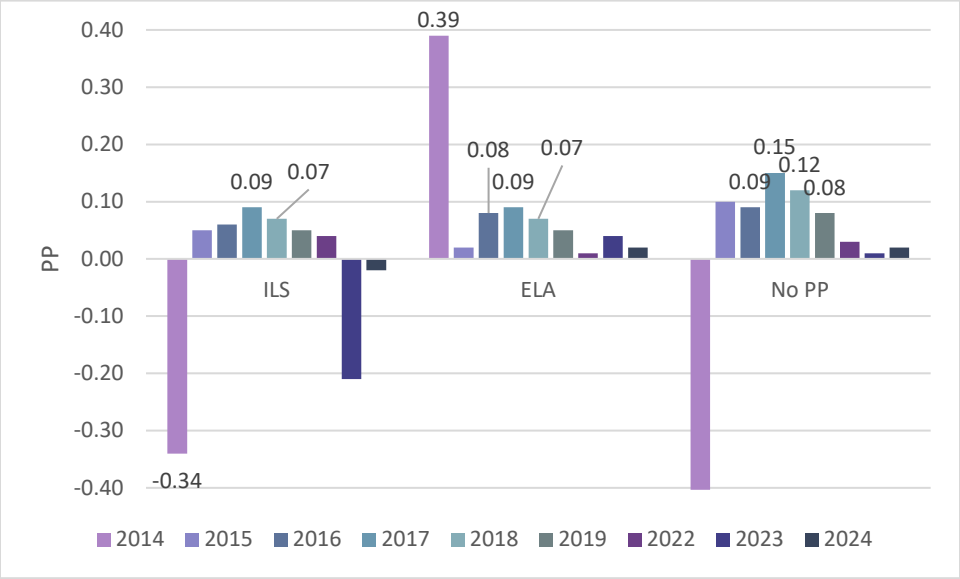
Figure IV-23. Marginal Effects by Year, Z-Score Earth Science Regents 2014-19 and 2022-24, Matched Sample



Sample includes all students in grades 9-12 who were enrolled in Earth Science, took the Earth Science Regents exam in the same year, and had complete student, teacher, and school data; while regressions control for individual student characteristics.
Robust standard errors clustered by teacher.
Coefficients indicate statistical significance at $p < 0.10$

As expected**,** based on the z-score results, RGGS students are slightly more likely to pass the Earth Science Regents (Figure IV-24) in years except 2014, 2022, and 2023, although this is dependent on our measure of past performance. Using the ILS results, RGGS students see a decrease in passing rates at 65 or higher in 2023 (21.0 pp) and 2024 (2.0 pp), although they are only statistically significant in 2023. In 2024, a -2 pp difference in the number of RGGS students passing the exam equates to 3.8% fewer RGGS students passing at 65 or higher. Using either ELA or no measure of past performance shows a 2pp increase in passing at 65 or higher, although neither is statistically significant.

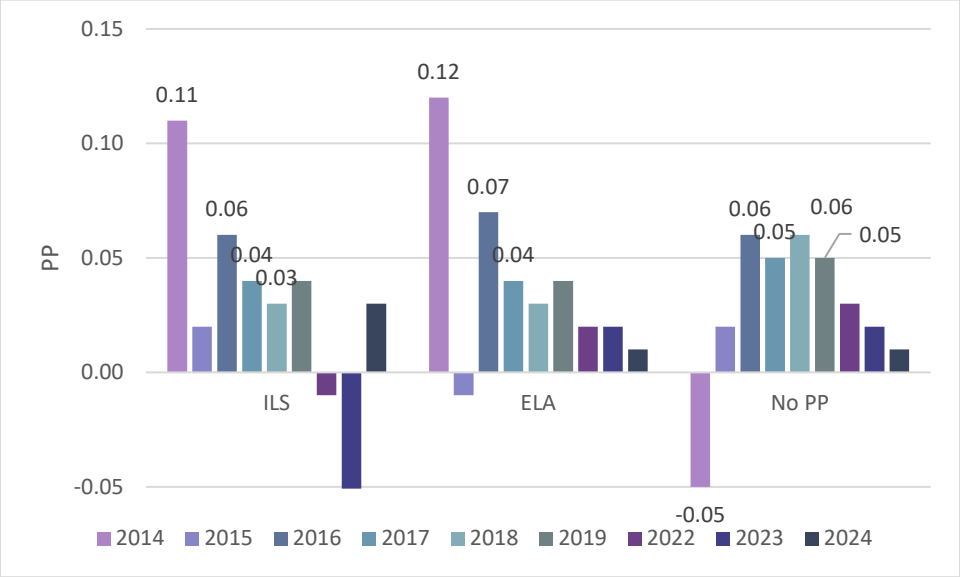
Figure IV-24. Marginal Effects by Year of Scoring 65 or higher on the Earth Science Regents, 2014-19 and 2022-24



