USA District Like Mine (High % English Language Learners) 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 high percent English language learners 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 124 grades, consisting of grades 3, 4, and 5 at 77 schools, with an average baseline z-score of -0.06. Refer to Figures 2 and 3 for the math performance and demographic distributions. They were matched to 124 similar, randomly selected control grades at 99 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 0.19 z-score points.

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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 high percent English language learners 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 high percent English language learners 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 English Language Learners at the district-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 high percent English language learners 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)

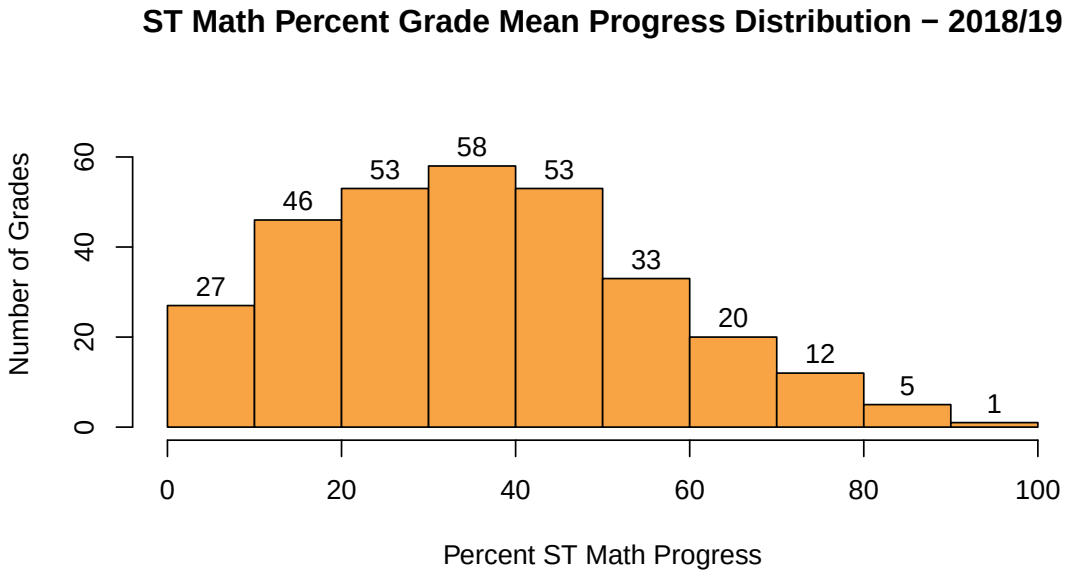

Figure 1: Histogram of ST Math Percent Progress for $\geq$ 85% Enrollment Grades 2018/19

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	0.0	95.9	36.0	19.6

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

Grades with >= 85% Enrollment:	308
Grades with in addition >= 40% Progress:	124

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	135	122	117	374
ST Math Using Schools	135	122	117	161
ST Math Students	10345	9174	9474	28993
ST Math Grades (Enroll >= 85%)	106	105	97	308
TRT Grades (Enroll >= 85% & Prog >= 40%)	46	36	42	124
TRT Schools (Enroll >= 85% & Prog >= 40%)	46	36	42	77
TRT Students (Enroll >= 85% & Prog >= 40%)	4293	3248	4329	11870
CTRL Grades	46	36	42	124
CTRL Schools	39	32	41	99
CTRL Students	4280	2813	3321	10414

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.

