getmoremath!

CASE STUDY:
LUFKIN MIDDLE SCHOOL (TX)

STAAR Growth with Get More Math Intervention

For the Spring 2017 round of the Texas Grade 8 STAAR Mathematics Assessment, 73 re-testers from Lufkin Middle School who did not meet grade-level performance on the March 2017 assessment were randomly placed into two groups to receive intervention instruction and practice over the course of approximately six weeks to prepare for the May 2017 assessment. Both cohorts received similar instruction, but one group utilized Get More Math software while the other group received interventions traditionally used at the school. The pass rate and performance of students using Get More Math far exceeded the pass rate and performance of students who received typical interventions.

- The pass rate of students using Get More Math was 76%, which surpassed the non-Get More Math cohort pass rate of 30% and statewide pass rate of 40%.

- The cohort of students using Get More Math improved their raw score on the Grade 8 STAAR Mathematics Assessment by an average of 5.5 points and their scaled score by an average of 74.8 points.

- The Get More Math cohort had 88% percent of students improve their scaled score from the March 2017 assessment to the May 2017 assessment.

- Students using Get More Math performed significantly better than all other students in Texas on the May 2017 assessment, scoring an average 62 scaled points higher than their peers.

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Introduction

While incorporating appropriate retrieval practice and other learning strategies is possible without technology, there are ways that computers can address complex issues and analyses that are beyond the capacity of most teachers. Get More Math is a program that provides adaptive, individualized, cumulative practice for mathematics students to increase long-term retention. Get More Math leverages research-based retrieval practice using spacing and interleaving. The software determines which skill a student should attempt, founded on data about the student's strengths, weaknesses, and time since last practicing each skill.

Another way Get More Math addresses complex student needs is through content differentiation. Get More Math is not an instructional tool, so it allows the teacher to deliver the appropriate instruction for students while the software dynamically provides practice problems that are tailored to each student's needs. The program intelligently selects problems for a student from a set of teacher-assigned skills based on each student's past successes and failures, providing each student with a differentiated experience. Little et al. (2009) explained, "the value of differentiation [is] to respond to student readiness… [and provide] opportunities for all students to work with tasks that challenge them" (p. 42). Get More Math also scaffolds individual skills to meet students at the appropriate level. This multi-level approach to individualization of practice keeps students in their zone of proximal development. Murray and Arroyo discussed accessing a student's zone of proximal development as integral in making learning efficient and effective (p. 749).

Get More Math was created by a mathematics teacher in the early 2000's and was refined for over a decade in the classroom before being released to a set of pilot schools in Pennsylvania. This document will discuss the results of the first school in Texas to pilot the program as an intervention tool to a set of eighth-grade students preparing to retake the Spring 2017 STAAR Mathematics Assessment.

School Profile

Lufkin Middle School (LMS), the only middle school in Lufkin Independent School District, is in eastern Texas. Lufkin ISD serves the city of Lufkin, Texas, and the surrounding area. For the 2020-2021 school year, Lufkin Middle School enrolled 1,690 students in grades 6 through 8 (NCES, 2022). The student population is diverse, with about 26% of the student body White, 31% Black, and 40% Hispanic. Lufkin MS is a Title I school, with 84% of the students eligible for free or reduced lunch (NCES, 2022).

Implementation

The Lufkin Middle School Mathematics Instructional Coach selected Get More Math as a possible intervention solution after learning about the program at a conference. Lufkin had 73 students who did

not meet the standard for academic readiness on the March 2017 STAAR Grade 8 Mathematics Assessment and needed to retest in May 2017 after receiving intervention outside of regular classroom instruction.

In an effort to test the efficacy of Get More Math, the instructional coach conducted an experiment by splitting the 73 students into two groups, one using Get More Math and the other using traditional intervention. Seventeen students were split between two teachers to receive instruction with Get More Math support, while the remaining 56 students were split among seven teachers to receive instruction and intervention without Get More Math. Students were randomly selected for each of the two groups with confirmation that demographics for the two groups were similar; also, components of instructional delivery were the same for both groups.

Results

On the Texas STAAR Exam, students are ranked according to four performance levels: Did Not Meet, Approaches, Meets, and Masters. Apart from the Did Not Meet performance level, the percentage of students identified at each level is a cumulative proportion of that level and any higher rating level. For example, if a school has 76% of its testers rated at the Approaches performance level, that means 76% of its students were at the Approaches level or above, including Meets and Masters. Any readiness rating of Approaches or above is considered passing on a STAAR assessment.

