USA District Like Mine (Rural) 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 rural grades using ST Math 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 123 grades, consisting of grades 3, 4, and 5 at 76 schools, with an average baseline z-score of 0.15. Refer to Figures 2 and 3 for the math performance and demographic distributions. They were matched to 123 similar, randomly selected control grades at 117 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 0.37 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 rural schools using ST Math 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 rural schools and grades using ST Math 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).

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 rural schools and grades using ST Math 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)

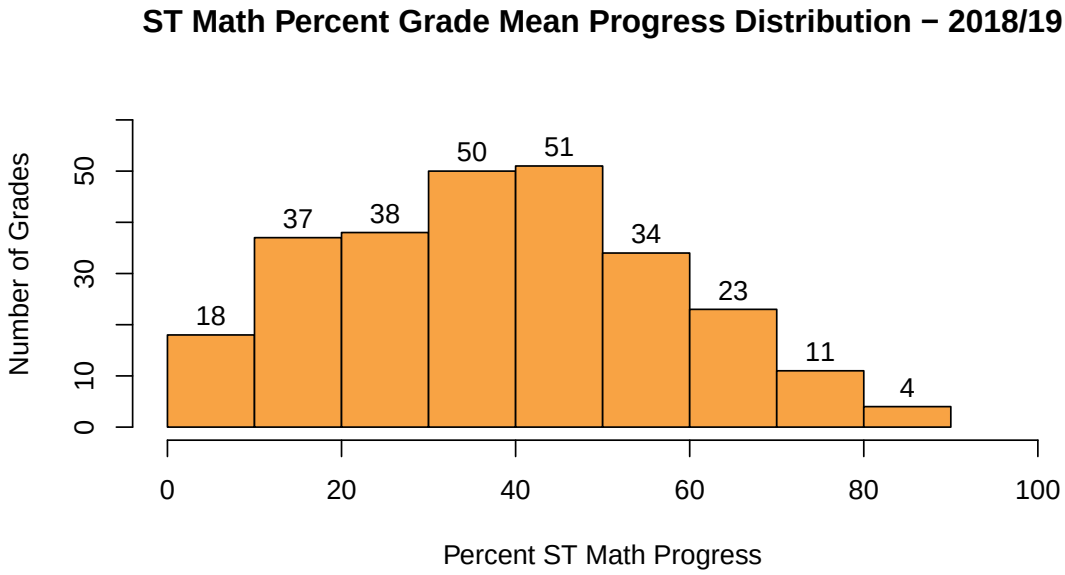

Figure 1: Histogram of ST Math Percent Progress for $\geq$ 85% Enrollment Grades 2018/19

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	0.7	87.8	38.1	19.0

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

Grades with >= 85% Enrollment:	266
Grades with in addition >= 40% Progress:	123

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	145	121	107	373
ST Math Using Schools	145	121	107	171
ST Math Students	9010	7454	6828	23292
ST Math Grades (Enroll >= 85%)	98	90	78	266
TRT Grades (Enroll >= 85% & Prog >= 40%)	52	39	32	123
TRT Schools (Enroll >= 85% & Prog >= 40%)	52	39	32	76
TRT Students (Enroll >= 85% & Prog >= 40%)	3268	2497	1956	7721
CTRL Grades	52	39	32	123
CTRL Schools	52	39	32	117
CTRL Students	3002	2074	2191	7267

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.