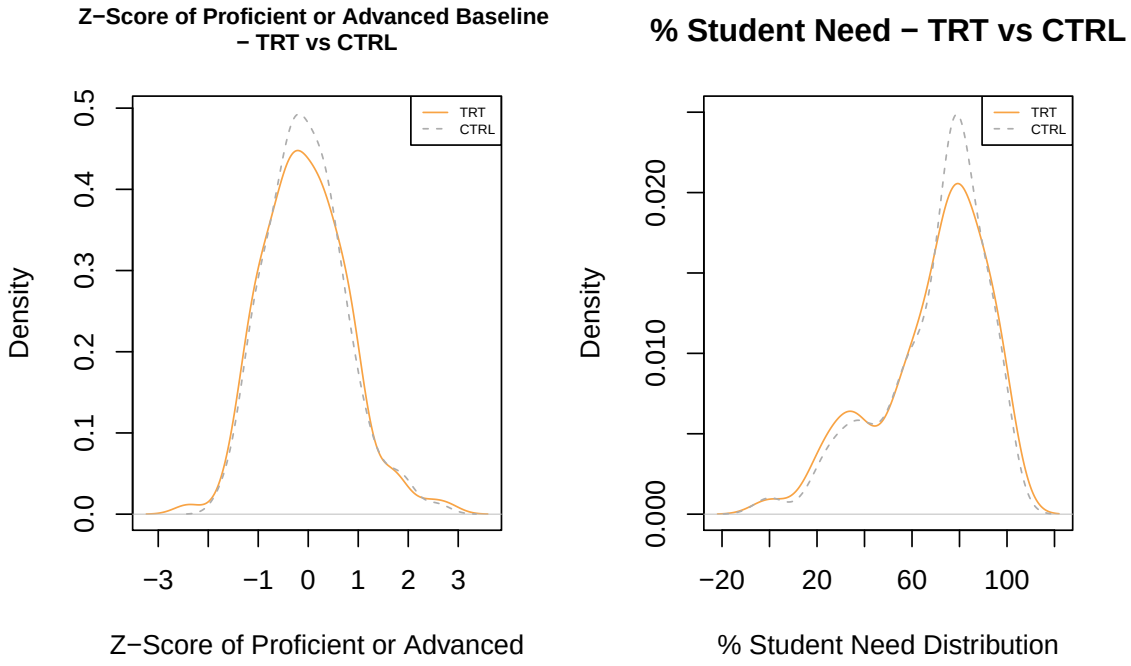

Figure 2: Baseline Year Density Plots Showing Math Scores and Percent Student Need Match between TRT and CTRL - Baseline

Further, figure 3 shows the density plot of the percentage of English Language Learners (ELL) 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.

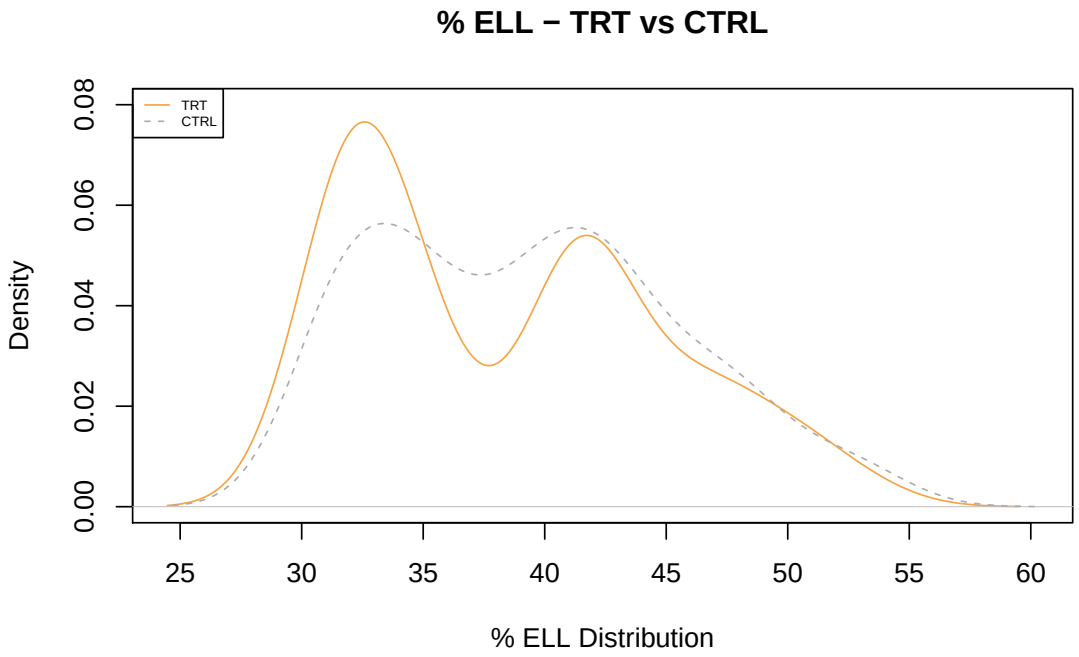

Figure 3: Baseline Year Density Plots Showing Percent ELL Match between TRT and CTRL - Baseline