The results of the May STAAR Grade 8 Mathematics Assessment indicated notable success for the students using Get More Math at Lufkin Middle School. For the students not using Get More Math, 17 out of 56, or 30%, passed. Thirteen of the 17 students using Get More Math passed the May assessment, a pass rate of 76%.
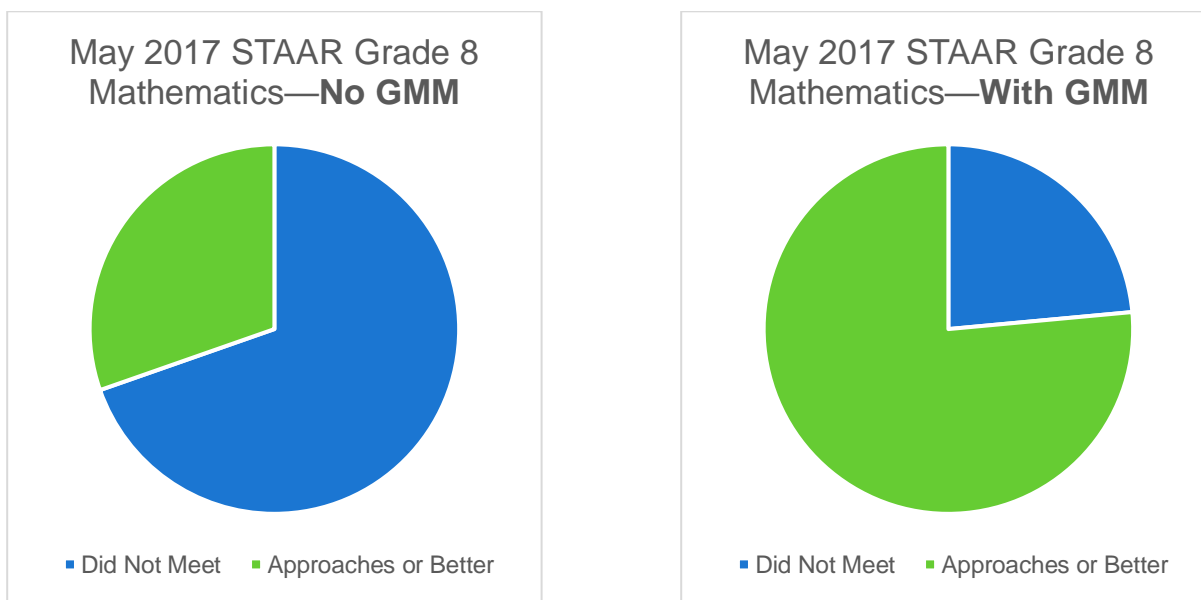

Figure 1: STAAR Grade 8 Mathematics Performance Levels, LMS, May 2017 Assessment

The Lufkin Middle School Get More Math users' pass rate was statistically greater (p = 0.00274, see Appendix B) than the overall pass rate of 40% (Texas Education Agency, 2017) for all other Texas Grade 8 students on the May 2017 administration of the STAAR Mathematics Assessment. More significantly perhaps, the LMS Get More Math users' pass rate was also statistically greater than the pass rate for the LMS students not using Get More Math (p ≈ 0.001, see Appendix B). In addition, the effect size for the difference in proportions, using Cohen's *h*, is 0.96, indicating a large effect size for the difference in proportions (see Appendix B).