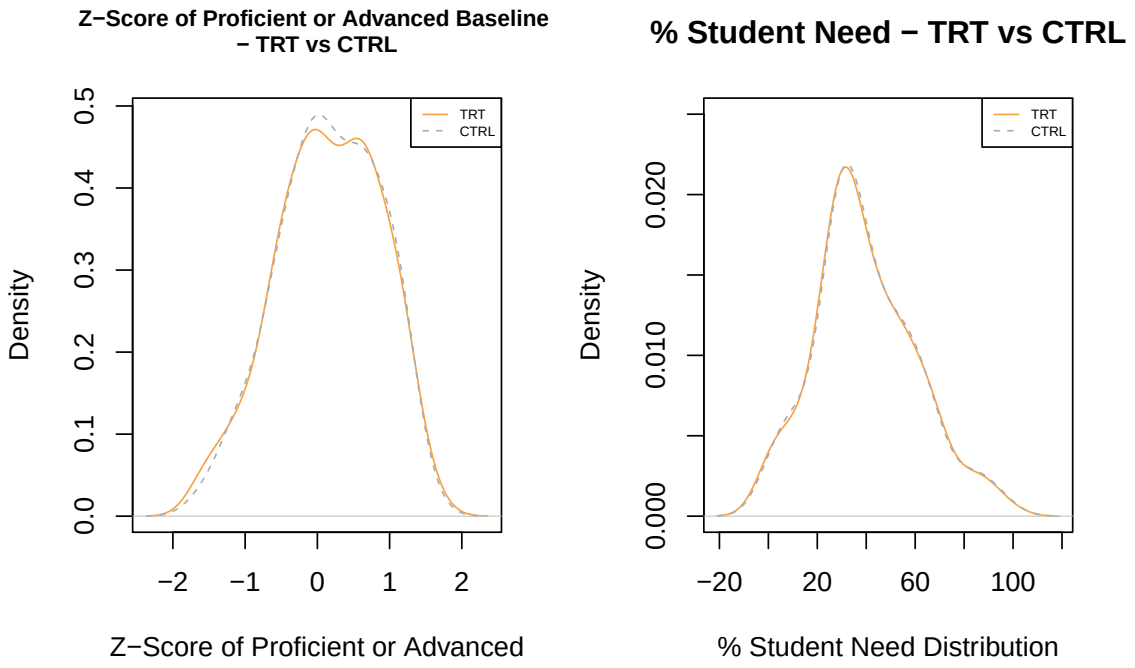

Figure 2: Baseline Year Density Plots Showing Math Scores and Percent Student Need Match between TRT and CTRL - Baseline

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	0.15	0.72	0.16	0.70	-0.01	0.90	-0.02
Percent Free or Reduced Lunch	39.70	20.72	39.89	20.67	-0.19	0.94	-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	123	76	7569	0.15	55.32	–
TRT.18.19	123	76	7133	0.42	63.97	54.72
TRT.Delta	–	–	–	0.27	8.65	–
CTRL.Baseline	123	117	7631	0.16	55.70	–
CTRL.18.19	123	117	7267	0.06	53.21	–
CTRL.Delta	–	–	–	-0.11	-2.49	–

Table 5: All Grades Together Growth

Figure 3 shows the changes in mean z-scores of percent Proficient or Advanced for the grade-aggregated Treatment and Control sets.