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 and for percent of students receiving free or reduced lunch. 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	-0.06	0.85	-0.04	0.79	-0.01	0.89	-0.02
Percent Free or Reduced Lunch	68.64	23.28	69.48	21.98	-0.84	0.77	-0.04
Percent English Language Learners	38.47	6.34	39.40	6.11	-0.93	0.24	-0.15

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	124	77	10348	-0.06	47.55	–
TRT.18.19	124	77	9978	0.06	51.13	55.54
TRT.Delta	–	–	–	0.12	3.58	–
CTRL.Baseline	124	99	10477	-0.04	47.79	–
CTRL.18.19	124	99	10414	-0.12	45.76	–
CTRL.Delta	–	–	–	-0.07	-2.03	–

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.

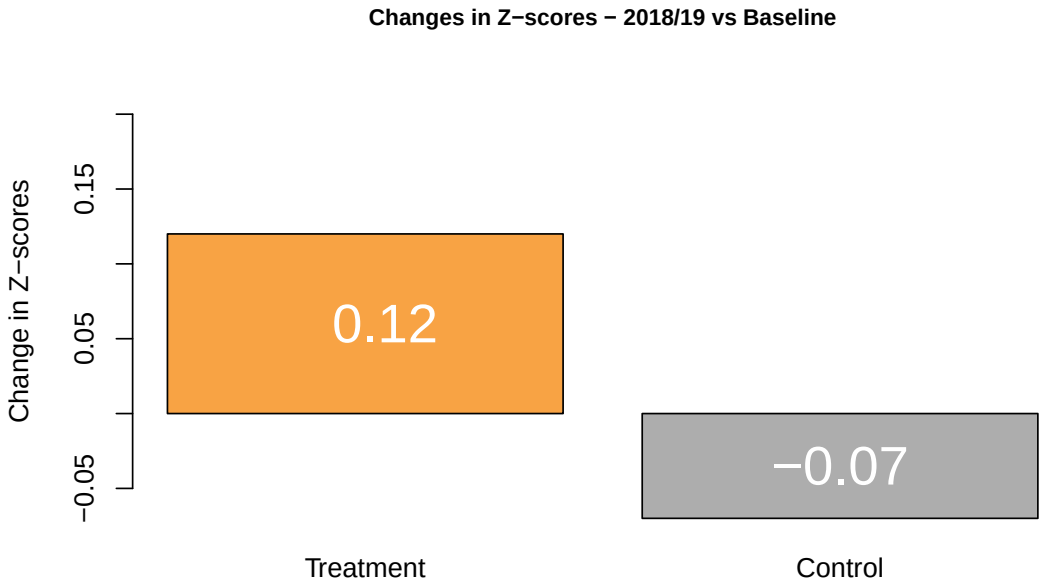

Figure 4: Changes in z-scores (See Section 3.1) for Grade-Aggregated TRT and CTRL datasets between Baseline and 2018/19

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	0.19	0.02*	0.04	0.34

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.

