



# Impact of TI MathForward on Mathematics Achievement for General Mathematics and Algebra I Students

August 7, 2009

This study measured the average effect of TI MathForward across all junior high school and high school campuses at Richardson Independent School District (RISD), an ethnically and economically diverse large inner ring suburban district. MathForward, developed by Texas Instruments, is a systemic algebra readiness program designed to improve student achievement and to increase teacher content knowledge. It incorporates technology, student assessment, and on-going professional development and teacher collaboration.

The program was implemented in 100-minute mathematics block periods in grades 7 and 8 general mathematics classes and grade 9 Algebra I classes. RISD conducted a roll out implementation of MathForward over four years. In 2005-2006, RISD piloted MathForward at one junior high school with 7<sup>th</sup> and 8<sup>th</sup> grade students who did not pass the Texas Assessment of Knowledge and Skills (TAKS). The following year, 2006-2007, MathForward expanded to include four more junior high schools and the 9<sup>th</sup> grade Algebra I high school students who advanced from the 8<sup>th</sup> grade pilot year. In 2007-2008, MathForward was implemented with all 7<sup>th</sup> and 8<sup>th</sup> grade students who struggled with mathematics at all junior high schools and struggling Algebra I students at all high schools. RISD continued to implement MathForward at the same schools and classes during the 2008-2009 school year.

*At RISD, 7<sup>th</sup> and 8<sup>th</sup> grade students who used TI MathForward achieved higher scores on the Texas Assessment of Knowledge and Skills (TAKS) Mathematics than similar 7<sup>th</sup> and 8<sup>th</sup> grade students who used other mathematics programs during previous years. This study found evidence that the strongest application of MathForward was at grade 7 and a positive, but smaller, result was found for grade 8. The study also found that 9<sup>th</sup> grade Algebra I students who used MathForward scored lower than a similar group of 9<sup>th</sup> grade Algebra I students from previous years. While there is no evidence that 9<sup>th</sup> grade Algebra I students achieve higher after having participated more years in MathForward, students appear to achieve higher if their teachers have more experience using MathForward.*

This study was provided as a MeasureResults™ service by Empirical Education Inc.

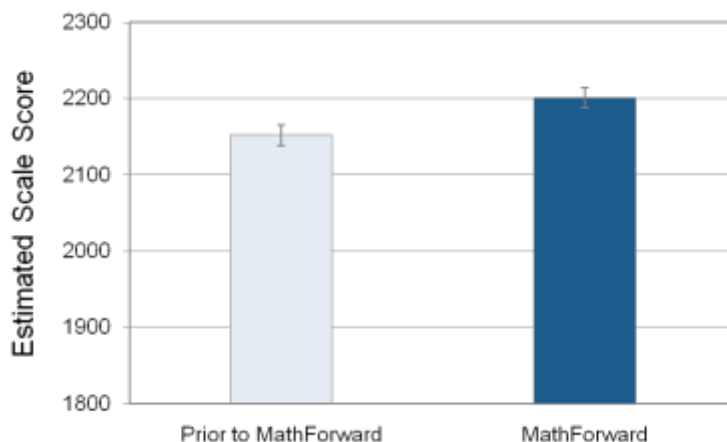
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## Results

**(1) Did students in 7<sup>th</sup> grade classes after the introduction of MathForward achieve higher math scores than students in similar classes from prior years?**

*Yes, 7<sup>th</sup> grade students in MathForward on average performed 11 percentile points higher.*

Figure 1 shows that, on average, students in grade 7 who participated in MathForward performed 11 percentile points (49 scale points) higher than students who did not. The very low  $p$  value of  $<.01$  indicates that the difference is unlikely to be the result of chance.

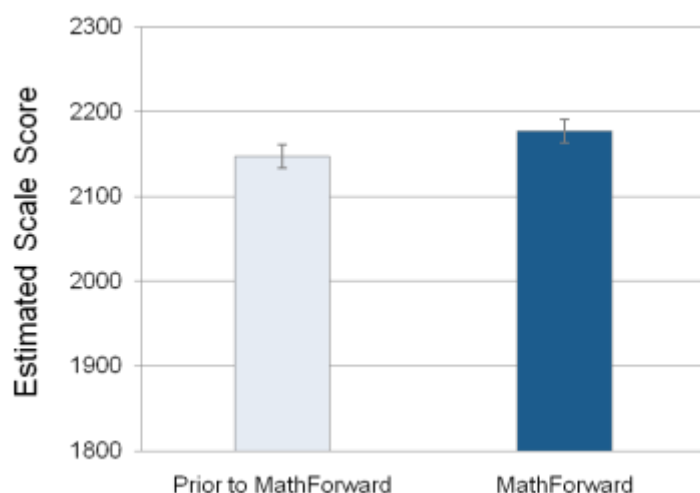


**Figure 1. Estimated Scale Score for Grade 7 Prior To and After MathForward**

**(2) Did students in 8<sup>th</sup> grade classes after the introduction of MathForward achieve higher math scores than students in similar classes from prior years?**

*Yes, 8<sup>th</sup> grade students in MathForward on average performed 9 percentile points higher.*

Figure 2 shows that, on average, students in grade 8 who participated in MathForward performed 9 percentile points (30 scale points) higher than students who did not. The  $p$  value of  $.16$  gives us limited confidence that the difference is not the result of chance.