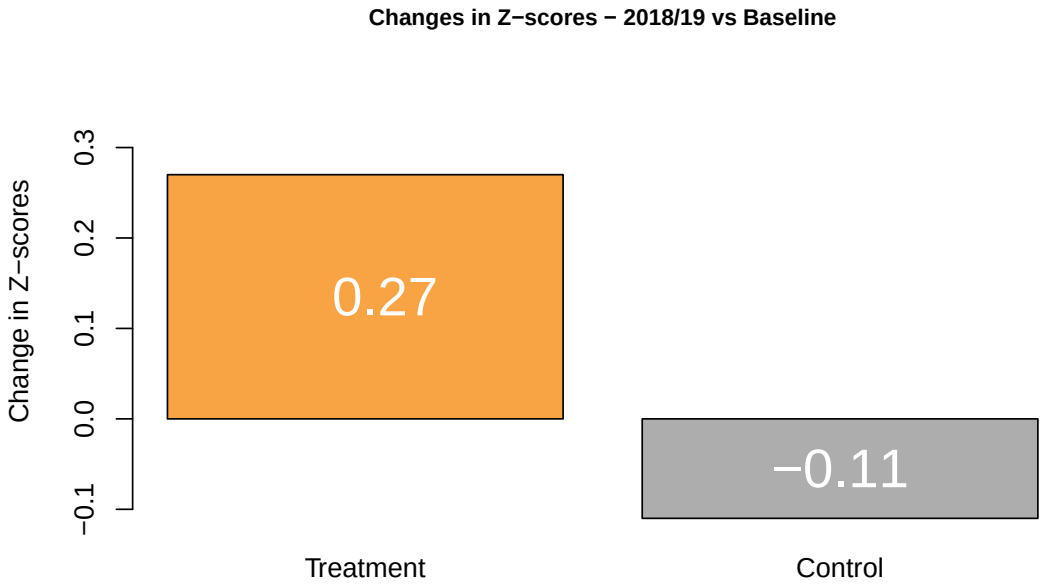

Figure 3: Changes in z-scores (See Section 3.1) for Grade-Aggregated TRT and CTRL datasets between Baseline and 2018/19

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	0.37	0.00*	0.19	0.56

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

Finally, Figure 4 shows the changes in mean percentile ranking between TRT and CTRL.

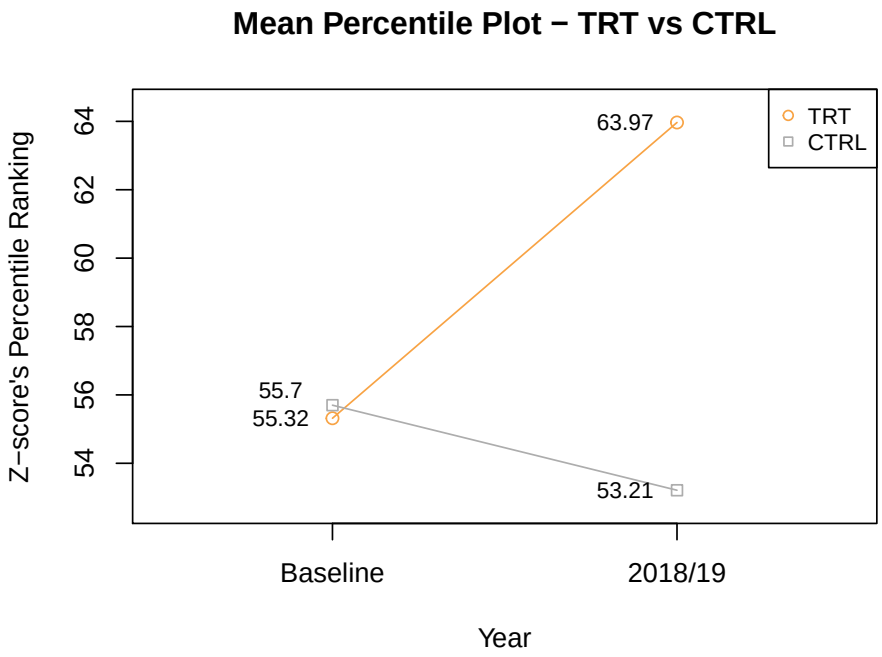

Figure 4: Changes in Percentile Ranking for TRT and CTRL Datasets between Baseline and 2018/19

[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	52	52	3135	0.27	59.31	–
TRT.18.19	52	52	2933	0.45	65.50	53.73
TRT.Delta	–	–	–	0.19	6.19	–
CTRL.Baseline	52	52	3289	0.27	59.37	–
CTRL.18.19	52	52	3002	0.12	54.85	–
CTRL.Delta	–	–	–	-0.15	-4.52	–

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	39	39	2477	0.04	51.62	–
TRT.18.19	39	39	2338	0.35	61.54	55.34
TRT.Delta	–	–	–	0.30	9.92	–
CTRL.Baseline	39	39	2108	0.06	52.03	–
CTRL.18.19	39	39	2074	0.17	56.33	–
CTRL.Delta	–	–	–	0.12	4.31	–

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	32	32	1957	0.10	53.34	–
TRT.18.19	32	32	1862	0.46	64.44	55.59
TRT.Delta	–	–	–	0.36	11.09	–
CTRL.Baseline	32	32	2234	0.13	54.22	–
CTRL.18.19	32	32	2191	-0.19	46.75	–
CTRL.Delta	–	–	–	-0.31	-7.47	–