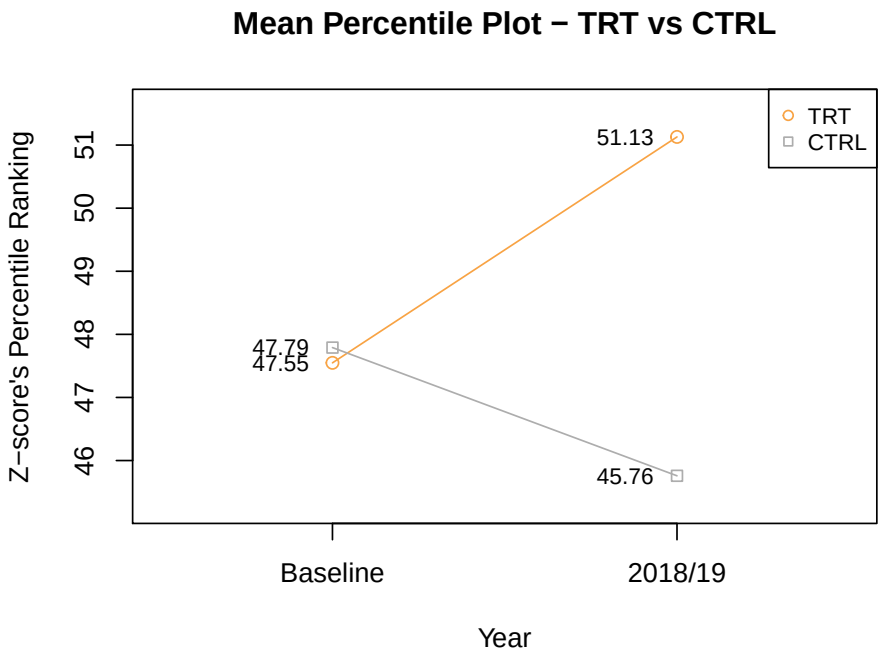

Figure 5: Changes in Percentile Ranking for TRT and CTRL Datasets between Baseline and 2018/19

[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	46	46	3677	0.01	51.41	–
TRT.18.19	46	46	3596	0.05	51.00	55.91
TRT.Delta	–	–	–	0.04	-0.41	–
CTRL.Baseline	46	39	4261	0.12	53.91	–
CTRL.18.19	46	39	4280	0.04	51.35	–
CTRL.Delta	–	–	–	-0.07	-2.57	–

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	36	36	2934	-0.03	47.28	–
TRT.18.19	36	36	2753	0.18	55.64	55.62
TRT.Delta	–	–	–	0.22	8.36	–
CTRL.Baseline	36	32	2920	-0.10	45.19	–
CTRL.18.19	36	32	2813	-0.22	42.42	–
CTRL.Delta	–	–	–	-0.12	-2.78	–

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	42	42	3737	-0.16	43.55	–
TRT.18.19	42	42	3629	-0.03	47.40	55.06
TRT.Delta	–	–	–	0.12	3.86	–
CTRL.Baseline	42	41	3296	-0.18	43.31	–
CTRL.18.19	42	41	3321	-0.20	42.50	–
CTRL.Delta	–	–	–	-0.03	-0.81	–

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:

