USA District Like Mine (High % Hispanic) Math Outcomes Analysis 2018/19

Grade Levels: 3, 4, 5
ST Math Program: Gen-5
Analysis Type: Z-score of math proficiency
Treatment-Years: 2018/19
Baseline-Year: 2012/13, 2013/14, 2014/15, 2015/16, 2016/17, or 2017/18
Subgroup: All

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Abstract

This analysis evaluates grades using ST Math with a high percentage of Hispanic students in the USA in 2018/19. It identifies those grades with nominal or better implementation of the ST Math program, and matches them to randomly selected, similar math-performance comparison grades. The nominal ST Math users are an aggregation of 148 grades, consisting of grades 3, 4, and 5 at 102 schools, with an average baseline z-score of -0.55. Refer to Figures 2 and 3 for the math performance and demographic distributions. They were matched to 148 similar, randomly selected control grades at 136 schools that never used ST Math. Grade-wise growth in math proficiency was evaluated (i.e. growth in same grade, same school, from Baseline to 2018/19) on the mean z-scores of percent Proficient or Advanced (see Section 3.1). Grades 3, 4, and 5 aggregated showed an ST Math effect of 0.24 z-score points.

Contents

List of Figures

List of Tables

1 Introduction

1.1 Background

This is a quasi-experimental analysis at the grade-mean level. Entire grades represent the units of analysis, and outcome measures are the multi-year changes in grade-mean z-score of Proficient or Advanced. The treatment grades used the ST Math program for 1, 2, 3, 4, 5, or 6 years, beginning in the 2013/14, 2014/15, 2015/16, 2016/17, 2017/18, or 2018/19 school year, respectively. The study hypothesis is treatment grades using ST Math will outperform similar matched control grades, using their "business as usual" conditions of instructional content and professional development. The control grades were selected to have similar demographic and math attributes (See Figures 2 and 3) to the treatment grades during the baseline year (2012/13, 2013/14, 2014/15, 2015/16, 2016/17, or 2017/18), and did not use ST Math in 2018/19. The treatment grades' selection pool was all schools using ST Math with a high percentage of Hispanic students in grades 3, 4, and 5 in the USA. The control grades' pool was all schools not using ST Math in grades 3, 4, and 5 in the USA. This study method measures effectiveness of the ST Math program when nominally implemented.

1.2 Program Description

Spatial-Temporal Math (ST Math) is game-based, instructional software for K–12 students, created by the MIND Research Institute (MIND). The purpose of the program is to boost math comprehension through visual learning. The ST Math software games begin without language or symbol abstractions by posing math problems as purely visual puzzles. In this way, three objectives are accomplished: i) language proficiency prerequisites to engage with the program are minimal, ii) non-mathematical distractions (e.g. back-stories for word problems) are minimized or eliminated – thereby reducing load on working memory, and iii) the actual math in the problem can be represented clearly, simply, and unambiguously. Interactive, animated visual manipulatives provide informative feedback on student solutions. A score of 100 percent on a game level comprised of 4-12 puzzles is required for progression through the levels. Failure requires a re-play of the level, via a new quasi-random set of puzzles. In this way, progression is self-paced.

Besides the self-paced progress made by students in their one-to-one environment, the program is designed to be referenced by teachers during their regular math instruction. It is supplemental to core or basal math instruction and instructional materials. As the great majority of grade-level math standards are covered in the ST Math digital curriculum, completion of 100% of the entire ST Math curriculum (i.e. completing every Game) is required to cover all grade-level math standards. Teachers receive initial training, either face to face or through self-guided online instruction. The training covers account startup, as well as math learning and growth mindset goals, the pedagogical approach to learning in a visual experiential game, monitoring and intervention of the student 1:1 game play, and connecting of ST Math content to classroom content and pacing.

For students to achieve nominal progress through the program, there is a recommended time-on-task requirement of 90 minutes per week over about 30 weeks. Consistent application of 90 minutes per week throughout the school year is normally sufficient to result in a grade's average ST Math content coverage exceeding 50% by year-end. In this study, we include grades that have achieved 40% or more content coverage (Progress) by April 15th.

This is a passive study with no experimental setup or extraordinary communications to any schools. All schools in this study therefore received normal program implementation support through the year from MIND support managers. This support includes bundled startup services of approximately 2-4 hours of training either in-person or online, access to live webinars, regular online and push reports on

usage and progress, email/phone helpdesk, and proactive monitoring for gaps or issues by MIND support representatives.

MIND Research Institute initiated, funded, and exercised editorial control over this study.

2 Data Collection

Since this analysis uses grades as the unit of analysis, and states publish grade-mean state standardized test scores, the data for student math outcomes is collected from each state education agency's research files (retrieved from state websites). The treatment students use ST Math student accounts served by MIND. Student ST Math usage data is aggregated to grade-level means by MIND.

2.1 Treatment Grades Pool and Selection

The Treatment grades pool originated with all schools and grades using ST Math with a high percentage of Hispanic students in the USA. From these schools, every grade that had used the ST Math program only for the year 2018/19 was identified. They comprise the Treatment grades pool for this evaluation of multi-year usage.

2.1.1 Enrollment Filter

Because the analysis uses grade-mean data, such as grade-mean scale scores or grade-mean proficiency level percentages, it is necessary that the program also be a grade-wide treatment, with the great majority of students in each grade receiving treatment. Otherwise, the grade-means reported by the state of 100% of *tested* students would not be valid measures of a smaller fraction of *treatment* students. MIND's site implementation requirement is that an entire grade, including all teachers and all classes within that grade, use the ST Math program. We validate how closely this is the case for each individual treatment grade by comparing the number of ST Math student accounts at a grade level to the reported enrollment at that grade level. We discard from the Treatment pool any grade with a ratio of ST Math student accounts to reported grade enrollment lower than 85%.

2.1.2 Content Coverage Filter

Furthermore, the outcomes measure is a summative year-end test, i.e. the standardized math assessment of that state. The math assessment thus covers all the math standards for that entire grade level. Meanwhile, the ST Math program curriculum (arranged into Learning Objectives) is also aligned to each state's math standards. To infer that the ST Math content is having a valid effect on student outcomes on the summative assessment, we discard any grade with grade-mean of ST Math Progress for its students lower than 40% by April.

Progress is a percentage, and is defined as Levels completed by the student, divided by the total number of Levels in the grade-level curriculum. Note that student achievement of at least 40% progress in ST Math is accomplished primarily by teacher assignment of computer session time to students. With sufficient time on task, students make progress. The program helps them self-pace through providing real-time informative feedback for each puzzle.