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

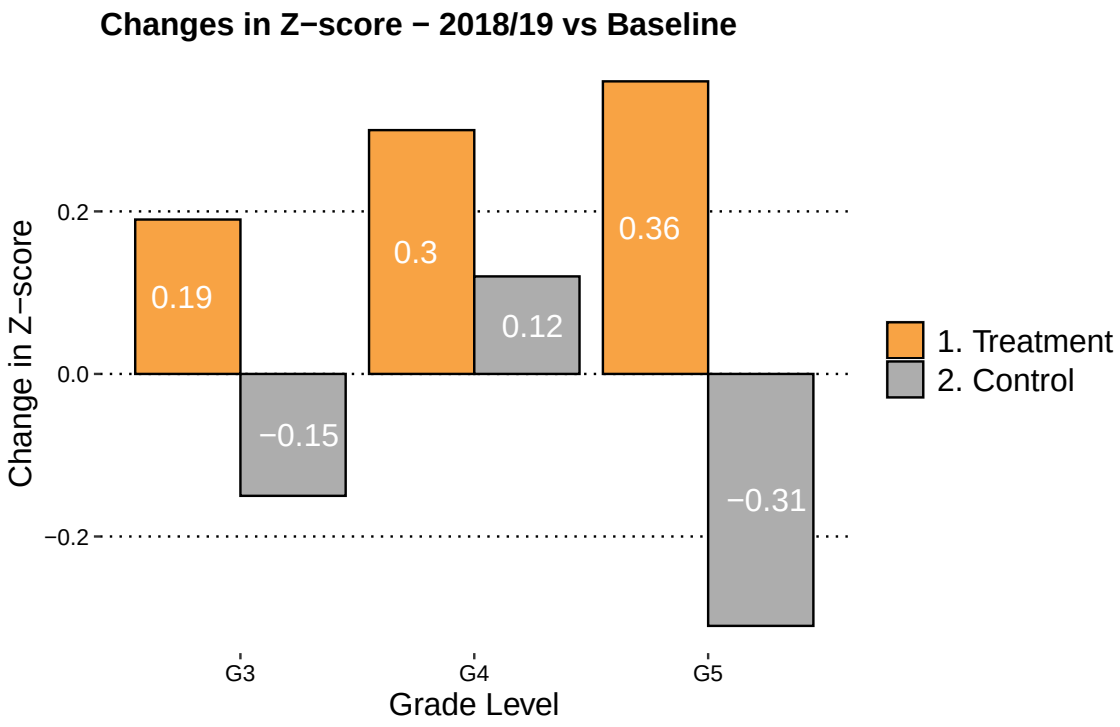

Figure 5: Changes in Grade-Mean Z-score (See Section 3.1) for TRT and CTRL Datasets between Baseline and 2018/19

Table 10 shows the statistics for the differences between TRT and CTRL (Treatment - Control) for these same z-score changes as shown in Figure 5.

	Estimate	P-Value	Int.Low	Int.High
Grade 3	0.33	0.02*	0.04	0.62
Grade 4	0.19	0.24	-0.12	0.50
Grade 5	0.67	0.00*	0.28	1.06

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	0.44
Grade 4	0.28
Grade 5	1.08
All Grades	0.53

Table 11: Cohen's d Effect Size

5 Findings Summary

USA rural grades 3, 4, and 5 using ST Math for the year 2018/19 averaged 32.9% ST Math Progress. 144/373 grades (39%) 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 0.37 points favorable for the ST Math treatment set. Furthermore, referring to table 10, grades 3 and 5 ST math treatment sets outperformed their matched controls for z-scores with statistically significant differences of 0.33 and 0.67, respectively.