Sample includes all students in grades 9-12 who were enrolled in Earth Science, took the Earth Science Regents exam in the same year, and had complete student, teacher, and school data; regression analysis include individual student characteristics
Robust standard errors clustered by teacher.
Coefficients indicate statistical significance at $p < 0.10$

However, RGGS students are more likely to pass at 85 or higher in 2024 (Figure IV-25), regardless of past performance measure, although the percentage point difference is small (ILS 3pp; ELA and no past performance 1pp). They are more likely to pass at 85 or higher for all years in 2016 and 2017 (all measures are statistically significant and 2018 (ILS and no past performance) and 2019 (no past performance). In 2024, a 3pp difference in passing at 85 or higher is equivalent to a 23% increase in the number of RGGS students passing at 85 or higher.

Figure IV-25. Marginal Effects by Year of Scoring 85 or higher on the Earth Science Regents, 2014-19 and 2022-24



Sample includes all students in grades 9-12 who were enrolled in Earth Science, took the Earth Science Regents exam in the same year, and had complete student, teacher, and school data; regressions include individual student characteristics
Robust standard errors clustered by teacher.
Coefficients indicate statistical significance at $p < 0.10$

V. Conclusion

This report presents the latest results on AMNH's RGGS Earth Science Residency Program. To recap, we use data obtained from the NYCDOE to examine the impact of RGGS graduates on student performance on the NYS Earth Science Regents exam using a comparison group of students who are matched to RGGS students on student characteristics, teacher characteristics, and characteristics of the schools they attend. The results presented in this report contain analyses on 9th to 12th graders who were enrolled in Earth Science courses in 2013-14 through 2023-24 and include graduates from cohorts 1-11. Separate descriptive analyses were conducted on students in 6th to 8th grade.

We find that, overall, RGGS graduates continue to teach NYC public school students who are poor, Black, Latino, students with disabilities, English learners and those who have a home language other than English and are not leaving these students in favor of higher performing and low-needs schools as

they gain teaching experience and seniority in the NYCDOE. Therefore, the RGGS program is serving a population with particularly high teacher attrition rates given high rates of turnover among science teachers and those teaching in middle schools (Guarino et al., 2004; Ingersoll, 2003; Marinell & Coca, 2013; Nguyen et al., 2020; Nguyen et al., 2022; Nguyen & Redding, 2018).

The percentage of RGGS students continue to take the Earth Science Regents at higher rates compared to non-RGGS students, and exam scores for this group are beginning to trend upwards. In general, RGGS students performed higher on the Earth Science Regents exam than their matched counterparts in 2024. While RGGS students performed between 0.13 and 0.17sd higher than those in the comparison group in 2015 through 2019, in 2024 RGGS students score 0.04sd higher. Additionally, they are less likely to pass at 65 or higher, controlling for ILS, but more likely to pass when we control for ELA or no measure of past performance and are only slightly more likely to pass at 85 or higher.

While the match rates for the analysis include a high proportion of RGGS graduates, the results may not be generalizable to all student populations. First, we cannot include students attending New York City charter schools or districts outside of New York City since we lack access to do the data. Second, we are limited in assessing RGGS graduates who teach in middle school grades since there are too few students who have either the Earth Science Regents or 8th grade ILS test results.

We will continue to monitor how well RGGS students do compared to non-RGGS students in the coming years.

References

Guarino, C. M., Santibañez, L., Daley, G. A., & Brewer, D. (2004). A review of the research literature on teacher recruitment and retention (TR-164-EDU). RAND. https://www.rand.org/pubs/technical_reports/TR164.html

Hainmueller, J. (2012). Entropy Balancing for Causal Effects: A multivariate Reweighting Method to Produce Balanced Samples in Observational Studies. Political Analysis, 20:25-46.

