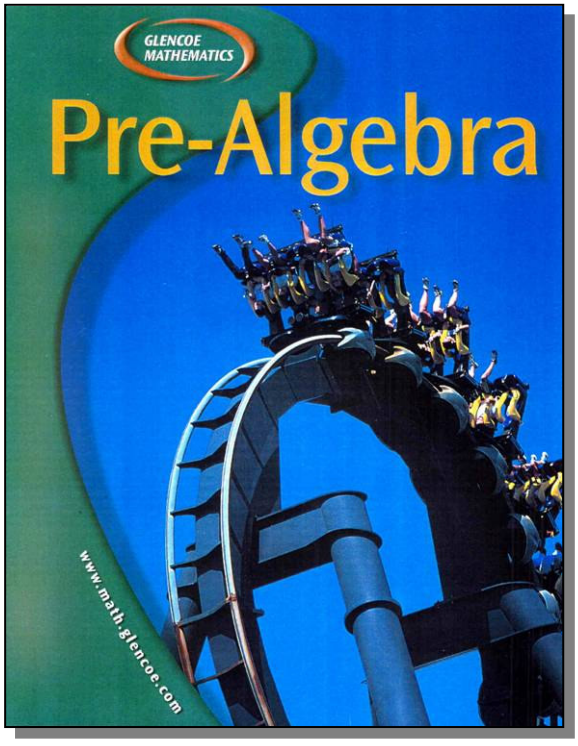
GLENCOE MATHEMATICS

RESEARCH SUMMARY FOR

Pre-Algebra



The McGraw-Hill Companies

Mc Graw Hill Glencoe

Study Objective

This study measures the effectiveness of *Glencoe Pre-Algebra*, a middle school pre-algebra program published by Glencoe/McGraw-Hill.

Teachers who participated in this study administered a pre-test prior to teaching Chapter 3 from *Glencoe Pre-Algebra*. To assess student progress, a post-test was administered after the chapter was taught. The results of these tests, which appear in the appendix, are included in this report.

Approximately 704 students in Grades 7 and 8 participated in this research. The students were enrolled in nine schools, one in an urban community, seven in suburban communities, and one in a rural community. The schools were located in five states: Florida, Missouri, New York, North Carolina, and Virginia.

Fifty percent of the participating students are boys and 50 percent are girls. Fifteen percent are minorities and 5 percent receive subsidized lunch.

Throughout this report, the primary measure of student performance is "Gap Reduction Percentages" (GRPs). GRPs reflect the degree to which students have succeeded in closing the gap between the average pre-test score and a perfect score, as reflected by the post-test. Specifically, GRPs are calculated using the following formula:

$$\text{GRP} = \frac{\text{Average post-test score} - \text{Average pre-test score}}{100\% - \text{Average pre-test score}}$$

A GRP of 0 percent means that student performance did not improve from pre-test to post-test. A GRP of 50 percent means that students have closed half the gap between the average pre-test score and a perfect score. For example, an average pre-test score of 50 percent followed by an average post-test score of 75 percent yields a GRP of 50 percent. In other words, the gap between the average pre-test score and a perfect score has been closed by half. Of course, a GRP of 100 percent means that the gap between the average pre-test score and a perfect score has been eliminated entirely.

The GRP was formulated to measure performance because percentage change, a more typical measure, is unduly influenced by the pre-test score. For example, a post-test score of 90 percent yields a percentage change of only 12 percent if the pre-test score is 80 percent. By contrast, a post-test score of 40 percent yields a percentage change of 33 percent if the pre-test score is 30 percent. In these examples, a ten percentage point increase yields very different and potentially misleading percentage change figures. GRPs attempt to eliminate this variability which occurs because high pre-test scores minimize the possibility of significant percentage changes, while low pre-test scores all but ensure them.

Consider another example. Average pre- and post-test scores of 20 percent and 80 percent, respectively, yield a percentage change of 300 percent and a GRP of 75 percent. Average pre- and post-test scores of 60 percent and 90 percent, respectively, yield a much lower percentage change of 50 percent, but the same GRP of 75 percent. The latter is true because in both cases, the gap between the average pre-test score and a perfect score closed by three-quarters.