Of the 13 Get More Math users who went on to pass the May 2017 round of the STAAR exam, three ended up raising their performance level by two levels from Did Not Meet to Meets. For all 17 Get More Math users, the average raw score growth from the March 2017 exam to the May 2017 exam was 5.53 points. Only two students' raw scores decreased, and that was by only one point each. More importantly, the scaled scores for the 17 Get More Math students increased by an average of 74.76 points, with the two scores that didn't improve decreasing by merely 4 points (see Appendix A).
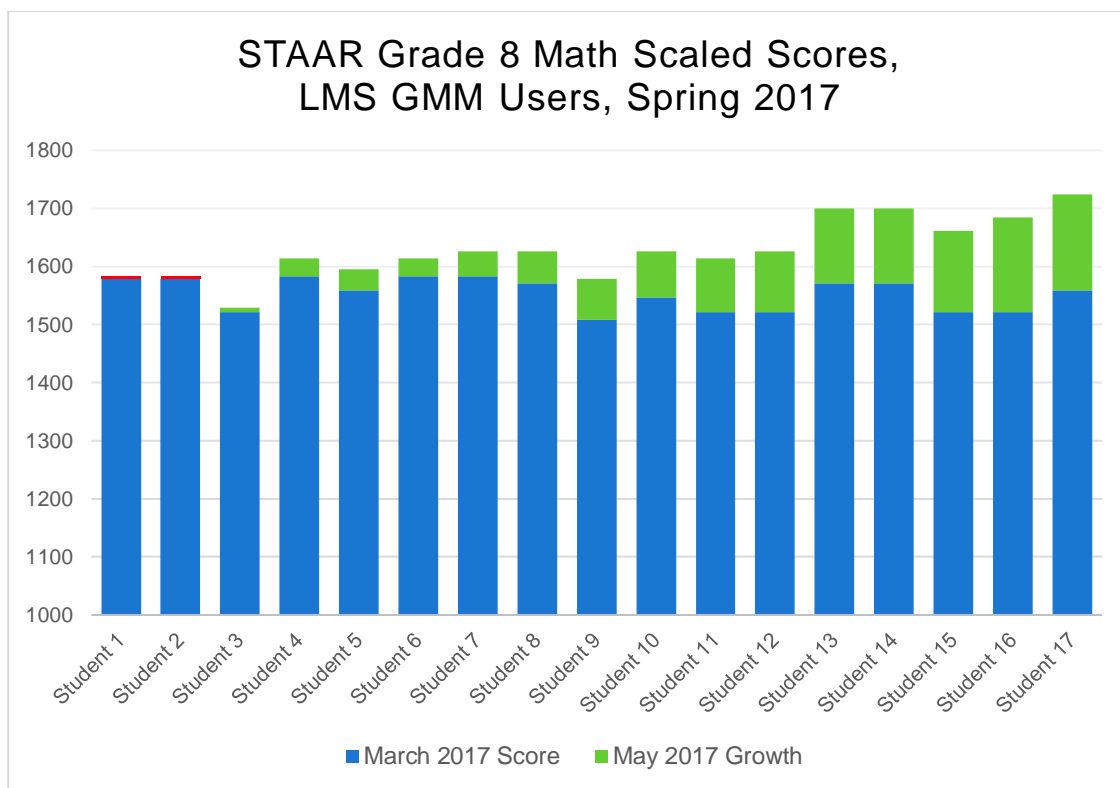

Figure 2: STAAR Grade 8 Mathematics Growth, LMS, Spring 2017 Assessments

Even though growth data is not readily available for all students in the May cohort, the achievement of the Get More Math students from Lufkin on that round of testing can be favorably compared to the achievement of the rest of the state's eighth grade re-testers. The raw score of 22.1 for the Get More

Math users at LMS was significantly greater (p = 0.0001, see Appendix B) than the state average of 17.2, while the scaled score of 1628 was significantly greater (p < 0.0001, see Appendix B) than the state average of 1566 (Texas Education Agency, 2017).

Conclusion

While Get More Math is known for boosting long-term retention through year-long regular usage, Lufkin Middle School achieved success with its STAAR Assessment re-testers utilizing it in an intervention environment. Students using Get More Math at LMS performed notably better than students not using Get More Math on the May 2017 STAAR Mathematics Assessment.

Appendix A: STAAR Grade 8 Mathematics Scores, LMS Re-testers, Spring 2017

Student	Raw Score				Scaled Score				Performance Level		
	March	May	Growth		March	May	Growth		March	May	Growth
Student 1	19	18	-1		1583	1579	-4		DNM	DNM	
Student 2	19	18	-1		1583	1579	-4		DNM	DNM	
Student 3	14	14	0		1521	1529	8		DNM	DNM	
Student 4	19	21	2		1583	1614	31		DNM	A	+
Student 5	17	19	2		1559	1595	36		DNM	A	+
Student 6	19	21	2		1583	1614	31		DNM	A	+
Student 7	19	22	3		1583	1626	43		DNM	A	+
Student 8	18	22	4		1571	1626	55		DNM	A	+
Student 9	13	18	5		1508	1579	71		DNM	DNM	
Student 10	16	22	6		1547	1626	79		DNM	A	+
Student 11	14	21	7		1521	1614	93		DNM	A	+
Student 12	14	22	8		1521	1626	105		DNM	A	+
Student 13	18	28	10		1571	1700	129		DNM	ME	+
Student 14	18	28	10		1571	1700	129		DNM	ME	+
Student 15	14	25	11		1521	1661	140		DNM	A	+
Student 16	14	27	13		1521	1685	164		DNM	A	+
Student 17	17	30	13		1559	1724	165		DNM	ME	+
Mean	**16.58824**	**22.11765**	**5.529412**		**1553.294**	**1628.059**	**74.76471**				