Ingersoll, R. M. (2003). Turnover and shortages among science and mathematics teachers in the United States. In J. Rhoton & P. Bowers (Eds.), Science teacher retention: Mentoring and renewal (pp. 1–12). NSTA Press.

Jann, B. (2017). "KMATCH: Stata module for multivariate-distance and propensity-score matching, including entropy balancing, inverse probability weighting, (coarsened) exact matching, and regression adjustment," Statistical Software Components S458346, Boston College Department of Economics, revised 19 Sep 2020.

Marinell, W. H., & Coca, V. M. (2013). "Who stays and who leaves? Findings from a three-part study of teacher turnover in NYC middle schools." Research Alliance for New York City Schools. http://media.ranycs.org/2013/003

Nguyen, T.D., Lam, C.B., & Bruno, P. (2022). Is there a national teacher shortage? A systematic examination of reports of teacher shortages in the United States. (EdWorkingPaper: 22-631). Annenberg Institute at Brown University: https://doi.org/10.26300/76eq-hj32

Nguyen, T.D., Pham, L. D., Crouch, M., & Springer, M. G. (2020). The correlates of teacher turnover: An updated and expanded Meta-analysis of the literature. Educational Research Review, 31. https://doi.org/10.1016/j.edurev.2020.100355

Nguyen, T. D. & Redding, C. (2018). Changes in the Demographics, Qualifications, and Turnover of American STEM Teachers, 1988–2012. AERA Open, 4(3). https://doi.org/10.1177/2332858418802790

Stuart, E. A. (2010). Matching methods for causal inference: A review and a look forward. Stat Sci, 25(1): 1-21.

VI. Appendices

Table VI-1. Demographic and Educational T-Tests Among Earth Science Regents Test-Takers by RGGS Status, 2014-24

	% Poor			% Female		
	RGGS	Not-RGGS	Sig	RGGS	Not-RGGS	Sig
2014	83.0	75.8	***	56.9	50.9	**
2015	80.7	76.2	***	52.1	51.1	NS
2016	78.4	72.6	***	47.6	50.8	*
2017	82.9	74.9	***	52.0	50.8	NS
2018	82.9	76.5	***	53.0	50.4	*
2019	81.5	76.4	***	49.4	49.8	NS
2022	75.8	77.3	NS	50.5	48.5	NS
2023	77.8	78.0	NS	49.3	48.9	NS
2024	79.2	81.0	**	49.0	49.4	NS

	% SWD			% ELL			% Home Language Not English		
	RGGS	Not-RGGS	Sig	RGGS	Not-RGGS	Sig	RGGS	Not-RGGS	Sig
2014	9.6	14.1	**	20.3	12.7	***	51.8	46.2	***
2015	9.8	15.0	***	13.5	10.9	**	46.3	45.9	NS
2016	11.7	15.8	***	13.8	10.0	***	53.9	46.7	***
2017	10.5	16.0	***	14.5	12.3	**	54.7	47.9	***
2018	11.2	17.4	***	14.3	13.1	NS	52.8	49.7	**
2019	12.3	17.2	***	16.6	12.9	***	54.3	50.2	***
2022	16.1	20.6	***	13.4	15.5	**	49.8	49.6	NS
2023	20.1	19.0	NS	10.9	14.0	***	51.8	49.2	**
2024	18.8	19.2	NS	16.3	15.2	NS	52.9	49.0	***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

	% Black			% Latino		
	RGGS	Not-RGGS	Sig	RGGS	Not-RGGS	Sig
2014	33.2	30.0	NS	43.7	41.8	NS
2015	33.7	29.6	**	46.0	42.2	*
2016	26.6	27.4	NS	52.0	42.5	***
2017	26.2	27.3	NS	51.9	42.9	***
2018	26.2	26.3	NS	51.2	43.9	***
2019	23.0	25.0	*	50.0	44.9	***
2022	21.7	23.4	NS	47.7	47.4	NS
2023	19.5	23.9	***	46.8	48.3	NS
2024	19.7	23.7	***	50.4	47.7	***