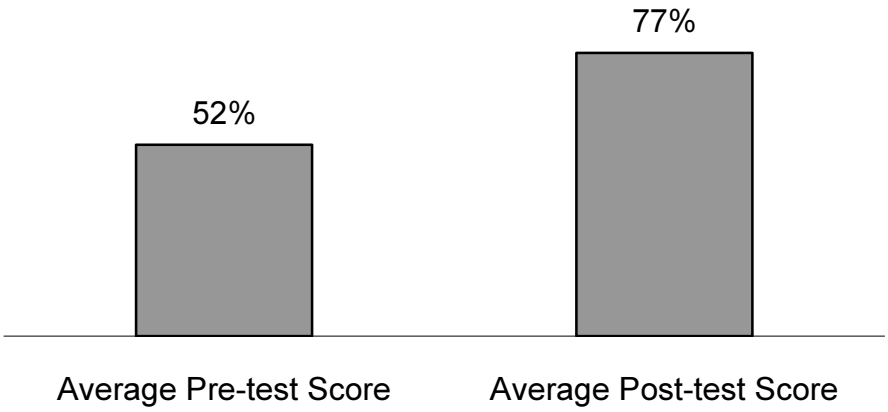
Top-line Results

- The research indicates that test scores increased among students using *Glencoe Pre-Algebra*.
- More than nine out of ten students earned higher scores after using the Glencoe program.
- Scores improved among both boys and girls.
- Scores improved among both minority and non-minority students.
- Scores improved among students who receive subsidized lunch and students who do not.
- Overall, the gap between the average pre-test score and a perfect score closed by 53 percent. Stated differently, on average, scores increased 48 percent after students used the Glencoe program.

"I liked the format and all the practice problems.
The kids got it!"

"Great organization, great examples, and lots of extra practice"

The gap between the average pre-test score and a perfect score closed by 53 percent.



Overall Performance

Approximately 704 students in 31 middle school classrooms completed pre- and post-tests. Students were tested on Chapter 3 only.

An analysis was performed on the pre- and post-test scores to determine the GRP – the extent to which the gap between the average pre-test score and a perfect score was closed by the post-test.

The overall results from each classroom are listed in Table 1(T). **In one class at School PSMS, the gap between the average pre-test score and a perfect score closed by 84 percent.**

Table 1(T) Classroom	Number of Students	Average Pre-test Score	Average Post-test Score	Pre-test Gap (100% - Average)	Post-test Gap (100% - Average)	GRP
BMS	27	56%	78%	44%	22%	50%
CMS-1	21	40%	75%	60%	25%	58%
CMS-2	28	36%	78%	64%	22%	66%
FZMS-1	21	42%	73%	58%	27%	53%
FZMS-2	23	48%	79%	52%	21%	60%
FZMS-3	18	48%	79%	52%	21%	60%
FZMS-4	19	54%	82%	46%	18%	61%
FZMS-5	24	41%	71%	59%	29%	51%
FZMS-6	24	39%	66%	61%	34%	44%
FZMS-7	26	46%	69%	54%	31%	43%
GMS-1	16	46%	60%	54%	40%	26%
GMS-2	18	71%	87%	29%	13%	55%
GMS-3	18	41%	77%	59%	23%	61%
JMS-1	24	58%	83%	42%	17%	60%
JMS-2	20	56%	80%	44%	20%	55%
JMS-3	18	60%	80%	40%	20%	50%
JMS-4	21	55%	78%	45%	22%	51%
JMS-5	22	52%	79%	48%	21%	56%
JMS-6	14	66%	83%	34%	17%	50%
JMS-7	23	64%	82%	36%	18%	50%
JMS-8	16	70%	88%	30%	12%	60%
MMS	32	69%	87%	31%	13%	58%
OMS-1	28	53%	72%	47%	28%	40%
OMS-2	28	46%	71%	54%	29%	46%
OMS-3	25	46%	63%	54%	37%	31%
OMS-4	27	47%	64%	53%	36%	32%
PSMS	29	51%	92%	49%	8%	84%
SHMS-1	19	61%	82%	39%	18%	54%
SHMS-2	26	57%	82%	43%	18%	58%
SHMS-3	24	57%	80%	43%	20%	53%
SHMS-4	25	54%	82%	46%	18%	61%
Total	704	52%	77%	48%	23%	52%

A test of significance (t-test) was used to determine whether the results from the post-test are significantly different from the pre-test results (i.e., a difference large enough not to be expected by chance). On average, **the resulting t-test value indicates that the scores from the post-test are significantly higher than the pre-test scores.** The results of the t-test can be found in Table 2(T).