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
4033774	TOP6O3	AZ	Topock Elementary District	Topock Elementary School	3
130045	ARO7BW	CA	Aromas - San Juan Unified	Aromas	4
131740	BUT7EX	CA	Butteville Union Elementary	Butteville Elementary	3
4947216	MAR75F	CA	Capistrano Unified	Marblehead Elementary	5, 3
118982	COL7CH	CA	Escalon Unified	Collegeville Elementary	4
60531	TRI7DH	CA	Klamath-Trinity Joint Unified	Trinity Valley Elementary	3
119106	LAM0RT	CA	Lammersville Joint Unified	Lammersville Elementary	5
121252	LIL77L	CA	San Miguel Joint Union	Lillian Larsen Elementary	3, 4, 5
2179504	FAL0RS	CO	DISTRICT 49	FALCON ELEMENTARY SCHOOL OF TECHNOLOGY	3, 4
10902945	BET2C0	GA	GRIFFIN	BETHLEHEM ELEMENTARY SCHOOL	5, 4
241072	BEL40J	IA	Bellevue CSD	Bellevue Elementary School	4, 5, 3
234433	CEN40K	IA	Central CSD	Central Elementary	4, 3
233843	ROO3XP	IA	Cherokee CSD	Roosevelt Elementary School	3
236297	DAN426	IA	Danville CSD	Danville Elementary School	4, 3
250475	BLU42G	IA	Davenport CSD	Blue Grass Elementary School	5, 4, 3
250499	BUF0RS	IA	Davenport CSD	Buffalo Elementary School	3, 5
250762	WAL0RT	IA	Davenport CSD	Walcott Elementary School	4, 5
235011	DEL40J	IA	Delwood CSD	Delwood Elementary School	3
244311	EAR3V3	IA	Earlham CSD	Earlham Elementary School	3, 4, 5
230102	NEW40W	IA	Eastern Allamakee CSD	New Albin Elementary School	5
235932	EDG40J	IA	Edgewood-Colesburg CSD	Edgewood-Colesburg Elementary School	4, 5, 3
246668	ESS3ZF	IA	Essex CSD	Essex Elementary School	4, 3
236479	HAR3YM	IA	Harris-Lake Park CSD	Harris-Lake Park Elementary School	5, 4
251479	IRW3YW	IA	IKM-Manning CSD	Irwin Elementary School	3
235085	NOR42J	IA	Northeast CSD	Northeast Elementary School	3
238570	SID3ZH	IA	Sidney CSD	Sidney Elementary School	5
254524	SOU40W	IA	South Winneshiek CSD	South Winneshiek Elementary School	5, 3, 4
245872	STA0RZ	IA	Stanton CSD	Stanton Elementary School	5, 3
238001	TUR40X	IA	Turkey Valley CSD	Turkey Valley Elementary School	4
1398537	RES0RS	MA	Millbury	Raymond E. Shaw Elementary	5, 4
485515	ASH0RS	MI	Ashley Community Schools	Ashley Elementary School	4
476368	STA0RW	MI	Standish-Sterling Community Schools	Standish-Sterling Central Elementary School	3, 4
537168	LAP0RS	MN	Laporte Public School District	Laporte Elementary	3, 4
5279490	REE52P	MO	REEDS SPRING R-IV	REEDS SPRING ELEM.	4, 3
634704	CAR25E	NC	Edgecombe County Public School	G W Carver Elementary	3
2110807	THO0OG	NJ	Bethlehem Twp	Thomas B. Conley Elementary School	3
685313	EAS0NR	NJ	East Amwell Twp	East Amwell Township	4, 5, 3
696269	TUC0RS	NJ	Tuckerton Boro	Tuckerton Elementary School	3
3328851	UTE0RS	NV	Achievement	Ute Perkins Elementary School	5
5270224	CHA6VM	NV	Achievement	Charles & Phyllis Frias Elementary School	5, 4, 3
10024804	STE6VQ	NV	Achievement	Steve Schorr Elementary School	3, 4, 5
713312	HJG6WG	NV	Storey	Hugh Gallagher Elementary School	5
770932	HOW15A	NY	ODESSA-MONTOUR CENTRAL SCHOOL DISTRICT	HOWARD A HANLON ELEMENTARY SCHOOL	4
719782	OXF12G	NY	OXFORD ACADEMY AND CENTRAL SCHOOL DISTRICT	OXFORD ACADEMY MIDDLE SCHOOL	5
799017	PLE3BU	OH	Fairfield Union Local	Pleasantville Elementary School	3
1401110	BRE3BQ	OH	Fairfield Union Local	Bremen Elementary School	3
819540	MON3BU	OH	Jonathan Alder Local	Monroe Elementary School	3
4803036	SCI3BM	OH	Olentangy Local	Scioto Ridge Elementary School	3
5275236	IND3BM	OH	Olentangy Local	Indian Springs Elementary	3
2131423	LIB3BM	OH	Worthington City	Liberty Elementary School	3
917582	ANN1B8	PA	ANNVILLE-CLEONA SD	ANNVILLE EL SCH	3, 5
909298	EDI19L	PA	GENERAL MCLANE SD	EDINBORO EL SCH	3
909327	MCK19M	PA	GENERAL MCLANE SD	MCKEAN EL SCH	4
1552800	NOR0S1	PA	NORTHERN POTTER SD	NORTHERN POTTER CHILDRENS SCH	3
903062	OSC1AA	PA	PHILIPSBURG-OSCEOLA AREA SD	OSCEOLA MILLS EL SCH	3, 4