	% White			% Asian		
	RGGS	Not-RGGS	Sig	RGGS	Not-RGGS	Sig
2014	5.4	12.0	***	16.7	14.8	NS
2015	7.6	11.7	***	10.5	14.3	***
2016	6.5	12.0	***	13.2	15.1	*
2017	5.9	11.8	***	13.3	15.0	*
2018	7.9	12.0	***	12.0	14.4	**
2019	9.7	12.2	***	14.7	15.3	NS
2022	11.2	10.6	NS	15.2	15.3	NS
2023	12.6	10.3	***	18.4	14.4	***
2024	11.9	10.2	***	15.2	14.7	NS

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table VI-2. Average standardized values and standardized differences for matched and weighted observations, Controlling for 8th grade ILS.

	After matching/weighting					
	Means			Variance		
	Treated	Untreated	StdDif	Treated	Untreated	StdDif
2014						
g8_zsci	-0.01	-0.48	0.62	0.61	0.59	1.03
Manh	0.20	0.01	0.46	0.16	0.01	11.08
Bronx	0.13	0.03	0.27	0.11	0.03	3.55
Brooklyn	0.41	0.09	0.67	0.24	0.08	3.03
Queens	0.21	0.86	-1.55	0.17	0.12	1.34
SI	0.05	0.01	0.19	0.05	0.01	5.31
totreg	657.90	990.28	-0.59	200626.5	132504.8	1.51
per_ecdis	79.41	88.58	-0.78	180.79	31.57	5.73
per_black	37.85	10.18	1.12	676.69	317.37	2.13
per_hisp	47.12	54.03	-0.29	617.26	190.16	3.25
per_asian	8.15	29.26	-2.21	92.85	261.44	0.36
per_white	5.62	5.55	0.01	20.08	6.95	2.89
teacher_years_doe	0.16	0.16	-0.00	0.00	0.03	0.00
license_es	0.93	0.97	-0.12	0.06	0.03	2.06
license_gs	0.07	0.03	0.16	0.06	0.03	2.13
2015						
g8_zsci	-0.08	-0.08	0.00	0.71	0.54	1.31
Manh	0.28	0.28	0.00	0.20	0.20	1.00
Bronx	0.18	0.18	0.00	0.15	0.15	1.00
Brooklyn	0.33	0.33	-0.00	0.22	0.22	1.00
Queens	0.13	0.13	0.00	0.11	0.11	1.00
SI	0.08	0.08	0.00	0.07	0.07	1.00
totreg	799.98	799.98	-0.00	378231.90	420998.00	0.90
per_ecdis	80.34	80.34	0.00	59.99	57.84	1.04
per_black	36.02	36.02	0.00	522.68	462.92	1.13
per_hisp	48.68	48.68	0.00	528.10	417.83	1.26
per_asian	7.88	7.88	-0.00	89.49	136.35	0.66
per_white	5.73	5.73	-0.00	32.93	45.70	0.72
teacher_years_doe	0.91	0.91	-0.00	0.19	0.92	0.20
license_es	0.91	0.91	0.00	0.08	0.08	1.00
license_gs	0.09	0.09	0.00	0.08	0.08	1.00
2016						
g8_zsci	-0.05	-0.05	0.00	0.72	0.49	1.45
Manh	0.32	0.32	0.00	0.22	0.22	1.00
Bronx	0.21	0.21	-0.00	0.16	0.16	1.00
Brooklyn	0.30	0.30	-0.00	0.21	0.21	1.00
Queens	0.11	0.11	0.00	0.10	0.10	1.00
SI	0.06	0.06	-0.00	0.06	0.06	1.00
totreg	1019.59	1019.59	-0.00	913030.00	483635.80	1.89