2.2 Control Grades Pool and Selection

The control grades are randomly selected from a control pool of schools in the USA. Though they are randomly selected, they are also matched to be similar to the Treatment grades' math attributes and demographics during the baseline Baseline year. The matched attributes include:

- grade-mean z-score of percent Proficient or Advanced
- percentage of students receiving free or reduced lunch at the school-level (using the demographic data from MDR)
- percentage of Hispanic students at the school-level (using the demographic data from MDR).

The method of matching used is propensity score matching, via the "matchit" program in R, with "mahalanobis" as the distance measure.

3 Data Analysis

The set of all schools and grades using ST Math with a high percentage of Hispanic students in the USA is evaluated for Enrollment percentage and Progress percentage parameters. A filtered Treatment set (TRT) of all ST Math grades with $\geq$ 85% Enrollment and $\geq$ 40% Progress is identified. State math assessment data is tabulated. A matching set of Control grades based on baseline year state math assessment is selected.

Changes in math performance, i.e. the difference in math performance of a grade from a baseline year to the final year, are evaluated and tabulated. Statistical tests of the significance of the difference in math performance changes between Treatment grades and Control grades are performed. Finally, a grade-by-grade disaggregation is performed.

3.1 Z-scores

In order to analyze across all states with different math assessments, a new z-score of that test's math proficiency is calculated. For each year being analyzed, by grade, a z-score takes the difference of the grade mean percent proficient and the mean of all percent proficient statewide for that year, and then divides it by the standard deviation of all percent proficient statewide for that year. Here is a fictional example to illustrate the calculation of a z-score for the 2015/16 exam:

School A, Grade 3, Percent Proficient: 70
Average across all schools statewide, Grade 3: 50
Standard deviation across all schools statewide, Grade 3: 20
Z-score=((School A, Grade 3, Percent Proficient)-(Average across all schools, Grade 3))/(Standard deviation across all schools, Grade 3)

$$\text{Z-score}=\frac{70-50}{20}=1$$

The z-score is calculated for every grade across all years being analyzed, using the full state data set of schools for the averages and standard deviations. The use of z-scores is a valid statistical method to normalize any dataset and to enable analysis across otherwise uncomparable exams. In this report, we only analyze z-scores.

3.2 Percentile Ranking

These newly calculated z-scores can then be converted into a percentile ranking. Each percentile ranking shows the grade's performance relative to the others in that year and grade. For example, for a specific grade 3, a percentile ranking of 50 shows that this grade 3 performed at the average of all third grades in the state for that testing year.

3.3 Final Treatment and Control

3.3.1 ST Math Grade-Aggregated Implementation ($\geq$ 85% Enrollment Grades Only)

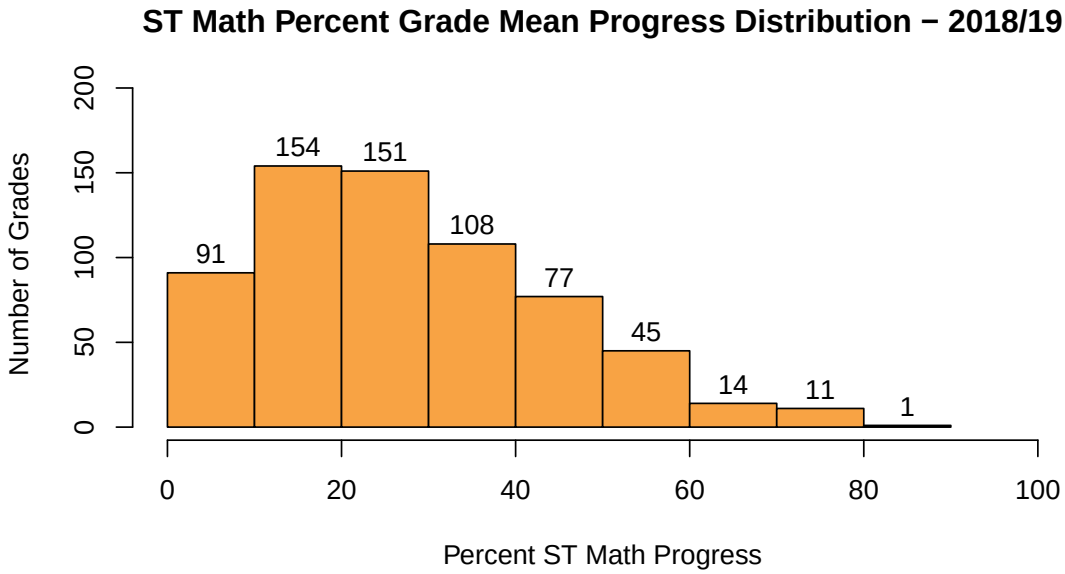

Figure 1: Histogram of ST Math Percent Progress for $\geq$ 85% Enrollment Grades 2018/19

For all ST Math grades with Enrollment $\geq$ 85%, Figure 1 shows the frequency distribution of grade-average Progress percentage through the program. Note that we will only be using grades with $\geq$ 40% Progress as the Treatment Group.

Table 1 provides descriptive statistics of the Progress distribution. Table 2 shows the number of remaining treatment grades after applying enrollment and progress filters.

	Min.	Max.	Average	S.D.
ST Math % Progress	0.8	80.7	27.7	16.4

Table 1: Descriptive Statistics of ST Math Percent Progress for >= 85 percent Enrollment Grades

Grades with >= 85% Enrollment:	652
Grades with in addition >= 40% Progress:	148

Table 2: Number of ST Math Grades with >= 85 percent Enrollment and with >= 40 percent progress

3.3.2 Filtering Treatment and Controls

Table 3 shows the total number of grades in the Treatment pool, the number of grades that exceeded the 85% Enrollment figure, and also the 40% Progress filter. Other rows in the table indicate counts of numbers of students (2018/19 from state testing count) and counts of number of schools represented. The number of matched Control (CTRL) grades, students, and schools is also shown.

	Grade 3	Grade 4	Grade 5	Total
ST Math Using Grades	321	309	304	934
ST Math Using Schools	321	309	304	406
ST Math Students	25051	23948	24842	73841
ST Math Grades (Enroll >= 85%)	232	221	199	652
TRT Grades (Enroll >= 85% & Prog >= 40%)	56	45	47	148
TRT Schools (Enroll >= 85% & Prog >= 40%)	55	45	46	102
TRT Students (Enroll >= 85% & Prog >= 40%)	4967	3695	4245	12907
CTRL Grades	56	45	47	148
CTRL Schools	55	44	47	136
CTRL Students	5018	3710	4426	13154

Table 3: Treatment Pool Filtering and Controls: Counts of Grades, Schools, and Students

3.3.3 Match of Controls to Treatment

Figure 2 shows the density plots of the baseline z-score of percent students at state assessment Proficient or Advanced (left plot) and the percentage of students needing free or reduced lunch (right plot) for treatment grades overlayed on control grades, showing the closeness of the match obtained between Treatment and Control sets of grades in the baseline year.