Table 2(T) Total	n	Average Pre-test Score	Average Post-test Score	t-test Value	p-Value
All students	704	52%	77%	42.34	.000
				df=703	

GRP and Gender

Improvement from pre-test to post-test for boys and girls as measured by GRP was tested for a significant difference using a t-test. The results are listed in Table 3(T). On average, **boys and girls closed the gap between the average pre-test score and a perfect score almost equally.**

Table 3(T) Gender	n	Average Pre-test Score	Average Post-test Score	Average GRP	t-test Value	p-Value
Boys	351	51%	77%	53%	.54	.593
Girls	353	53%	78%	54%	df=702	

GRP and Subsidized Lunch

Improvement from pre-test to post-test for students who receive subsidized lunch and students who do not as measured by GRP was tested for a significant difference using a t-test. The results are listed in Table 4(T). On average, **all students, regardless of subsidized or unsubsidized lunch status, closed the gap between the average pre-test score and a perfect score almost equally.**

Table 4(T) Receives Subsidized Lunch	n	Average Pre-test Score	Average Post-test Score	Average GRP	t-test Value	p-Value
Yes	33	48%	72%	49%	.53	.597
No	590	54%	77%	51%	df=621	

GRP and Race

Improvement from pre-test to post-test for minority and non-minority students as measured by GRP was tested for a significant difference using a t-test. The results are listed in Table 5(T). Non-minority students closed the gap between the average pre-test score and a perfect score slightly more than minority students; however, **both minority and non-minority students improved.**

Table 5(T) Race	n	Average Pre-test Score	Average Post-test Score	Average GRP	t-test Value	p-Value
Minority	106	50%	72%	46%	2.51	.012
Non-minority	547	53%	78%	53%	df=651	

Figure 1(T): Overall Performance

"I liked the format and all the practice problems. The kids got it!"

"Great organization, great examples, and lots of extra practice"

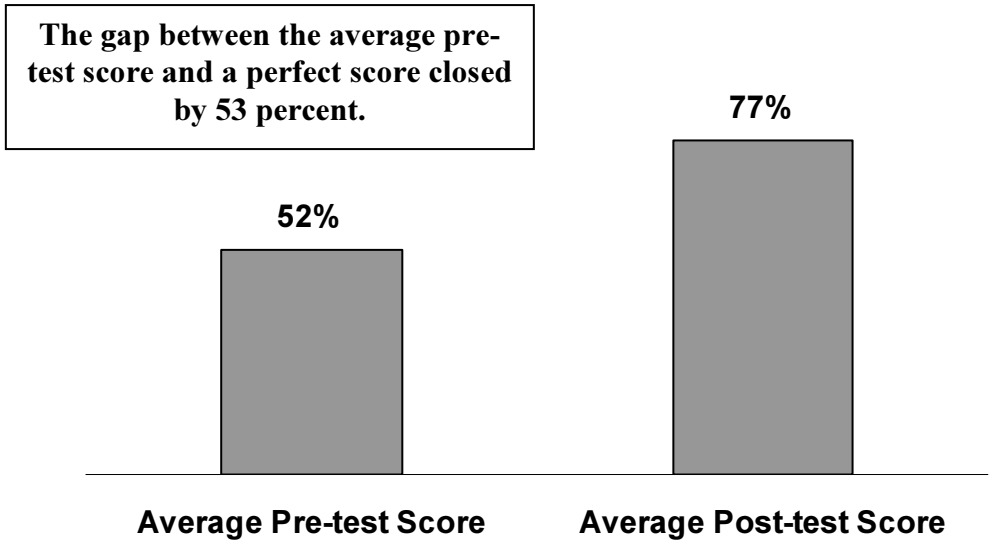


Figure 2(T): Overall Performance Gender

Boys and girls closed the gap between the average pre-test score and the average post-test score almost equally.