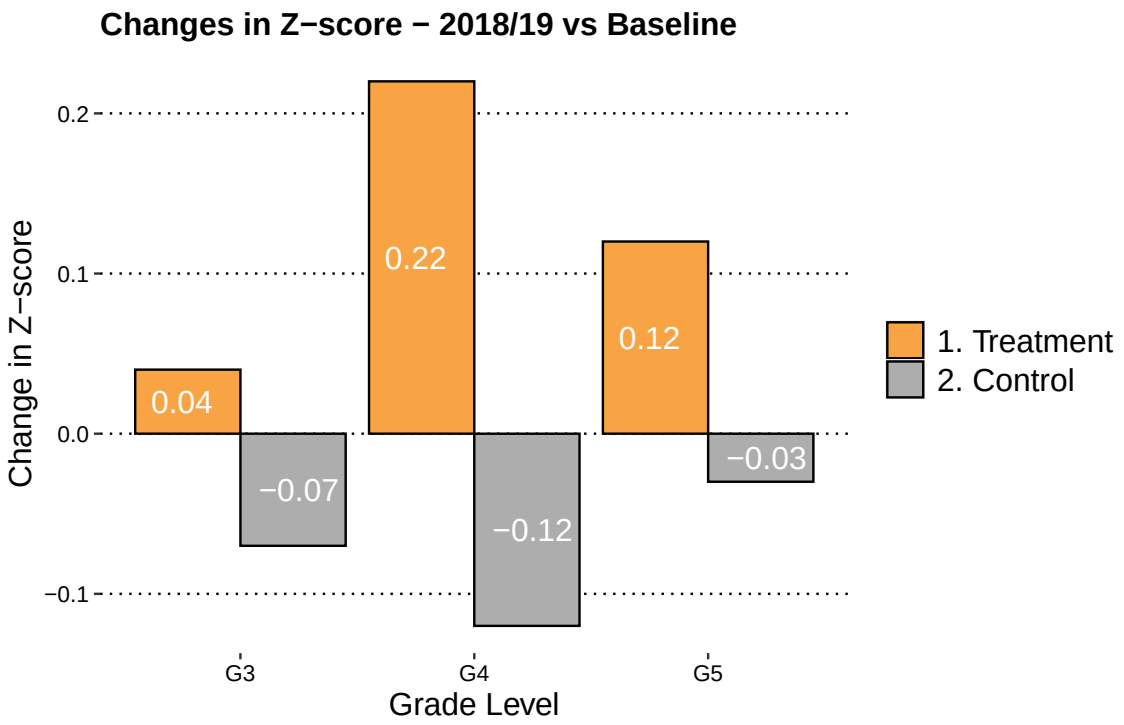

Figure 6: Changes in Grade-Mean Z-score (See Section 3.1) for TRT and CTRL Datasets between Baseline and 2018/19

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	0.11	0.43	-0.16	0.38
Grade 4	0.34	0.02*	0.07	0.61
Grade 5	0.15	0.27	-0.12	0.42

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	0.14
Grade 4	0.41
Grade 5	0.19
All Grades	0.24

Table 11: Cohen's d Effect Size

5 Findings Summary

USA grades 3, 4, and 5 using ST Math with high percent English language learners for the year 2018/19 averaged 32.6% ST Math Progress. 132/374 grades (35%) 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 0.19 points favorable for the ST Math treatment set. Furthermore, referring to table 10, grade 4 ST math treatment set outperformed their matched controls for z-scores with a statistically significant difference of 0.34.