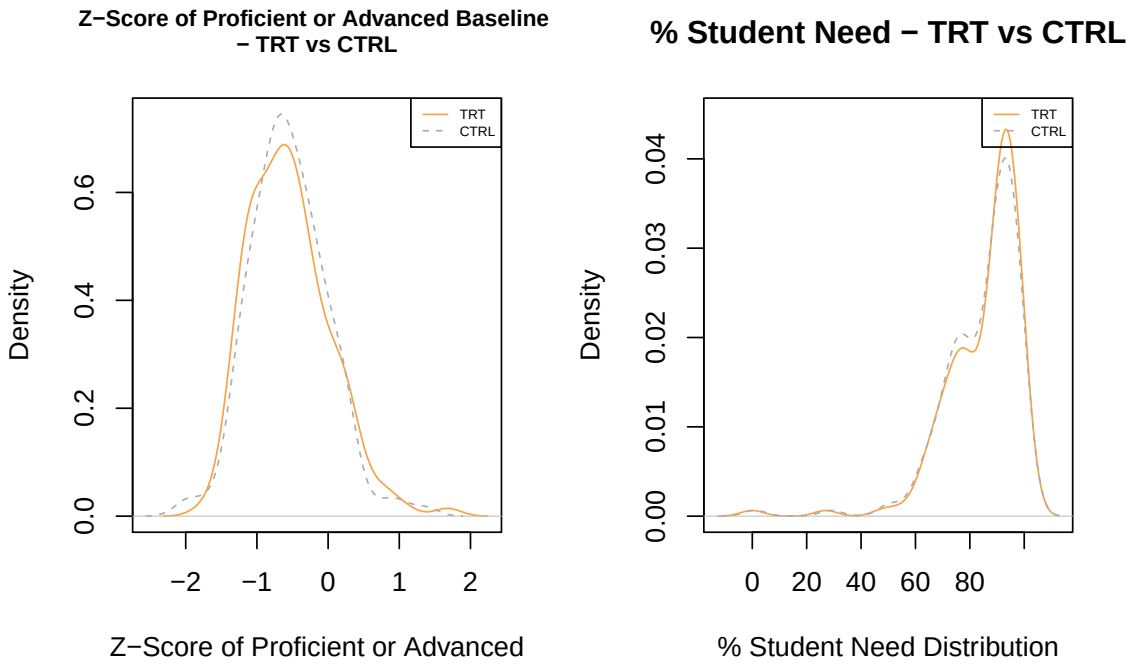

Figure 2: Baseline Year Density Plots Showing Math Scores and Percent Student Need Match between TRT and CTRL - Baseline

Further, figure 3 shows the density plot of the percentage of Hispanic students for treatment grades overlayed on control grades, showing the closeness of the match obtained between Treatment and Control sets of grades in the baseline year, Baseline.

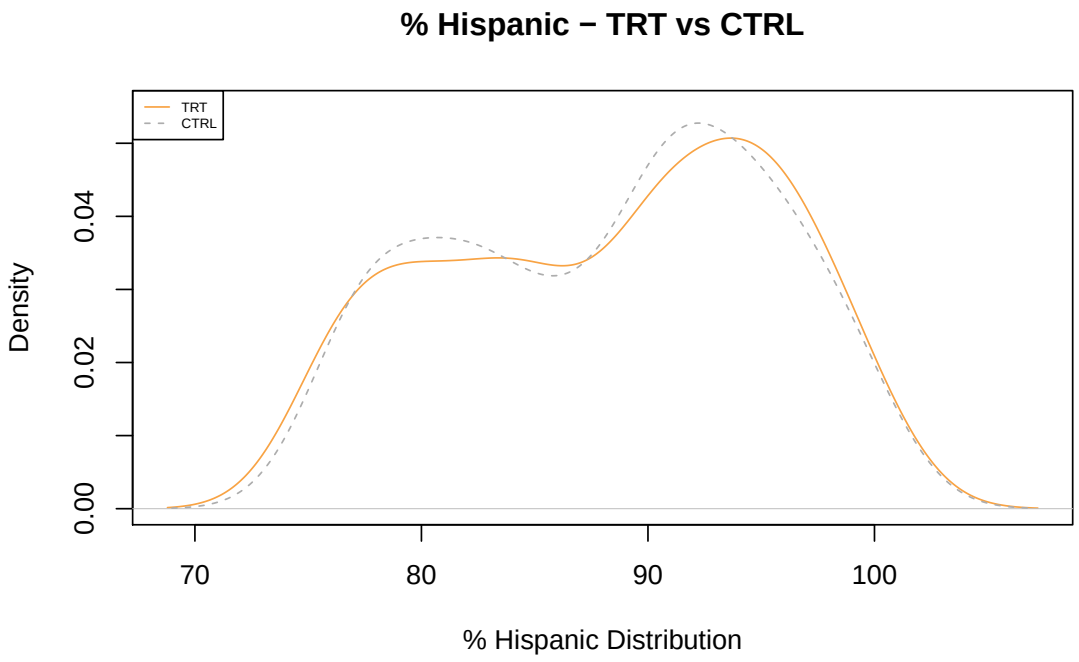

Figure 3: Baseline Year Density Plots Showing Percent ELL Match between TRT and CTRL - Baseline

Table 4 shows the difference of the means of Treatment versus Control in the baseline year, with accompanying p-values, for mean z-score of percent Proficient or Advanced, for percent of students receiving free or reduced lunch, and for percent of Hispanic students. The large p-values show the differences between the Treatment and Control grades are not statistically significant.

	Mean(TRT)	SD(TRT)	Mean(CTRL)	SD(CTRL)	Estimate	P-Value	Effect Size
Z-Score of Proficient or Advanced - Baseline	-0.55	0.57	-0.55	0.54	0.00	0.99	0.00
Percent Free or Reduced Lunch	85.09	13.94	84.51	13.95	0.57	0.72	0.04
Percent Hispanic	88.34	7.26	88.30	7.06	0.05	0.95	0.01

Table 4: Matching TRT and CTRL

3.4 Grade-Aggregated Analysis

Table 5 shows for both Treatment (TRT) and Control (CTRL) aggregation across grades of z-score distributions. The far right column also shows the average ST Math Progress for the TRT set.