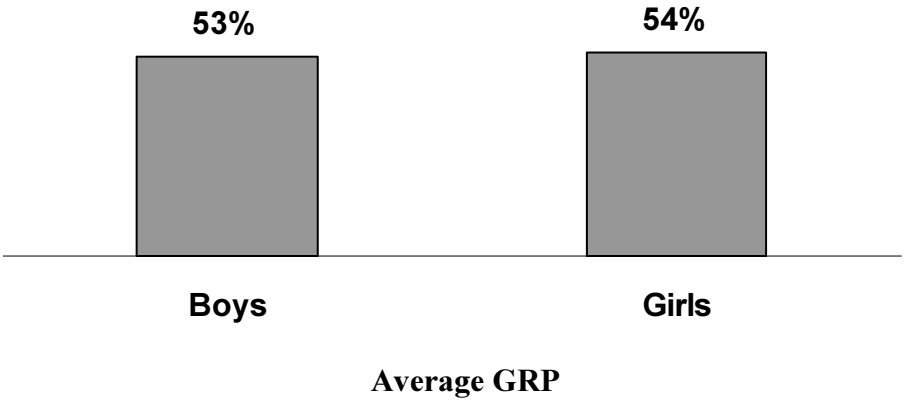


Figure 3(T): Overall Performance Subsidized Lunch Status

All students, regardless of subsidized or unsubsidized lunch status, closed the gap between the average pre-test score and a perfect score almost equally.

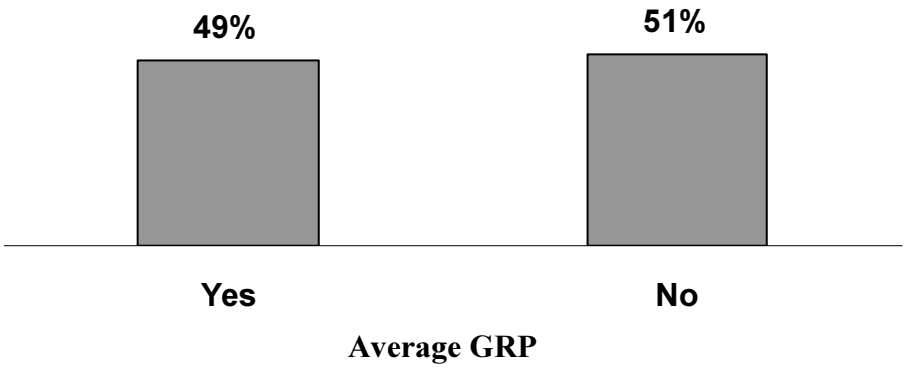
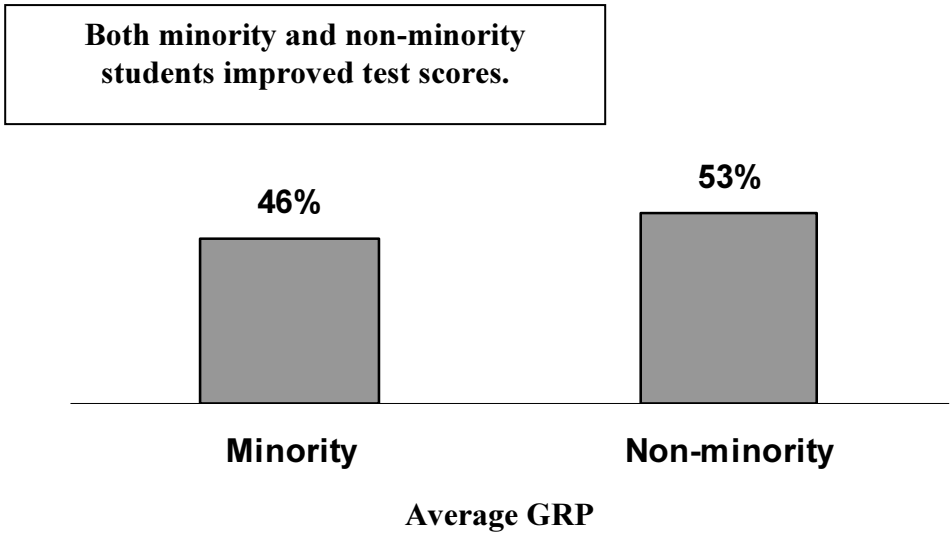