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
35653	WES5M4	AR	SPRINGDALE SCHOOL DISTRICT	WESTWOOD ELEMENTARY SCHOOL	3, 4
4015655	GEO5M4	AR	SPRINGDALE SCHOOL DISTRICT	GEORGE ELEMENTARY SCHOOL	4, 5, 3
4916906	BER5M4	AR	SPRINGDALE SCHOOL DISTRICT	BERNICE YOUNG ELEMENTARY SCHOOL	5
10908030	MON5M4	AR	SPRINGDALE SCHOOL DISTRICT	MONITOR ELEMENTARY	5, 3, 4
11713943	SON5M4	AR	SPRINGDALE SCHOOL DISTRICT	SONORA ELEMENTARY SCHOOL	4, 5, 3
110198	AVO73E	CA	Cajon Valley Union	Avocado Elementary	4
110203	BOS73M	CA	Cajon Valley Union	Bostonia Language Academy	3
110239	CRE73M	CA	Cajon Valley Union	Crest Elementary	5
110265	FLY73M	CA	Cajon Valley Union	Flying Hills School of Arts	5, 4
110277	FUE73M	CA	Cajon Valley Union	Fuerte Elementary	3
110318	LEX73L	CA	Cajon Valley Union	Lexington Elementary	4
110332	MAG73M	CA	Cajon Valley Union	Magnolia Elementary	3
110344	MER73L	CA	Cajon Valley Union	Meridian Elementary	4
110382	WDH73M	CA	Cajon Valley Union	W. D. Hall Elementary	3
2129652	VIS73L	CA	Cajon Valley Union	Vista Grande Elementary	3, 4, 5
2896805	RAN73L	CA	Cajon Valley Union	Rancho San Diego Elementary	3, 5
4015514	JAM73L	CA	Cajon Valley Union	Jamacha Elementary	3
4291134	BLO73M	CA	Cajon Valley Union	Blossom Valley Elementary	3
95263	BUE6ZT	CA	Centralia Elementary	Buena Terra Elementary	5, 4, 3
95299	GEO6ZQ	CA	Centralia Elementary	George B. Miller Elementary	5, 4, 3
95304	GHD6ZQ	CA	Centralia Elementary	Glen H. Dysinger Sr. Elementary	4, 5, 3
95316	LOS6ZQ	CA	Centralia Elementary	Los Coyotes Elementary	3, 4, 5
95342	RAY6ZQ	CA	Centralia Elementary	Raymond Temple Elementary	5, 4, 3
95354	SAN6ZQ	CA	Centralia Elementary	San Marino Elementary	3, 4, 5
4032938	CEN75S	CA	Centralia Elementary	Centralia Elementary	5
68806	CHE72T	CA	El Monte City	Cherrylee Elementary	5, 4, 3
68818	CLE72Y	CA	El Monte City	Cleminson Elementary	4
68832	COR72T	CA	El Monte City	Cortada Elementary	5, 4
68844	DUR72T	CA	El Monte City	Durfee Elementary	3, 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
68935	RIO72T	CA	El Monte City	Rio Vista Elementary	4
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
96073	BRY75W	CA	Garden Grove Unified	Bryant Elementary	4
96097	CLI75W	CA	Garden Grove Unified	Clinton Elementary	5
96334	JOH0RW	CA	Garden Grove Unified	John Marshall Elementary	3
70445	RAM0RS	CA	Hawthorne	Ramona	3
70495	ZEL6YP	CA	Hawthorne	Zela Davis	5, 3
133657	HEA0RS	CA	Healdsburg Unified	Healdsburg Elementary	4, 5, 3
11708716	HEA0RU	CA	Healdsburg Unified	Healdsburg Charter	4
111960	KIM0RS	CA	National Elementary	Kimball	3
1530553	LAE7AS	CA	Oakland Unified	La Escuelita Elementary	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
4949848	WAT7C3	CA	Pajaro Valley Unified	Watsonville Charter School of the Arts	3
80335	ABR700	CA	Paramount Unified	Abraham Lincoln	5
5347633	LEO700	CA	Paramount Unified	Leona Jackson	4
10004153	HOW700	CA	Paramount Unified	Howard Tanner	4
140404	RIO76G	CA	Rio Elementary	Rio Real Elementary	3
99001	HAN0RU	CA	Savanna Elementary	Hansen Elementary	5, 3

Table 12: Treatment Schools (TRT Dataset)

PID	IID	State	District	School Name	GRADE
114431	BAY73D	CA	South Bay Union	Bayside STEAM Academy	5
114443	CEN73D	CA	South Bay Union	Central Elementary	4, 5
114455	EMO73Z	CA	South Bay Union	Emory Elementary	5, 3, 4
114467	GOD73Z	CA	South Bay Union	Godfrey G. Berry Elementary	3
114481	IMP73D	CA	South Bay Union	Imperial Beach Charter	5
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
11720051	WEB78A	CA	W.E.B. DuBois Public Charter	W.E.B. DuBois Public Charter	5
99427	FAY75G	CA	Westminster	Fryberger Elementary	5
245042	ANS3VB	IA	Marshalltown CSD	Anson Elementary School	3, 4
245080	FIS3VB	IA	Marshalltown CSD	Fisher Elementary School	4
245107	FRA3VB	IA	Marshalltown CSD	Franklin Elementary Sch	3, 4
245119	JCH3VB	IA	Marshalltown CSD	J C Hoglan Elementary School	3
245157	ROG3VB	IA	Marshalltown CSD	Rogers Elementary School	3
245171	WOO3VB	IA	Marshalltown CSD	Woodbury Elementary School	3
10804927	LEN3VB	IA	Marshalltown CSD	Lenihan Intermediate School	5
448086	UNI0RU	MA	Worcester	Union Hill School	3, 5
1027178	MEA0RV	TX	SPRING BRANCH I	MEADOW WOOD ELE	5, 4, 3
1027233	NOT0RS	TX	SPRING BRANCH I	NOTTINGHAM ELEM	3