	# Grades	# Schools	# Students	Z-Score	Percentile	ST Math Per Comp.
TRT.Baseline	148	102	12322	-0.55	31.24	–
TRT.18.19	148	102	11536	-0.31	39.14	51.62
TRT.Delta	–	–	–	0.24	7.90	–
CTRL.Baseline	148	136	13934	-0.55	31.23	–
CTRL.18.19	148	136	13154	-0.55	31.82	–
CTRL.Delta	–	–	–	-0.00	0.59	–

Table 5: All Grades Together Growth

Figure 4 shows the changes in mean z-scores of percent Proficient or Advanced for the grade-aggregated Treatment and Control sets.

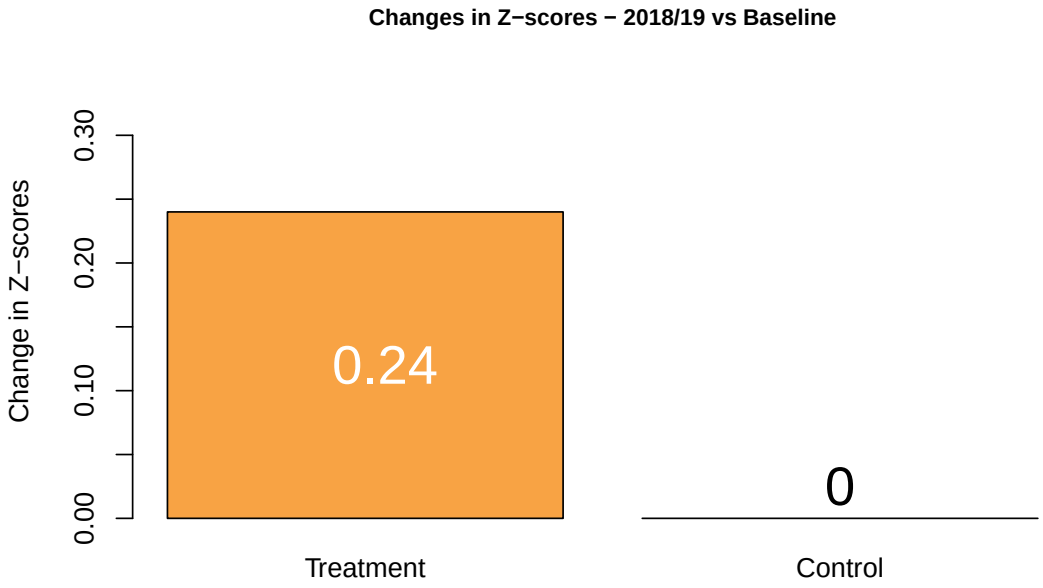

Figure 4: Changes in z-scores (See Section 3.1) for Grade-Aggregated TRT and CTRL datasets between Baseline and 2018/19

Further, Table 6 shows the statistics for the *differences* in changes between TRT and CTRL (Treatment - Control) for these same z-score changes as in the above figure. [1]

	Estimate	P-Value	Int.Low	Int.High
Z-Score	0.24	0.00*	0.10	0.38

Table 6: Statistics for the Differential Changes in Math Scores Growth (TRT - CTRL)

Finally, Figure 5 shows the changes in mean percentile ranking between TRT and CTRL.

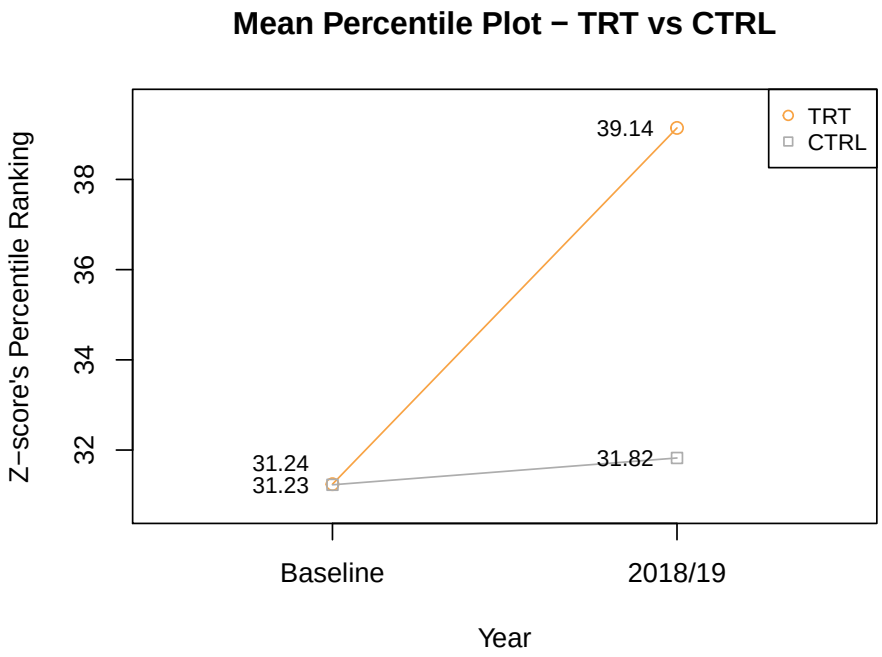

Figure 5: Changes in Percentile Ranking for TRT and CTRL Datasets between Baseline and 2018/19

[1] * statistically significant p<0.05

3.5 Grade-Level Analysis

3.5.1 Grade Level Result Tables

The following tables (Table 7, 8, and 9) present a disaggregation of results by grade level. The far right column in each table also shows the average ST Math Progress for the TRT set.

	# Grades	# Schools	# Students	Z-Score	Percentile	ST Math Per Prog.
TRT.Baseline	56	55	4777	-0.51	32.59	–
TRT.18.19	56	55	4422	-0.14	44.84	50.77
TRT.Delta	–	–	–	0.37	12.25	–
CTRL.Baseline	56	55	5086	-0.55	31.68	–
CTRL.18.19	56	55	5018	-0.68	27.88	–
CTRL.Delta	–	–	–	-0.14	-3.80	–

Table 7: Grade 3 - Yearly Math Performance and Counts for TRT and CTRL Datasets

	# Grades	# Schools	# Students	Z-Score	Percentile	ST Math Per Prog.
TRT.Baseline	45	45	3561	-0.56	31.02	–
TRT.18.19	45	45	3374	-0.37	37.42	53.71
TRT.Delta	–	–	–	0.19	6.40	–
CTRL.Baseline	45	44	4155	-0.50	32.71	–
CTRL.18.19	45	44	3710	-0.47	34.44	–
CTRL.Delta	–	–	–	0.03	1.73	–