Figure 4(T): Overall Performance Race



School BMS

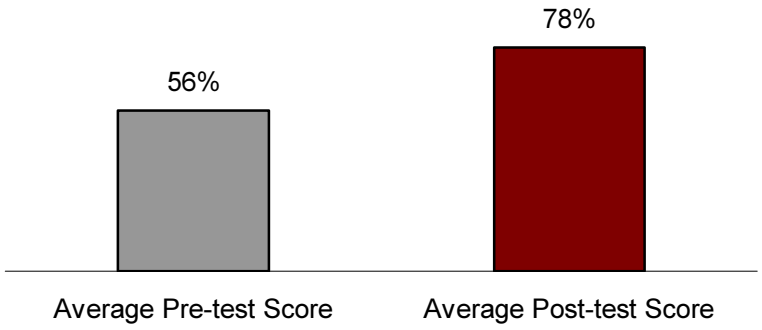
Overall Performance

At School BMS, approximately 27 students completed pre- and post-tests. The results from each participating teacher are listed in Table 1(BMS). **Students at school BMS closed the gap between the average pre-test score and a perfect score by 50 percent.**

Table 1(BMS) Teacher	Number of Students	Average Pre-test Score	Average Post-test Score	Pre-test Gap (100% - Average)	Post-test Gap (100% - Average)	GRP
BMS-A	27	56%	78%	44%	22%	50%
Total	27	56%	78%	44%	22%	50%

A test of significance (t-test) was used to determine whether the results from the post-test are significantly different from the pre-test results (i.e., a difference large enough not to be expected by chance). The resulting t-test value indicates that, on average, **the scores from the post-test are significantly higher than the pre-test scores.** The results of the t-test can be found in Table 2(BMS).

Table 2(BMS) Total	n	Average Pre-test Score	Average Post-test Score	t-test Value	p-Value
All BMS Students	27	56%	78%	7.92	.000
				df=26	



School CMS

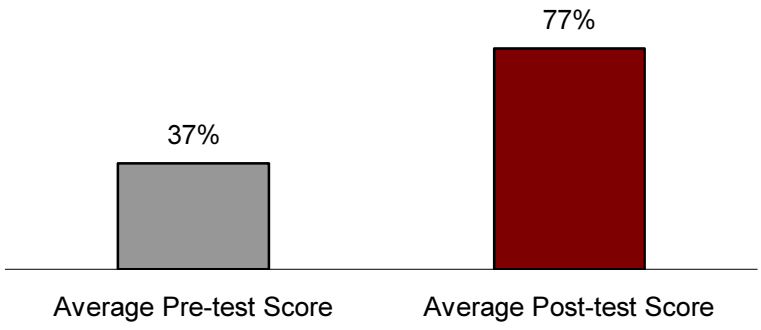
Overall Performance

At School CMS, approximately 49 students completed pre- and post-tests. The results from each participating teacher are listed in Table 1(CMS). **Students at school CMS closed the gap between the average pre-test score and a perfect score by 63 percent.**

Table 1(CMS) Teacher	Number of Students	Average Pre-test Score	Average Post-test Score	Pre-test Gap (100% - Average)	Post-test Gap (100% - Average)	GRP
CMS-A	49	37%	77%	63%	23%	63%
Total	49	37%	77%	63%	23%	63%

A test of significance (t-test) was used to determine whether the results from the post-test are significantly different from the pre-test results (i.e., a difference large enough not to be expected by chance). The resulting t-test value indicates that, on average, **the scores from the post-test are significantly higher than the pre-test scores.** The results of the t-test can be found in Table 2(CMS).