Table 12: Treatment Schools (TRT Dataset)

PID	IID	State	District	School Name	GRADE
938110	EIS0RT	PA	WARREN COUNTY SD	EISENHOWER EL SCH	3
1529920	BEA0RW	PA	WARREN COUNTY SD	BEATY-WARREN MS	5
1049279	HEM5UY	TX	HEMPHILL ISD	HEMPHILL ELEM.	3, 4
1019949	NIX612	TX	NIXON-SMILEY CI	NIXON SMILEY EL	3
1066772	NOR6HE	UT	North Summit District	North Summit School	3
1066849	SOU6HF	UT	South Summit District	South Summit School	4, 3
1068897	BRO1RP	VA	Albemarle County	Broadus Wood Elementary	3, 4, 5
1068902	BRO1RQ	VA	Albemarle County	Brownsville Elementary	4
1068926	CRO1RP	VA	Albemarle County	Crozet Elementary	3, 4
1068990	MER1RM	VA	Albemarle County	Meriwether Lewis Elementary	4
1069047	STO1RQ	VA	Albemarle County	Stony Point Elementary	5
4014144	AGN1RM	VA	Albemarle County	Agnor-Hurt Elementary	4
1070723	BRE0RS	VA	Botetourt County	Breckinridge Elementary	3, 4, 5
1072173	BOY1QU	VA	Clarke County	Boyce Elementary	5
1075345	GOO1S3	VA	Goochland County	Goochland Elementary	3, 5
1075383	RAN1RZ	VA	Goochland County	Randolph Elementary	3, 4
1077290	WIN1T8	VA	Isle of Wight County	Windsor Elementary	3, 4, 5
4029694	CAR1SS	VA	Isle of Wight County	Carrollton Elementary	3
1078385	CHA1UG	VA	Mecklenburg County	Chase City Elementary	3
1078414	CLA1UG	VA	Mecklenburg County	Clarksville Elementary	4, 5
1078476	SOU1UL	VA	Mecklenburg County	South Hill Elementary	4, 5