Table 8: Grade 4 - Yearly Math Performance and Counts for TRT and CTRL Datasets

	# Grades	# Schools	# Students	Z-Score	Percentile	ST Math Per Prog.
TRT.Baseline	47	46	3984	-0.58	29.85	–
TRT.18.19	47	46	3740	-0.46	34.00	50.62
TRT.Delta	–	–	–	0.12	4.15	–
CTRL.Baseline	47	47	4693	-0.59	29.28	–
CTRL.18.19	47	47	4426	-0.47	34.02	–
CTRL.Delta	–	–	–	0.12	4.74	–

Table 9: Grade 5 - Yearly Math Performance and Counts for TRT and CTRL Datasets

3.5.2 Grade-Level Analysis of Changes in Z-scores of Proficient or Advanced

Figure 6 shows the changes in the grade-mean z-scores of students for the TRT and CTRL datasets, disaggregated by grade:

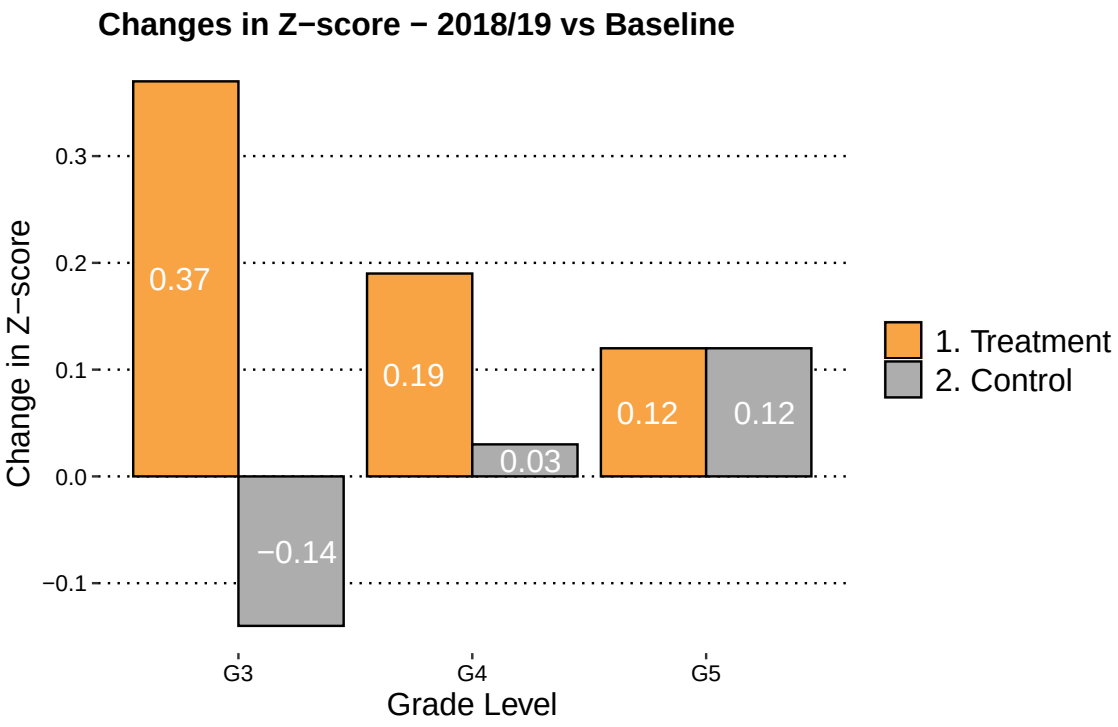

Figure 6: Changes in Grade-Mean Z-score (See Section 3.1) for TRT and CTRL Datasets between Baseline and 2018/19

Table 10 shows the statistics for the differences between TRT and CTRL (Treatment - Control) for these same z-score changes as shown in Figure 6.

	Estimate	P-Value	Int.Low	Int.High
Grade 3	0.51	0.00*	0.27	0.74
Grade 4	0.16	0.15	-0.06	0.38
Grade 5	-0.00	0.99	-0.24	0.24

Table 10: Statistics for the Differential Changes in Z-scores (See Section 3.1) Growth, (TRT - CTRL)

4 Effect Size

The following table shows the effect sizes for z-score of Proficient or Advanced.

	Z-Score of Proficient or Advanced Effect Size
Grade 3	0.84
Grade 4	0.29
Grade 5	-0.00
All Grades	0.44

Table 11: Cohen's d Effect Size

5 Findings Summary

USA grades 3, 4, and 5 using ST Math with a high percentage of Hispanic students for the year 2018/19 averaged 23.7% ST Math Progress. 171/934 grades (18%) averaged covering more than 40% of ST Math content. Statistically significant differences were found in this analysis for both grade-aggregated and individual grade levels. Looking at Table 6, a statistically significant differences was found for grade-aggregated z-score, with an estimate of 0.24 points favorable for the ST Math treatment set. Furthermore, referring to table 10, grade 3 ST math treatment set outperformed their matched controls for z-scores with a statistically significant difference of 0.51.

6 Confounders

Despite best efforts in minimizing confounders to the results of this analysis, there still remain a few input variables that could be significant in affecting differences of state test score outcomes between the Treatment and Control sets. One issue is the lack of randomization of grades chosen to receive the ST Math treatment. Instead of randomized selection, Treatment grades are self-selected. Self-selection can be an indication of districts or schools with a focus on math, an appetite for change, and with a spotlight on math training. Furthermore, not all grades using the ST Math program are chosen for analysis. Each grade must pass two specific filters to be considered for the Treatment set: the first being an enrollment filter of at least 85% of students in each grade using the program, and the second being a progress filter of at least 40% of the program completed on average by students in that grade. These filters might indicate relatively high-functioning schools with a team of relatively effective teachers in that grade, thus resulting in better instruction overall. A mitigation of this possible confounder is our selection of treatment groups on the grade level, rather than the teacher level, so there is no cherry picking of teachers: the full range of teachers in each grade is included. Moreover, the specific teachers may often be the same in the baseline year as in the current year, so the Treatment growth is not due to teacher differences. Finally, a possible confounder lies in the "business as usual" conditions at the matched control grades chosen for each analysis. It's unknown whether these control grades used other programs that could affect the comparison of the two sets of grades.

7 Lists of Schools

7.1 Treatment Schools

The following tables list the treatment schools and grades (after 85% enrollment and 40% progress filtering) used in the analysis.