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
34233	AR	DEQUEEN SCHOOL DISTRICT	DEQUEEN ELEMENTARY SCHOOL	3, 4, 5
35574	AR	SPRINGDALE SCHOOL DISTRICT	ELMDALE ELEMENTARY SCHOOL	5
35639	AR	SPRINGDALE SCHOOL DISTRICT	JOHN TYSON ELEMENTARY SCHOOL	4
10009581	AR	SPRINGDALE SCHOOL DISTRICT	HUNT ELEMENTARY SCHOOL	5
10025872	AR	SPRINGDALE SCHOOL DISTRICT	TURNBOW ELEMENTARY SCHOOL	3, 3, 3, 4, 4, 5
129840	CA	Alum Rock Union Elementary	Thomas P. Ryan Elementary	3, 5
10913621	CA	Alum Rock Union Elementary	Adelante Dual Language Academy	3
88375	CA	Alview-Dairyland Union Elementary	Alview Elementary	3
62010	CA	Bakersfield City	Colonel Howard Nichols Elementary	5
4286933	CA	Bakersfield City	Cesar E. Chavez Elementary	3
11457826	CA	Ballington Academy for the Arts and Scie	Ballington Academy for the Arts and Sciences	4
125193	CA	Berryessa Union Elementary	Ruskin Elementary	3
125222	CA	Berryessa Union Elementary	Vinci Park Elementary	3
1169350	CA	Brawley Elementary	Miguel Hidalgo Elementary	5
139601	CA	Briggs Elementary	Briggs Elementary	5
61171	CA	Calipatria Unified	Bill E. Young Jr. Middle	5
110552	CA	Chula Vista Elementary	Halecrest Elementary	4
110631	CA	Chula Vista Elementary	Rice (Lilian J.) Elementary	3
110746	CA	Chula Vista Elementary	Valle Lindo Elementary	3
4811203	CA	Chula Vista Elementary	Casillas (Joseph) Elementary	5
10002569	CA	Chula Vista Elementary	Veterans Elementary	5
11925914	CA	Chula Vista Elementary	Camarena (Enrique S.) Elementary	3
120715	CA	Coast Unified	Cambria Grammar	5
67876	CA	Compton Unified	Tibby Elementary	5
4323024	CA	Corning Union Elementary	Rancho Tehama Elementary	4
137794	CA	Dinuba Unified	Lincoln Elementary	3
61274	CA	El Centro Elementary	Lincoln Elementary	4, 5
61298	CA	El Centro Elementary	McKinley Elementary	5, 5
12030952	CA	Fairfax Elementary	Zephyr Lane Elementary	3
111180	CA	Fallbrook Union Elementary	La Paloma Elementary	4
111207	CA	Fallbrook Union Elementary	Mary Fay Pendleton Elementary	5
1521136	CA	Fallbrook Union Elementary	San Onofre Elementary	5
4871954	CA	Fallbrook Union Elementary	William H. Frazier Elementary	3
96114	CA	Garden Grove Unified	C. C. Violette Elementary	4
96126	CA	Garden Grove Unified	Dwight D. Eisenhower Elementary	4
96190	CA	Garden Grove Unified	Ethan B. Allen Elementary	4
96413	CA	Garden Grove Unified	Louis G. Zeyen Elementary	3, 4
96592	CA	Garden Grove Unified	Riverdale Elementary	4
96645	CA	Garden Grove Unified	Stanford Elementary	3
96700	CA	Garden Grove Unified	Woodbury Elementary	5
69408	CA	Garvey Elementary	Hillcrest Elementary	5
124046	CA	Goleta Union Elementary	Hollister Elementary	4
124058	CA	Goleta Union Elementary	Isla Vista Elementary	4, 5
124060	CA	Goleta Union Elementary	Kellogg Elementary	4
1169013	CA	Hayward Unified	Longwood Elementary	3
139766	CA	Hueneme Elementary	Julien Hathaway Elementary	5
139778	CA	Hueneme Elementary	Parkview Elementary	5
139792	CA	Hueneme Elementary	Sunkist Elementary	5
121915	CA	Jefferson Elementary	Thomas Edison Elementary	5
121941	CA	Jefferson Elementary	Westlake Elementary	3
11712028	CA	Kerman Unified	Goldenrod Elementary	5
58100	CA	Kings Canyon Joint Unified	Dunlap Elementary	4
5356074	CA	Kings Canyon Joint Unified	Thomas Law Reed Elementary	4
71190	CA	Lawndale Elementary	Mark Twain Elementary	3
71243	CA	Lennox	Buford Elementary	3