Table 2(CMS) Total	n	Average Pre-test Score	Average Post-test Score	t-test Value	p-Value
All CMS Students	49	37%	77%	19.38	.000
				df=48	



School FZMS

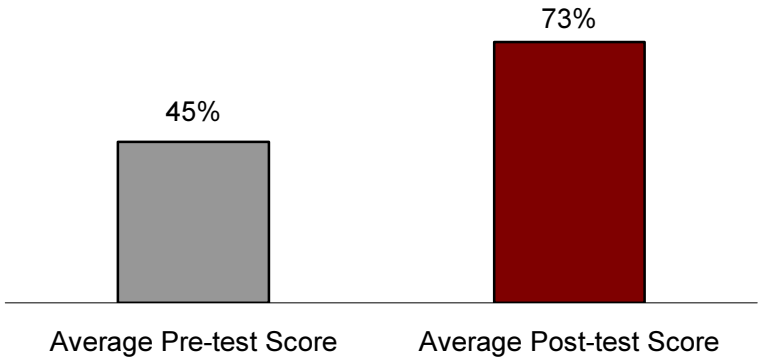
Overall Performance

At School FZMS, approximately 155 students completed pre- and post-tests. The results from each participating teacher are listed in Table 1(FZMS). **Students at school FZMS closed the gap between the average pre-test score and a perfect score by 51 percent.**

Table 1(FZMS) Teacher	Number of Students	Average Pre-test Score	Average Post-test Score	Pre-test Gap (100% - Average)	Post-test Gap (100% - Average)	GRP
FZMS-A	81	48%	78%	52%	22%	58%
FZMS-B	74	42%	68%	58%	32%	45%
Total	155	45%	73%	55%	27%	51%

A test of significance (t-test) was used to determine whether the results from the post-test are significantly different from the pre-test results (i.e., a difference large enough not to be expected by chance). The resulting t-test value indicates that, on average, **the scores from the post-test are significantly higher than the pre-test scores.** The results of the t-test can be found in Table 2(FZMS).

Table 2(FZMS) Total	n	Average Pre-test Score	Average Post-test Score	t-test Value	p-Value
All FZMS Students	155	45%	73%	24.38	.000
				df=154	



School GMS

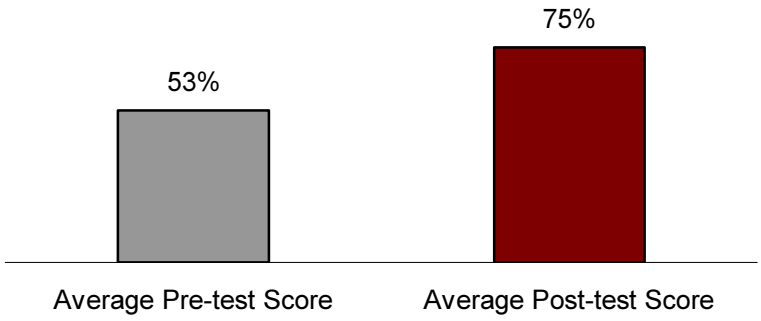
Overall Performance

At School GMS, approximately 52 students completed pre- and post-tests. The results from each participating teacher are listed in Table 1(GMS). **Students at school GMS closed the gap between the average pre-test score and a perfect score by 47 percent.**

Table 1(GMS) Teacher	Number of Students	Average Pre-test Score	Average Post-test Score	Pre-test Gap (100% - Average)	Post-test Gap (100% - Average)	GRP
GMS-A	52	53%	75%	47%	25%	47%
Total	52	53%	75%	47%	25%	47%

A test of significance (t-test) was used to determine whether the results from the post-test are significantly different from the pre-test results (i.e., a difference large enough not to be expected by chance). The resulting t-test value indicates that, on average, **the scores from the post-test are significantly higher than the pre-test scores.** The results of the t-test can be found in Table 2(GMS).

Table 2(GMS) Total	n	Average Pre-test Score	Average Post-test Score	t-test Value	p-Value
All GMS Students	52	53%	75%	8.39	.000
				df=51	