PID	IID	State	District	School Name	GRADE
4015655	GEO5M4	AR	SPRINGDALE SCHOOL DISTRICT	GEORGE ELEMENTARY SCHOOL	4, 5
41080	IRE0RS	AZ	Roosevelt Elementary District	Irene Lopez School	3
4949343	ASC7AS	CA	ASCEND	ASCEND	5
94465	JUA75S	CA	Anaheim Elementary	Juarez (Benito) Elementary	3
94544	PRI75S	CA	Anaheim Elementary	Price (Adelaide) Elementary	5, 4
10912940	ORA75S	CA	Anaheim Elementary	Orange Grove Elementary	3
66171	MOU72Q	CA	Azusa Unified	Mountain View Elementary	3
95017	CAR6ZQ	CA	Buena Park Elementary	Carl E. Gilbert Elementary	3
4032938	CEN75S	CA	Centralia Elementary	Centralia Elementary	5
68806	CHE72T	CA	El Monte City	Cherrylee Elementary	5, 4, 3
68832	COR72T	CA	El Monte City	Cortada Elementary	5, 4
68856	GID72T	CA	El Monte City	Gidley Elementary	4
68868	ANN72T	CA	El Monte City	Legore Elementary	5, 3
68894	NEW72T	CA	El Monte City	New Lexington Elementary	5
68911	POT72T	CA	El Monte City	Potrero Elementary	4, 5, 3
68947	SHI72T	CA	El Monte City	Shirpser Elementary	3, 4, 5
68961	WIL72T	CA	El Monte City	Wilkerson Elementary	3
68973	WRI72T	CA	El Monte City	Wright Elementary	5
118982	COL7CH	CA	Escalon Unified	Collegeville Elementary	4
96073	BRY75W	CA	Garden Grove Unified	Bryant Elementary	4
96097	CLI75W	CA	Garden Grove Unified	Clinton Elementary	5
70445	RAM0RS	CA	Hawthorne	Ramona	3
133657	HEA0RS	CA	Healdsburg Unified	Healdsburg Elementary	4, 5, 3
11132313	KIP6Y3	CA	KIPP Raices Academy	KIPP Raices Academy	4
71528	BUR709	CA	Long Beach Unified	Bobbie Smith Elementary	3
71803	KIN708	CA	Long Beach Unified	King Elementary	5
71815	LAF708	CA	Long Beach Unified	Lafayette Elementary	4
71841	ABR709	CA	Long Beach Unified	Lincoln Elementary	3
5345776	CES708	CA	Long Beach Unified	Chavez Elementary	4
72780	HAR6Z0	CA	Los Angeles Unified	Harbor City Elementary	5, 3
73411	NIN6Y0	CA	Los Angeles Unified	Ninety-Sixth Street Elementary	3
73526	STA6YS	CA	Los Angeles Unified	Stanford Avenue Elementary	4, 5, 3
73538	STA0RS	CA	Los Angeles Unified	State Street Elementary	5, 3
74001	PAR6Y0	CA	Los Angeles Unified	Parmelee Avenue Elementary	3
76126	BUS6Y4	CA	Los Angeles Unified	Bushnell Way Elementary	5
76231	GAR0RT	CA	Los Angeles Unified	Garvanza Elementary	4, 5, 3
77338	RES71P	CA	Los Angeles Unified	Reseda Elementary	3
77730	HER71Q	CA	Los Angeles Unified	Herrick Avenue Elementary	5, 3
1832600	ARL6Y1	CA	Los Angeles Unified	Arlington Heights Elementary	5
10013702	PAN0RS	CA	Los Angeles Unified	Panorama City Elementary	3
11552036	EST6Y1	CA	Los Angeles Unified	Estrella Elementary	4
11562419	JAI0RS	CA	Los Angeles Unified	Jaime Escalante Elementary	3
111960	KIM0RS	CA	National Elementary	Kimball	3
4875895	REA75A	CA	Newport-Mesa Unified	Everett A. Rea Elementary	5
4949381	INT7AS	CA	Oakland Unified	International Community	5
4949496	ACO7AU	CA	Oakland Unified	ACORN Woodland Elementary	4, 3
4919180	RAM0RT	CA	Oxnard	Ramona Elementary	4
130198	MAC7C3	CA	Pajaro Valley Unified	T. S. MacQuiddy Elementary	5
4901286	ANN7C3	CA	Pajaro Valley Unified	Ann Soldo Elementary	5
80335	ABR700	CA	Paramount Unified	Abraham Lincoln	5
5347633	LEO700	CA	Paramount Unified	Leona Jackson	4
10004153	HOW700	CA	Paramount Unified	Howard Tanner	4
80907	LEX72W	CA	Pomona Unified	Lexington Elementary	3
138358	ROC0RS	CA	Porterville Unified	Roche Elementary	4
140404	RIO76G	CA	Rio Elementary	Rio Real Elementary	3

Table 12: Treatment Schools (TRT Dataset)