Performance Levels

DNM = Did Not Meet
A = Approaches
ME = Meets

Appendix B: Statistical Tests

May 2017 STAAR Mathematics Grade 8 Assessment Pass Rate: LMS GMM Users vs. Rest of May Testers

One-sample proportion summary hypothesis test:

p: Proportion of successes for GMM users at LMS
H_0: p = 0.40329482
H_A: p > 0.40329482

Hypothesis test results, using binomial distribution, since the conditions for a one-sample proportion hypothesis z-test are not met:

$$p-value = \sum_{n=13}^{17} \binom{17}{n}.403^n.597^{17-n} = 0.00274 < 0.01$$

May 2017 STAAR Mathematics Grade 8 Assessment Pass Rate: LMS GMM Users vs. LMS GMM Non-Users

Two-sample proportion summary hypothesis test:

p_1: proportion of successes for Get More Math users at LMS (0.76)
p_2: proportion of successes for non-Get More Math users at LMS (0.30)
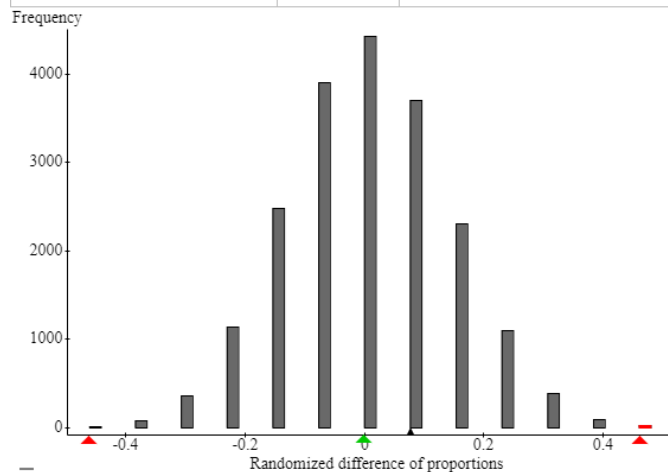p_1 - p_2: Difference in proportions
H_0: p_1 - p_2 = 0
H_A: p_1 - p_2 > 0

Hypothesis test results, based on randomization difference of 20,000 trials, since sample sizes are relatively small:

$p-value \approx 0.001$

Event	Count	Proportion of 20000 runs
-0.461134 or below	0	0
0.461134 or above	20	0.001
Total	20	0.001

Randomized difference of proportions

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Effect Size, using Cohen's *h*:

$$h = 2\sin^{-1}\sqrt{0.76} - 2\sin^{-1}\sqrt{0.30} = 0.96$$

May 2017 STAAR Mathematics Grade 8 Assessment Raw Score: LMS GMM Users vs. Rest of May Test Takers

One-sample T hypothesis test:

μ: Mean raw score of Get More Math users at LMS
H_0: μ = 17.2
H_A: μ > 17.2

Hypothesis test results:

Variable	Sample Mean	Std. Err.	DF	T-Stat	P-value
var1	22.117647	1.0392388	16	4.7319702	0.0001

May 2017 STAAR Mathematics Grade 8 Assessment Scaled Score: LMS GMM Users vs. Rest of May Test Takers

One-sample T hypothesis test:

μ: Mean scaled score of Get More Math users at LMS
H_0: μ = 1566
H_A: μ > 1566

Hypothesis test results:

Variable	Sample Mean	Std. Err.	DF	T-Stat	P-value
var2	1628.0588	12.517479	16	4.9577733	<0.0001

References

Little, C.A., Hauser, S., & Corbishley, J. (2009). Constructing complexity for differentiated learning. *Mathematics Teaching in the Middle School, 15*(1), 34-42. https://www.jstor.org/stable/41182949

Murray, T. & Arroyo, I. (2002, June 2). *Toward measuring and maintaining the zone of proximal development in adaptive instructional systems*. International Conference on Intelligent Tutoring Systems*, 749-758. San Sebastian, Spain. 10.1007/3-540-47987-2_75

National Center for Education Statistics. (n.d.). *School directory information – Lufkin Middle.* Retrieved April 26, 2022, from https://nces.ed.gov/ccd/

Texas Education Agency. (2017). *State of Texas assessments of academic readiness summary report.* https://tea.texas.gov/sites/default/files/STAAR_Sum_2017_05May_G8-f.pdf