School JMS

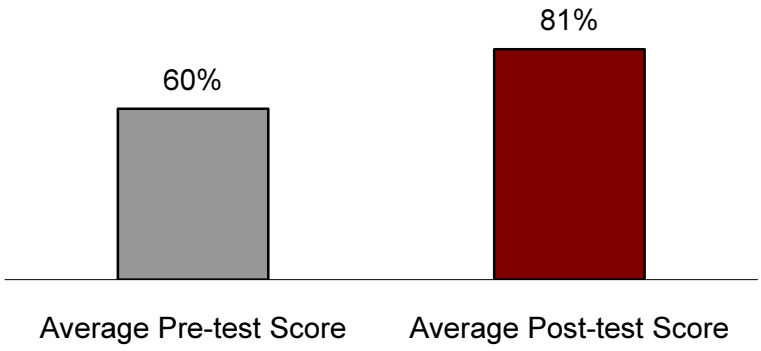
Overall Performance

At School JMS, approximately 158 students completed pre- and post-tests. The results from each participating teacher are listed in Table 1(JMS). **Students at school JMS closed the gap between the average pre-test score and a perfect score by 52 percent.**

Table 1(JMS) Teacher	Number of Students	Average Pre-test Score	Average Post-test Score	Pre-test Gap (100% - Average)	Post-test Gap (100% - Average)	GRP
JMS-A	44	57%	82%	43%	18%	58%
JMS-B	61	56%	79%	44%	21%	52%
JMS-C	53	67%	84%	33%	16%	52%
Total	158	60%	81%	40%	19%	52%

A test of significance (t-test) was used to determine whether the results from the post-test are significantly different from the pre-test results (i.e., a difference large enough not to be expected by chance). The resulting t-test value indicates that, on average, **the scores from the post-test are significantly higher than the pre-test scores.** The results of the t-test can be found in Table 2(JMS).

Table 2(JMS) Total	n	Average Pre-test Score	Average Post-test Score	t-test Value	p-Value
All JMS Students	158	60%	81%	18.46	.000
				df=157	



School MMS

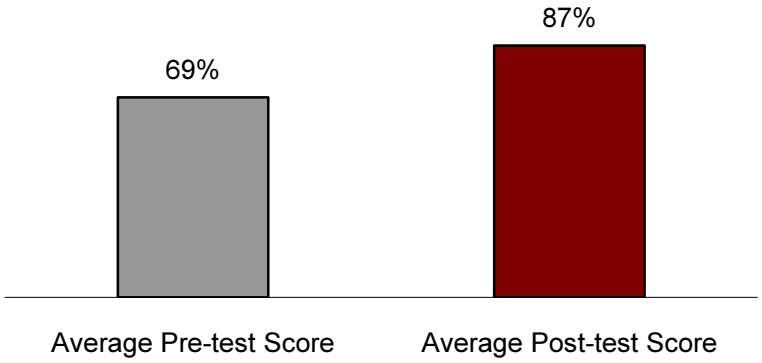
Overall Performance

At School MMS, approximately 32 students completed pre- and post-tests. The results from each participating teacher listed in Table 1(MMS). **Students at school MMS closed the gap between the average pre-test score and a perfect score by 58 percent.**

Table 1(MMS) Teacher	Number of Students	Average Pre-test Score	Average Post-test Score	Pre-test Gap (100% - Average)	Post-test Gap (100% - Average)	GRP
MMS-A	32	69%	87%	31%	13%	58%
Total	32	69%	87%	31%	13%	58%

A test of significance (t-test) was used to determine whether the results from the post-test are significantly different from the pre-test results (i.e., a difference large enough not to be expected by chance). The resulting t-test value indicates that, on average, **the scores from the post-test are significantly higher than the pre-test scores.** The results of the t-test can be found in Table 2(MMS).

Table 2(MMS) Total	n	Average Pre-test Score	Average Post-test Score	t-test Value	p-Value
All MMS Students	32	69%	87%	9.00	.000
				df=31	



School OMS

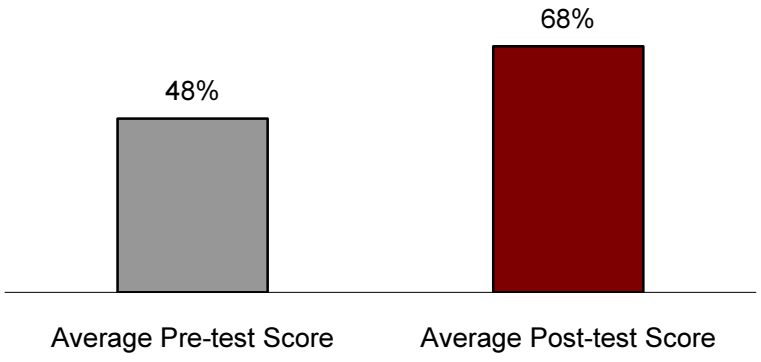
Overall Performance

At School OMS, approximately 108 students completed pre- and post-tests. The results from each participating teacher listed in Table 1(OMS). **Students at school OMS closed the gap between the average pre-test score and a perfect score by 38 percent.**