PID	IID	State	District	School Name	GRADE
102476	HIG74Y	CA	Riverside Unified	Highgrove Elementary	3, 5
102555	LON74Y	CA	Riverside Unified	Longfellow Elementary	5, 3
113035	FIE73V	CA	San Diego Unified	Field Elementary	3
121252	LIL77L	CA	San Miguel Joint Union	Lillian Larsen Elementary	3, 4, 5
2068814	CAR75I	CA	Santa Ana Unified	Carl Harvey Elementary	4
11134206	HER75I	CA	Santa Ana Unified	Heroes Elementary	4
114431	BAY73D	CA	South Bay Union	Bayside STEAM Academy	5
114443	CEN73D	CA	South Bay Union	Central Elementary	4, 5
114467	GOD73Z	CA	South Bay Union	Godfrey G. Berry Elementary	3
114493	NES73Z	CA	South Bay Union	Nestor Language Academy Charter	4, 5, 3
114508	ONE73D	CA	South Bay Union	Oneonta Elementary	5
114510	SUN73Z	CA	South Bay Union	Sunnyslope Elementary	3
1414727	HOW73Z	CA	South Bay Union	Howard Pence Elementary	5
4876887	MEN73Z	CA	South Bay Union	Teofilo Mendoza	3, 5
119869	AUG7CG	CA	Stockton Unified	August Elementary	3
119936	FIL7CG	CA	Stockton Unified	Fillmore Elementary	5
119998	GRU7CG	CA	Stockton Unified	Grunsky Elementary	4
120105	MCK7CG	CA	Stockton Unified	McKinley Elementary	4
2105072	KIN7CG	CA	Stockton Unified	King Elementary	4
4950110	HUE7CG	CA	Stockton Unified	Dolores Huerta Elementary	3
83143	DAN6ZO	CA	Whittier City Elementary	Daniel Phelan Elementary	5, 3, 4
83179	LON6ZO	CA	Whittier City Elementary	Longfellow Elementary	3, 5
83193	LYD6ZO	CA	Whittier City Elementary	Lydia Jackson Elementary	3, 4, 5
83222	ORA6ZO	CA	Whittier City Elementary	Orange Grove Elementary	5
83234	WES0RU	CA	Whittier City Elementary	West Whittier Elementary	4, 3
146355	BAR0RX	CO	DENVER COUNTY 1	BARNUM ELEMENTARY SCHOOL	3, 4, 5
277526	GUN4OF	IL	City of Chicago SD 299	Gunsaulus Elem Scholastic Academy	5, 3
4291330	CHA4OC	IL	City of Chicago SD 299	Chavez Elem Multicultural Acad Ct	3
1540637	LOR4N0	IL	SD U-46	Lords Park Elem School	3
422135	ALE054	MA	Lawrence	Alexander B Bruce	3
422240	JOH055	MA	Lawrence	John K Tarbox	4, 3
422288	OLI054	MA	Lawrence	Oliver Partnership School	4
2907076	COM054	MA	Lawrence	Community Day Arlington	3, 4
684723	WAS0JJ	NJ	Kearny Town	Washington Elementary School	3
703874	BAR6PY	NM	Albuquerque Public Schools	Barcelona Elementary School	4
704220	ALA6PZ	NM	Albuquerque Public Schools	Alameda Elementary School	4
1523469	DOL6PY	NM	Albuquerque Public Schools	Dolores Gonzales Elementary School	4, 5
712148	SUN6VI	NV	Achievement	Sunrise Acres Elementary School	3
3274377	JOH0RT	NV	Achievement	John F Mendoza Elementary School	4
3401661	RIC6VJ	NV	Achievement	Richard J Rundle Elementary School	5
742882	PS20RV	NY	NEW YORK CITY GEOGRAPHIC DISTRICT # 6	PS 28 WRIGHT BROTHERS	5
742935	PS10RW	NY	NEW YORK CITY GEOGRAPHIC DISTRICT # 6	PS 152 DYCKMAN VALLEY	5
3316729	MAD5ZD	TX	BRAZOSPORT ISD	GRIFFITH ELEM.	4, 3
5070141	HIG0RT	TX	EAST CENTRAL IS	HIGHLAND FOREST	3
995417	LYT60U	TX	LYTLE ISD	LYTLE ELEM.	4, 3, 5
1019949	NIX612	TX	NIXON-SMILEY CI	NIXON SMILEY EL	3
1528213	MEA6HN	UT	Salt Lake District	Meadowlark School	3
1133076	MIT43S	WI	Milwaukee	Mitchell Elementary	4
1133155	VIE43S	WI	Milwaukee	Vieau Elementary	4
10010607	ROG43S	WI	Milwaukee	Rogers Street Academy	4

Table 13: Treatment Schools (TRT Dataset)

7.2 Control Schools

The following tables list the control schools and grades (matched control grades to treatment grades) used in the analysis.

PID	State	District	School Name	GRADE
4944068	AR	ROGERS SCHOOL DISTRICT	JONES ELEMENTARY SCHOOL	4, 5
2094930	AZ	Sunnyside Unified District	Esperanza Elementary School	3
65476	CA	ABC Unified	Melbourne (Ella P.) Elementary	3
129656	CA	Alum Rock Union Elementary	Donald J. Meyer Elementary	4
100856	CA	Alvord Unified	Twinhill Elementary	5
11735587	CA	Aspire College Academy	Aspire College Academy	5
90732	CA	Atwater Elementary	Bellevue Elementary	5
90756	CA	Atwater Elementary	Mitchell Elementary	5
62060	CA	Bakersfield City	Fremont Elementary	3
62101	CA	Bakersfield City	Horace Mann Elementary	4
1169374	CA	Brawley Elementary	Myron D. Witter Elementary	3
139601	CA	Briggs Elementary	Briggs Elementary	5
11454812	CA	Camino Nuevo Charter Academy	Camino Nuevo Charter Academy	4
92027	CA	Chualar Union	Chualar Elementary	3, 4
110538	CA	Chula Vista Elementary	Rohr (Fred H.) Elementary	3
110760	CA	Chula Vista Elementary	Vista Square Elementary	5
4811215	CA	Chula Vista Learning Community Charter	Chula Vista Learning Community Charter	4
4781036	CA	Coachella Valley Unified	Saul Martinez Elementary	4
67735	CA	Compton Unified	Jefferson Elementary	4
5230341	CA	Compton Unified	Clinton, William Jefferson	5
68026	CA	Covina-Valley Unified	Cypress Elementary	3
62644	CA	Delano Union Elementary	Albany Park Elementary	4
4885709	CA	Desert Sands Unified	Lyndon B. Johnson Elementary	5
10007416	CA	Desert Sands Unified	Carrillo Ranch Elementary	4
68387	CA	Downey Unified	Gauldin (A.L.) Elementary	5
68466	CA	Downey Unified	Rio Hondo Elementary	5
68648	CA	East Whittier City Elementary	Ceres Elementary	5
61236	CA	El Centro Elementary	De Anza Magnet	3
107749	CA	Fontana Unified	Live Oak Elementary	5
107804	CA	Fontana Unified	Randall Pepper Elementary	3
107842	CA	Fontana Unified	Virginia Primrose Elementary	5
4872257	CA	Fontana Unified	Citrus Elementary	5
5274206	CA	Fontana Unified	Almond Elementary	3
57467	CA	Fresno Unified	Lowell Elementary	3
57508	CA	Fresno Unified	Mayfair Elementary	4
11825895	CA	Fresno Unified	Vang Pao Elementary	3
96695	CA	Garden Grove Unified	Wakeham Elementary	4
4808232	CA	Garden Grove Unified	Linton T. Simmons Elementary	3
62955	CA	Greenfield Union	Plantation Elementary	3
70225	CA	Hacienda la Puente Unified	Nelson Elementary	3
4036611	CA	Jurupa Unified	Stone Avenue Elementary	3
11712028	CA	Kerman Unified	Goldenrod Elementary	5
71140	CA	Lawndale Elementary	William Anderson Elementary	5
71334	CA	Little Lake City Elementary	Jersey Avenue Elementary	3, 4
72584	CA	Los Angeles Unified	Catskill Avenue Elementary	3
72687	CA	Los Angeles Unified	Dominguez Elementary	5
73368	CA	Los Angeles Unified	Middleton Street Elementary	3, 4
73564	CA	Los Angeles Unified	Twentieth Street Elementary	3
74075	CA	Los Angeles Unified	South Park Elementary	5
75718	CA	Los Angeles Unified	Fourth Street Elementary	5
76255	CA	Los Angeles Unified	Glassell Park Elementary	3
76281	CA	Los Angeles Unified	Griffin Avenue Elementary	4
76487	CA	Los Angeles Unified	San Pascual Elementary Science Technology Engineer	5
76592	CA	Los Angeles Unified	Canterbury Avenue Elementary	4
76724	CA	Los Angeles Unified	Lankershim Elementary	4