per_ecdis	77.28	77.28	0.00	92.77	55.77	1.66
per_black	29.20	29.20	-0.00	417.07	220.56	1.89
per_hisp	52.83	52.83	0.00	537.00	295.17	1.82
per_asian	9.94	9.94	-0.00	125.92	76.11	1.65
per_white	6.61	6.61	-0.00	33.42	36.96	0.90
teacher_years_doe	1.45	1.45	0.00	0.70	2.08	0.33
license_es	0.93	0.93	-0.00	0.06	0.06	1.00
license_gs	0.05	0.05	-0.00	0.05	0.05	1.00
2017						
g8_zsci	0.00	0.00	0.00	0.71	0.53	1.33
Manh	0.26	0.26	0.00	0.19	0.19	1.00
Bronx	0.31	0.31	-0.00	0.21	0.21	1.00
Brooklyn	0.28	0.28	0.00	0.20	0.20	1.00
Queens	0.12	0.12	-0.00	0.11	0.11	1.00
SI	0.03	0.03	-0.00	0.03	0.03	1.00
totreg	1023.77	1023.77	-0.00	914329.20	975217.80	0.94
per_ecdis	81.94	81.94	-0.00	75.44	55.61	1.36
per_black	26.94	26.94	0.00	391.47	324.39	1.21
per_hisp	53.36	53.36	-0.00	569.21	428.88	1.33
per_asian	11.73	11.73	-0.00	172.88	196.66	0.88
per_white	6.17	6.17	-0.00	42.62	49.79	0.86
teacher_years_doe	1.81	1.81	0.00	1.28	3.61	0.36
license_es	0.95	0.95	0.00	0.05	0.05	1.00
license_gs	0.05	0.05	0.00	0.05	0.05	1.00
2018						
g8_zsci	0.06	0.06	0.00	0.75	0.59	1.28
Manh	0.18	0.18	0.00	0.15	0.15	1.00
Bronx	0.37	0.37	-0.00	0.23	0.23	1.00
Brooklyn	0.27	0.27	0.00	0.20	0.20	1.00
Queens	0.15	0.15	0.00	0.13	0.13	1.00
SI	0.04	0.04	0.00	0.04	0.04	1.00
totreg	1159.53	1159.53	0.00	1163062.00	1045400.00	1.11
per_ecdis	83.20	83.20	-0.00	84.13	37.05	2.27
per_black	24.16	24.16	-0.00	249.49	287.15	0.87
per_hisp	54.87	54.87	-0.00	552.26	424.24	1.30
per_asian	11.71	11.71	0.00	144.97	158.50	0.91
per_white	7.23	7.23	0.00	45.84	47.84	0.96
teacher_years_doe	2.06	2.06	0.00	1.81	4.07	0.44
license_es	1.00	1.00	0.00	0.00	0.00	1.00
license_gs	0.00	0.00	0.00	0.00	0.00	1.00
2019						
g8_zsci	0.12	0.12	0.00	0.70	0.59	1.19
Manh	0.22	0.22	0.00	0.17	0.17	1.00
Bronx	0.29	0.29	0.00	0.21	0.21	1.00
Brooklyn	0.24	0.24	-0.00	0.18	0.18	1.00

Queens	0.22	0.22	-0.00	0.17	0.17	1.00
SI	0.03	0.03	-0.00	0.03	0.03	1.00
totreg	1056.19	1056.19	-0.00	958543.40	938855.90	1.02
per_ecdis	79.92	79.92	0.00	142.55	75.47	1.89
per_black	25.27	25.27	0.00	368.23	293.44	1.25
per_hisp	53.21	53.21	0.00	542.81	385.38	1.41
per_asian	10.01	10.01	0.00	124.12	90.61	1.37
per_white	9.29	9.29	-0.00	129.35	119.31	1.08
teacher_years_doe	2.44	2.44	0.00	2.79	3.67	0.76
license_es	1.00	1.00	0.00	0.00	0.00	0.00
license_gs	0.00	0.00	.	0.00	0.00	.
2022						
g8_zsci	0.40	0.38	0.03	0.46	0.58	0.80
Manh	0.11	0.13	-0.07	0.10	0.11	0.85
Bronx	0.01	0.01	-0.01	0.01	0.01	0.91
Brooklyn	0.67	0.66	0.02	0.22	0.23	0.97
Queens	0.22	0.21	0.03	0.17	0.17	1.03
SI	0.00	0.00	.	0.00	0.00	.
totreg	2045.85	2058.32	-0.01	1425534.00	1717761.00	0.83
per_ecdis	74.77	74.36	0.06	59.78	28.30	2.11
per_black	0.11	0.11	0.05	0.01	0.01	2.49
per_hisp	0.40	0.41	-0.04	0.02	0.02	1.36
per_asian	0.24	0.24	-0.01	0.01	0.01	1.01
per_white	0.21	0.21	0.01	0.01	0.02	0.63
teacher_years_doe	2.30	5.89	-0.63	2.37	42.52	0.06
license_es	1.00	1.00	.	0.00	0.00	.
license_gs	0.00	0.00	.	0.00	0.00	.
2023						
g8_zsci	0.50	0.36	0.19	0.58	1.09	0.53
Manh	0.41	0.39	0.05	0.24	0.24	1.02
Bronx	0.26	0.32	-0.14	0.19	0.22	0.87
Brooklyn	0.30	0.27	0.07	0.21	0.20	1.07
Queens	0.03	0.02	0.06	0.03	0.02	1.33
SI	0.00	0.00	0.02	0.00	0.00	1.59
totreg	1405.38	1090.74	0.27	2366298.00	1027957.00	2.30
per_ecdis	0.76	0.77	-0.07	0.02	0.02	1.58
per_black	0.24	0.26	-0.16	0.01	0.02	0.50
per_hisp	0.43	0.45	-0.09	0.05	0.03	1.58
per_asian	0.16	0.14	0.19	0.02	0.01	2.77
per_white	0.12	0.11	0.15	0.01	0.01	0.87
teacher_years_doe	4.30	5.26	-0.21	9.27	9.88	0.94
license_es	0.96	0.97	-0.02	0.04	0.03	1.10
license_gs	0.04	0.03	0.02	0.04	0.03	1.10
2024						