Table 1(OMS) Teacher	Number of Students	Average Pre-test Score	Average Post-test Score	Pre-test Gap (100% - Average)	Post-test Gap (100% - Average)	GRP
OMS-A	108	48%	68%	52%	32%	38%
Total	108	48%	68%	52%	32%	38%

A test of significance (t-test) was used to determine whether the results from the post-test are significantly different from the pre-test results (i.e., a difference large enough not to be expected by chance). The resulting t-test value indicates that, on average, **the scores from the post-test are significantly higher than the pre-test scores.** The results of the t-test can be found in Table 2(OMS).

Table 2(OMS) Total	n	Average Pre-test Score	Average Post-test Score	t-test Value	p-Value
All OMS Students	108	48%	68%	13.08	.000
				df=107	



School PSMS

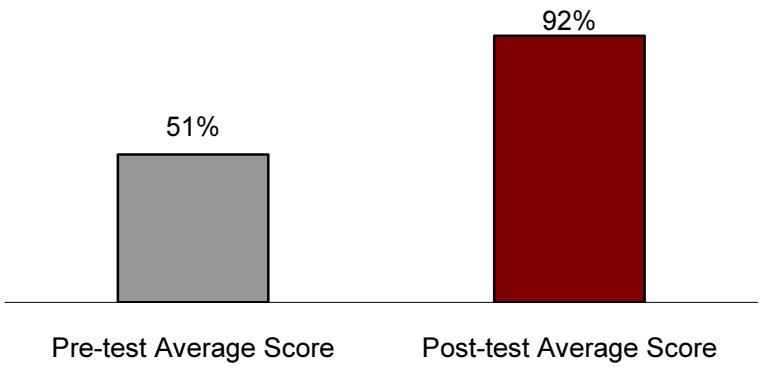
Overall Performance

At School PSMS, approximately 29 students completed pre- and post-tests. The results from each participating teacher listed in Table 1(PSMS). **Students at school PSMS closed the gap between the average pre-test score and a perfect score by 84 percent.**

Table 1(PSMS) Teacher	Number of Students	Average Pre-test Score	Average Post-test Score	Pre-test Gap (100% - Average)	Post-test Gap (100% - Average)	GRP
PSMS-A	29	51%	92%	49%	8%	84%
Total	29	51%	92%	49%	8%	84%

A test of significance (t-test) was used to determine whether the results from the post-test are significantly different from the pre-test results (i.e., a difference large enough not to be expected by chance). The resulting t-test value indicates that, on average, **the scores from the post-test are significantly higher than the pre-test scores.** The results of the t-test can be found in Table 2(PSMS).

Table 2(PSMS) Total	n	Average Pre-test Score	Average Post-test Score	t-test Value	p-Value
All PSMS Students	29	51%	92%	18.75	.000
				df=28	



School SHMS

Overall Performance

At School SHMS, approximately 94 students completed pre- and post-tests. The results from each participating teacher are listed in Table 1(SHMS). **Students at school SHMS closed the gap between the average pre-test score and a perfect score by 58 percent.**

Table 1(SHMS) Teacher	Number of Students	Average Pre-test Score	Average Post-test Score	Pre-test Gap (100% - Average)	Post-test Gap (100% - Average)	GRP
SHMS-A	94	57%	82%	43%	18%	58%
Total	94	57%	82%	43%	18%	58%

A test of significance (t-test) was used to determine whether the results from the post-test are significantly different from the pre-test results (i.e., a difference large enough not to be expected by chance). The resulting t-test value indicates that, on average, **the scores from the post-test are significantly higher than the pre-test scores.** The results of the t-test can be found in Table 2(SHMS).

Table 2(SHMS) Total	n	Average Pre-test Score	Average Post-test Score	t-test Value	p-Value
All SHMS Students	94	57%	82%	18.98	.000
				df=93