Table 14: Matched Control Schools (CTRL Dataset)

PID	State	District	School Name	GRADE
77510	CA	Los Angeles Unified	Beachy Avenue Elementary	5
77601	CA	Los Angeles Unified	El Dorado Avenue Elementary	4
77754	CA	Los Angeles Unified	Hubbard Street Elementary	5
78332	CA	Los Angeles Unified	Hart Street Elementary	5
78576	CA	Los Angeles Unified	Winnetka Avenue Elementary	4
10011766	CA	Los Angeles Unified	Kingsley Elementary	4
11562897	CA	Los Angeles Unified	Andres and Maria Cardenas Elementary	4
91140	CA	Los Banos Unified	R. M. Miano Elementary	4
5356103	CA	Los Banos Unified	Lorena Falasco Elementary	5
78904	CA	Lynwood Unified	Will Rogers Elementary	5
63349	CA	McFarland Unified	Browning Road STEAM Academy	3
2856013	CA	Moreno Valley Unified	Sunnymeadows Elementary	3
3023099	CA	Moreno Valley Unified	Cloverdale Elementary	5
1549750	CA	Mountain Empire Unified	Potrero Elementary	4
79453	CA	Mountain View Elementary	Baker Elementary	3, 5
3055573	CA	Mt. Diablo Unified	Rio Vista Elementary	3
4287688	CA	Mt. Diablo Unified	Cambridge Elementary	3
111958	CA	National Elementary	John A. Otis Elementary	5
97601	CA	Newport-Mesa Unified	Sonora Elementary	3
1521124	CA	Ontario-Montclair	Lincoln Elementary	5
4017110	CA	Oxnard	Emilie Ritchen Elementary	3
12103133	CA	PUC Community Charter Elementary	PUC Community Charter Elementary	3
102098	CA	Palm Springs Unified	Cathedral City Elementary	3
4812829	CA	Palm Springs Unified	Two Bunch Palms Elementary	3, 5
2848470	CA	Palmdale Elementary	Desert Rose Elementary	4
5342059	CA	Parlier Unified	S Ben Benavidez Elementary	3
1169934	CA	Redlands Unified	Lugonia Elementary	3
108810	CA	Rialto Unified	Kelley Elementary	3
1169996	CA	Rialto Unified	Trapp Elementary	4
3055690	CA	Rialto Unified	Elizabeth T. Hughbanks Elementary	4
4811112	CA	Rialto Unified	Sam V. Curtis Elementary	3
11135602	CA	Rialto Unified	Charlotte N. Werner Elementary	4
109084	CA	San Bernardino City Unified	Manuel A. Salinas Creative Arts Elementary	3
109395	CA	San Bernardino City Unified	Riley Elementary	5
11927508	CA	San Bernardino City Unified	Dr. Mildred Dalton Henry Elementary	5
116788	CA	San Francisco Unified	Serra (Junipero) Elementary	4
102725	CA	San Jacinto Unified	Hyatt Elementary	4
112495	CA	San Marcos Unified	La Mirada Academy	5
58722	CA	Sanger Unified	Madison Elementary	5
124553	CA	Santa Barbara Unified	Cleveland Elementary	3
123755	CA	Santa Maria-Bonita	Bonita Elementary	4
124797	CA	Santa Maria-Bonita	Bruce (Robert) Elementary	5
81834	CA	Saugus Union	Cedarcreek Elementary	4
121288	CA	Shandon Joint Unified	Shandon Elementary	5
4939075	CA	Soledad Unified	Rose Ferrero Elementary	3
99221	CA	Tustin Unified	Jeane Thorman Elementary	3
5347310	CA	Val Verde Unified	Columbia Elementary	5
141276	CA	Ventura Unified	E. P. Foster Elementary	3, 3
138839	CA	Visalia Unified	Crowley Elementary	5
5347944	CA	Visalia Unified	Four Creeks Elementary	4
64094	CA	Wasco Union Elementary	Karl F. Clemens Elementary	5
91487	CA	Winton	Sybil N. Crookham Elementary	3
147359	CO	DENVER COUNTY 1	SWANSEA ELEMENTARY SCHOOL	3
147440	CO	DENVER COUNTY 1	CASTRO ELEMENTARY SCHOOL	4, 5
3050951	IL	CUSD 300	Lakewood School	3

Table 15: Matched Control Schools (CTRL Dataset)

PID	State	District	School Name	GRADE
278673	IL	City of Chicago SD 299	Stevenson Elem School	5
279134	IL	City of Chicago SD 299	Brentano Elem Math & Science Acad	3
279287	IL	City of Chicago SD 299	Chase Elem School	3
441222	MA	Boston	Rafael Hernandez	3
4282793	MA	Chelsea	George F. Kelly Elementary	3, 4, 4
425436	MA	Holyoke	Kelly Elementary	3, 4
684486	NJ	Jersey City	Christa Mcauliffe School	3
5346811	NM	Gadsden Independent Schools	Sunrise Elementary School	4
706735	NM	Hobbs Municipal Schools	Edison Elementary School	5
711209	NM	Los Lunas Public Schools	Ann Parish Elementary School	4
4035083	NM	Santa Fe Public Schools	Ramirez Thomas Elementary School	4
711821	NV	Achievement	Lincoln Elementary School	3
4919879	NV	Achievement	Reynaldo Martinez Elementary School	4
4919893	NV	Achievement	William K. Moore Elementary School	5
772265	NY	BRENTWOOD UNION FREE SCHOOL DISTRICT	LAUREL PARK ELEMENTARY SCHOOL	5
742923	NY	NEW YORK CITY GEOGRAPHIC DISTRICT # 6	PS 132 JUAN PABLO DUARTE	5
4949329	TX	ARLINGTON ISD	KNOX ELEM.	3
1013048	TX	HEREFORD ISD	NORTHWEST ELEM.	3
1036301	TX	KINGSVILLE ISD	PEREZ ELEM.	4
4865943	TX	NORTHSIDE ISD	MICHAEL ELEM.	3, 4
5278812	TX	POTEET ISD	POTEET INTERMED	5
999059	TX	SAN ANTONIO ISD	BONHAM ACAD.	3
1068134	UT	Ogden City District	Odyssey School	3
11462467	WI	Bruce Guadalupe	Bruce Guadalupe	4
11020473	WI	Seeds of Health Inc	Seeds of Health Elementary Program	4
1144025	WI	Sheboygan Area	Sheridan Elementary	4

Table 16: Matched Control Schools (CTRL Dataset)