g8_zsci	0.11	0.11	-0.00	0.72	0.63	1.15
Manh	0.27	0.27	-0.00	0.20	0.20	1.00
Bronx	0.21	0.21	0.00	0.17	0.17	1.00
Brooklyn	0.31	0.31	-0.00	0.22	0.22	1.00
Queens	0.18	0.18	0.00	0.15	0.15	1.00
SI	0.03	0.03	0.00	0.03	0.03	1.00
totreg	1375.07	1375.07	-0.00	1469406.00	1540229.00	0.95
per_ecdis	6.80	6.80	-0.00	530.69	529.95	1.00
per_black	0.20	0.20	0.00	0.02	0.02	0.79
per_hisp	0.50	0.50	0.00	0.04	0.04	1.05
per_asian	0.15	0.15	-0.00	0.02	0.02	1.13
per_white	0.11	0.11	-0.00	0.01	0.01	0.95
teacher_years_doe	4.25	4.25	0.00	10.17	18.16	0.56
license_es	0.97	0.97	0.00	0.03	0.03	1.00
license_gs	0.03	0.03	-0.00	0.03	0.03	1.00

Figure VI-1: Predictive margins controlling for Intermediate Level Science, Z-Score on Earth Science Regents Exam

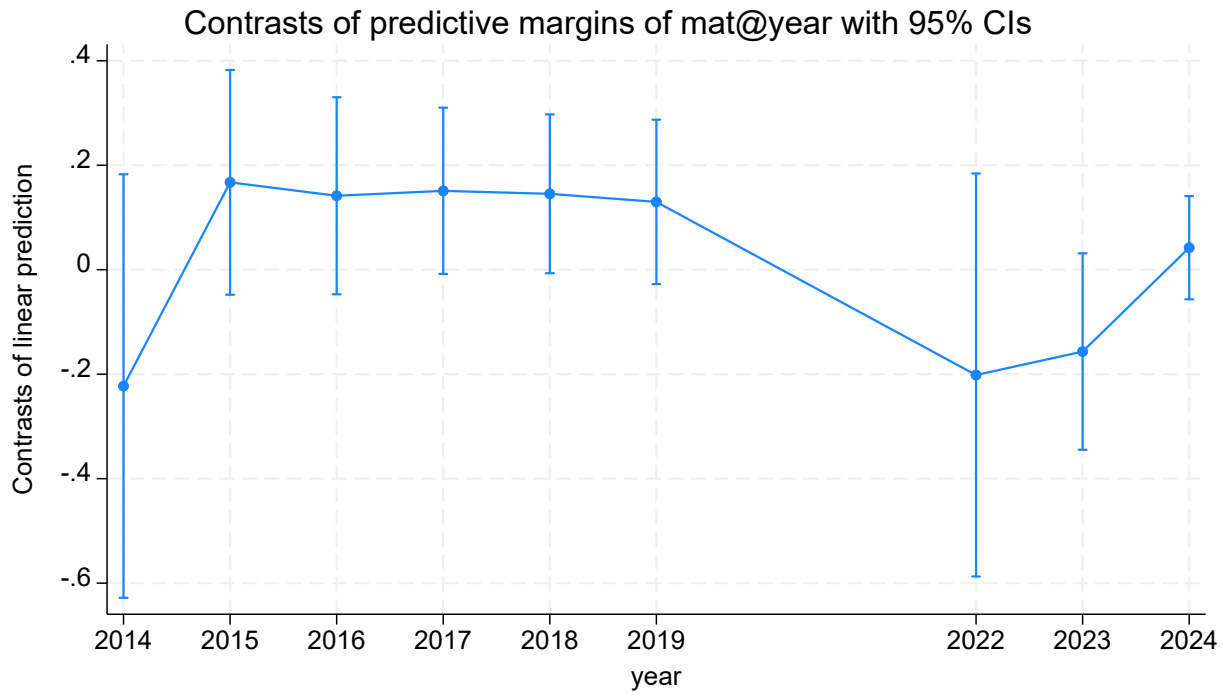


Figure VI-2. Contrasts of Predictive Margins Controlling for Intermediate Level Science, Passing at 65 or higher

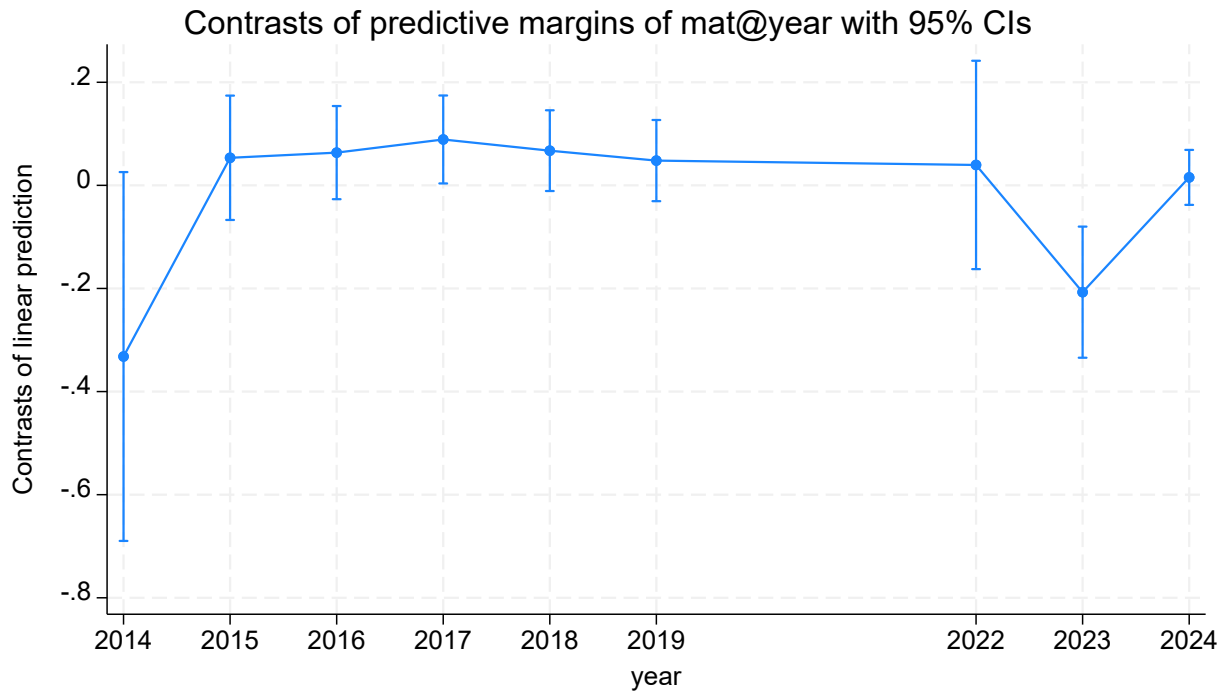


Figure VI-3. Predictive Contrasts Controlling for Intermediate Level Science Passing at 85 or Higher