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
10012538	AZ	Cave Creek Unified District	Horseshoe Trails Elementary School	3
52376	CA	Chico Unified	Shasta Elementary	5
92027	CA	Chualar Union	Chualar Elementary	4
137847	CA	Ducor Union Elementary	Ducor Union Elementary	3
70574	CA	Hughes-Elizabeth Lakes Union Elementary	Hughes-Elizabeth Lakes	5
137005	CA	Los Molinos Unified	Los Molinos Elementary	4
52936	CA	Mark Twain Union Elementary	Copperopolis Elementary	4
2892081	CA	Palm Springs Unified	Della S. Lindley Elementary	3
61585	CA	Seeley Union Elementary	Seeley Elementary	5
11219052	CA	Sky Mountain Charter	Sky Mountain Charter	3
137512	CA	Trinity Alps Unified	Weaverville Elementary	3
154015	CO	FRENCHMAN RE-3	FLEMING ELEMENTARY SCHOOL	3
157134	CO	HAYDEN RE-1	HAYDEN VALLEY ELEMENTARY SCHOOL	4
10026084	GA	GRIFFIN	TIMBER RIDGE ELEMENTARY SCHOOL	5
11077438	GA	GRIFFIN	ROCK SPRING ELEMENTARY	4
2887878	IA	AHSTW CSD	AHSTW Intermediate School	4
235164	IA	Ar-We-Va CSD	Ar-We-Va Elementary Community School	4
1485726	IA	BCLUW CSD	BCLUW Elementary School	3
230449	IA	Belle Plaine CSD	Longfellow Elementary School	3
249892	IA	Brooklyn-Guernsey-Malcom CSD	Brooklyn-Guernsey-Malcom Elementary School	3
233116	IA	CAM CSD	CAM South Elementary School	5
238192	IA	Central Springs CSD	Central Springs Elem. School - Nora Springs	3
234500	IA	Clayton Ridge CSD	Clayton Ridge Elementary School	3
241682	IA	Clear Creek Amana CSD	Clear Creek Elementary School	5
250279	IA	East Sac County CSD	East Sac County Elementary Sac Building	3
240872	IA	English Valleys CSD	English Valleys Elementary School	4, 5
232942	IA	Glidden-Ralston CSD	Glidden-Ralston Elementary School	3
240937	IA	Iowa Valley CSD	Iowa Valley Elementary School	4
231613	IA	Janesville Consolidated School District	Janesville Elementary School	5
254653	IA	Lawton-Bronson CSD	Bronson Elementary School	3, 4
241931	IA	Lone Tree CSD	Lone Tree Elementary School	3
254110	IA	Manson Northwest Webster CSD	Manson Northwest Webster Elementary School-Barnum	4
254574	IA	Maple Valley-Anthon Oto CSD	Anthon Elementary	4
253427	IA	Martensdale-St Marys CSD	Martensdale Elementary School	3
244684	IA	Melcher-Dallas CSD	Melcher-Dallas Elem	4, 5
250114	IA	Mount Ayr CSD	Mount Ayr Elementary	3
232394	IA	North Butler CSD	North Butler Elementary	5
243795	IA	North Linn CSD	North Linn Elementary	5
250889	IA	North Scott CSD	Virgil Grissom Elementary School	4
241527	IA	PCM CSD	Prairie City Elementary School	3
240470	IA	Riceville CSD	Riceville Elementary School	3
249268	IA	Riverside CSD	Riverside Community Intermediate School	5
246747	IA	Shenandoah CSD	Shenandoah Middle School	5
239249	IA	South Hamilton CSD	South Hamilton Elem	5
248678	IA	Southeast Polk CSD	Four Mile Elementary	4
231869	IA	Waverly-Shell Rock CSD	Shell Rock Elementary School	3
244268	IA	West Lyon CSD	West Lyon Elementary School	5
10010413	IA	Western Dubuque CSD	Peosta Elementary School	4
424171	MA	Mohawk Trail	Buckland-Shelburne Regional	5
2044703	MA	Quaboag Regional	West Brookfield Elementary	4
477427	MI	Benzie County Central Schools	Crystal Lake Elementary School	3
486818	MI	Dansville Schools	Dansville Elementary School	4
503478	MI	Ravenna Public Schools	Beechnau Elementary School	4
539283	MN	Lynd Public School District	Lynd Elementary	4
12100583	MN	Star of the North Academy Charter School	Star of the North Academy Charter School	3

Table 14: Matched Control Schools (CTRL Dataset)