Table 14: Matched Control Schools (CTRL Dataset)

PID	State	District	School Name	GRADE
71281	CA	Lennox	Dolores Huerta Elementary	5
61808	CA	Lone Pine Unified	Lo-Inyo Elementary	5
61511	CA	Meadows Union Elementary	Meadows Elementary	4
4014326	CA	Mount Pleasant Elementary	Ida Jew Academies	3
110708	CA	Mueller Charter (Robert L.)	Mueller Charter (Robert L.)	4
112005	CA	National Elementary	Palmer Way	3, 5
92601	CA	North Monterey County Unified	Prunedale Elementary	3, 3
11019498	CA	Oakland Unified	East Oakland Pride Elementary	4
133906	CA	Old Adobe Union	Old Adobe Elementary Charter	3
108389	CA	Ontario-Montclair	Lehigh Elementary	5
5279751	CA	Ontario-Montclair	Vista Grande Elementary	3
140076	CA	Oxnard	Harrington Elementary	5
140155	CA	Oxnard	Rose Avenue Elementary	4
4748682	CA	Oxnard	Norman R. Brekke Elementary	4
138205	CA	Palo Verde Union Elementary	Palo Verde Elementary	3, 4, 5
135849	CA	Patterson Joint Unified	Las Palmas Elementary	4
10004335	CA	Patterson Joint Unified	Apricot Valley Elementary	3
124682	CA	Peabody Charter	Peabody Charter	3
3390919	CA	Pittsburg Unified	Stoneman Elementary	5
5100394	CA	Pomona Unified	Pantera Elementary	4
10020236	CA	Rio Elementary	Rio Del Mar	3
2176746	CA	Robla Elementary	Glenwood Elementary	4
122828	CA	San Bruno Park Elementary	Rollingwood Elementary	4
124694	CA	Santa Barbara Unified	Roosevelt Elementary	5
140478	CA	Santa Paula Unified	Grace Thille Elementary	3
58837	CA	Selma Unified	Indianola Elementary	3
121288	CA	Shandon Joint Unified	Shandon Elementary	5
11554228	CA	Shiloh Elementary	Shiloh Charter	4
93057	CA	Soledad Unified	San Vicente Elementary	5
140882	CA	Somis Union	Somis Elementary	5
134508	CA	Sonoma Valley Unified	Dunbar Elementary	3
55108	CA	West Contra Costa Unified	Mira Vista Elementary	4, 4
55237	CA	West Contra Costa Unified	Shannon Elementary	5
55316	CA	West Contra Costa Unified	Washington Elementary	5
1881211	CA	West Contra Costa Unified	Ohlone Elementary	3
1522910	CA	Wright Elementary	J. X. Wilson Elementary	3
4243656	CA	Wright Elementary	Robert L. Stevens Elementary	3
232320	IA	Storm Lake CSD	Storm Lake Elementary	3, 3, 3, 3, 3, 4, 4, 4
232344	IA	Storm Lake CSD	Storm Lake Middle School	5
447719	MA	Worcester	Elm Park Community	5
447941	MA	Worcester	Nelson Place	3
1009891	TX	DALLAS ISD	MOCKINGBIRD ELE	4
5095816	TX	EAGLE PASS ISD	LIBERTY ELEM.	3
11434769	TX	MANOR ISD	OAK MEADOWS ELE	5
1059509	TX	UNITED ISD	COL SANTOS BENA	3

Table 15: Matched Control Schools (CTRL Dataset)