PID	State	District	School Name	GRADE
572601	MO	MORGAN CO. R-I	MORGAN CO. R-I ELEM.	3
586767	MO	SUMMERSVILLE R-II	SUMMERSVILLE ELEM.	4
632201	NC	Columbus County Schools	Hallsboro-Artesia Elementary	3
666549	NJ	Estell Manor City	Estell Manor Elementary School	4
700327	NJ	Frankford Twp	Frankford Township School	5
685595	NJ	Lebanon Twp	Valley View School	3
676623	NJ	Maurice River Twp	Maurice River Township School	3
672562	NJ	Springfield Twp	Springfield Township School	3
4945452	NV	Achievement	Marshall C Darnell Elementary	5
5099525	NV	Achievement	Tony Alamo Elementary School	3
5348065	NV	Achievement	William & Mary Scherkenbach Elementary School	4
10024828	NV	Achievement	Sandra L Thompson Elementary School	4
10909292	NV	Achievement	Robert L Forbuss Elementary School	5
11103594	NV	Achievement	Carolyn S Reedom Elementary School	3
3050640	NV	Elko	Spring Creek Elementary School	5
4946614	NV	Nye	Hafen Elementary	5
771819	NY	JASPER-TROUPSBURG CENTRAL SCHOOL DISTRICT	JASPER-TROUPSBURG ELEMENTARY SCHOOL	5
1417236	NY	PORT JERVIS CITY SCHOOL DISTRICT	N A HAMILTON BICENTENNIAL SCHOOL	4
804313	OH	Berkshire Local	Ledgemont Elementary	3
830908	OH	Bloom-Vernon Local	Bloom-Vernon Elementary School	3
786058	OH	Eastern Local	Russellville Elementary School	3
836407	OH	Lakeview Local	Lakeview Elementary School	3
806880	OH	Madeira City	Madeira Elementary School	3
811392	OH	West Holmes Local	Lakeville Elementary School	3
900565	PA	BALD EAGLE AREA SD	PORT MATILDA EL SCH	3
912764	PA	BLAIRSVILLE-SALTSBURG SD	BLAIRSVILLE EL SCH	4
920577	PA	NORTHWEST AREA SD	NORTHWEST AREA INTERMEDIATE SCH	5
900412	PA	PANTHER VALLEY SD	PANTHER VALLEY EL SCH	3
916605	PA	PENN MANOR SD	MARTIC EL SCH	4
902458	PA	REDBANK VALLEY SD	REDBANK VALLEY INTRMD SCH	3
908701	PA	SAINT MARYS AREA SD	BENNETTS VALLEY EL SCH	3
936526	PA	SHANKSVILLE-STONYCREEK SD	SHANKSVILLE-STONYCREEK EL SCH	5
911734	PA	TUSCARORA SD	MONTGOMERY EL SCH	3
1013115	TX	COOPER ISD	COOPER ELEM.	4
1007996	TX	RALLS ISD	RALLS ELEM.	3
1041021	TX	VAN VLECK ISD	VAN VLECK ELEM.	3
2131033	UT	Alpine District	Meadow School	4
4867044	UT	Jordan District	Hayden Peak School	3
1066590	UT	South Sanpete District	Gunnison Valley School	3
1068809	VA	Accomack County	Kegotank Elementary	3
1070591	VA	Bedford County	Otter River Elementary	4, 5
1070967	VA	Buchanan County	Twin Valley Elementary/Middle	4
1071569	VA	Carroll County	Hillsville Elementary	5
1072575	VA	Dinwiddie County	Sutherland Elementary	5
3323344	VA	Fauquier County	C. Hunter Ritchie Elementary	4
11071032	VA	Fauquier County	Greenville Elementary	3, 5
1074690	VA	Floyd County	Check Elementary	3
3004328	VA	Fluvanna County	Fluvanna Middle	5
1075113	VA	Frederick County	Redbud Run Elementary	4
1075876	VA	Hanover County	Elmont Elementary	3
1075981	VA	Hanover County	Washington-Henry Elementary	4
4751380	VA	Hanover County	Cool Spring Elementary	4
1077410	VA	King and Queen County	King & Queen Elementary	4
1078854	VA	New Kent County	New Kent Elementary	4
1079640	VA	Pittsylvania County	Mount Airy Elementary	5
4448882	VA	Powhatan County	Pocahontas Elementary	3
1079860	VA	Prince George County	David A. Harrison Elementary	3
1080546	VA	Rappahannock County	Rappahannock County Elementary	3
4015423	VA	Spotsylvania County	Brock Road Elementary	3, 5
1089138	VA	Virginia Beach City	Creeds Elementary	4
4915483	VA	Williamsburg-James City County	Stonehouse Elementary	5
1083483	VA	Wythe County	Rural Retreat Elementary	4

Table 15: Matched Control Schools (CTRL Dataset)