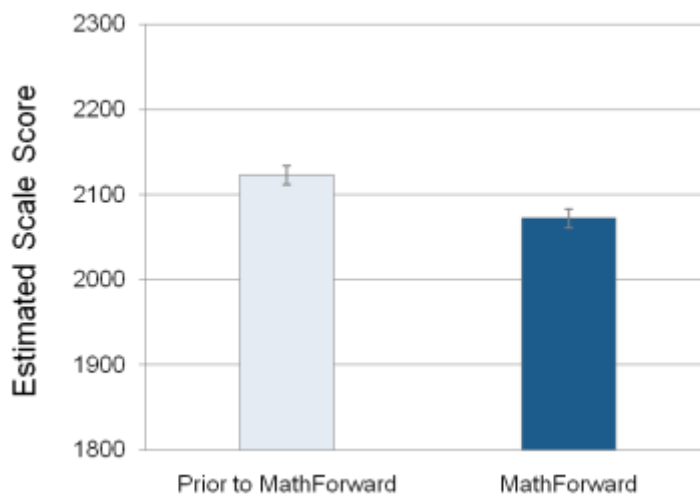


**Figure 2. Estimated Scale Score for Grade 8 Prior To and After MathForward**

**(3) Did students in 9<sup>th</sup> grade classes after the introduction of MathForward achieve higher math scores than students in similar classes from prior years?**

*No, 9<sup>th</sup> grade students in MathForward on average performed 14 percentile points lower.*

Figure 3 shows that, on average, students in grade 9 who participated in MathForward performed 14 percentile points (51 scale points) lower than students who did not. The very low  $p$  value of  $<.01$  indicates that the difference is unlikely to be the result of chance.

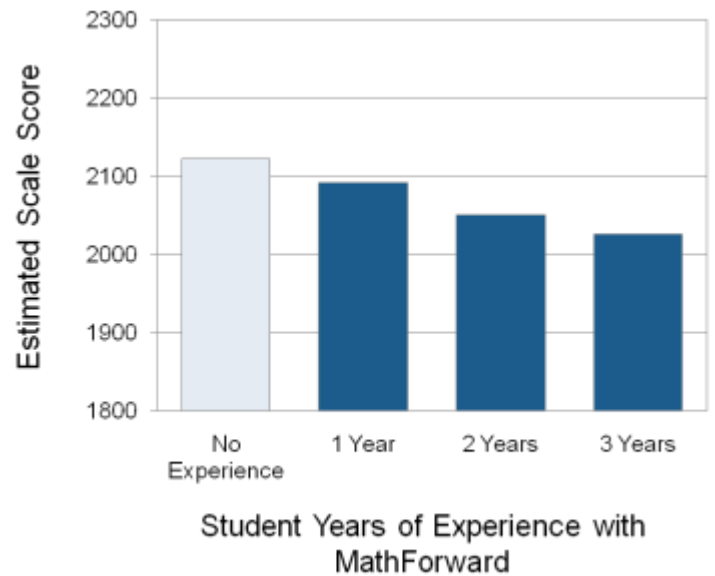


**Figure 3. Estimated Scale Score for Grade 9 Prior To and After MathForward**

**(4) Did 9<sup>th</sup> grade students who had more years of participation in MathForward outperform students with fewer years of participation?**

*No, 9<sup>th</sup> grade students who had more years of participation in MathForward did not perform higher.*

Figure 4 shows that in examining just the students in grade 9, there is no evidence that those who previously participated in MathForward in 7<sup>th</sup> and/or 8<sup>th</sup> grade had an advantage over those who first participated in 9<sup>th</sup> grade.

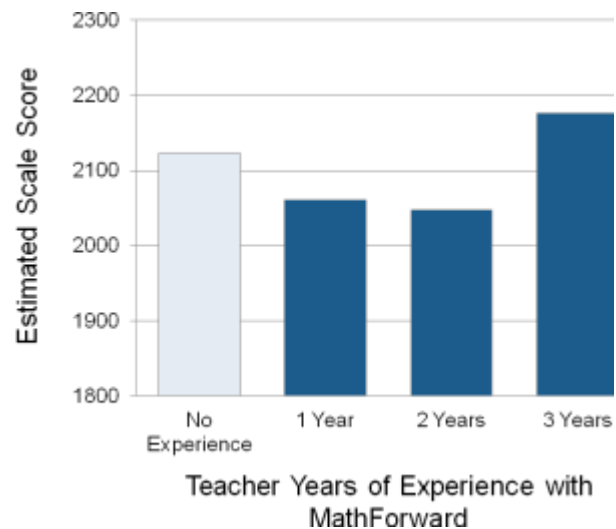


**Figure 4. Estimated Scale Score for Grade 9 Students After Receiving Different Years of MathForward**

**(5) Did 9<sup>th</sup> grade students of teachers who had more years experience with MathForward outperform students of teachers who had no or fewer years of experience with the program?**

*Yes, 9<sup>th</sup> grade students of teachers who had more experience with MathForward performed higher.*

Figure 5 shows that there is some variation in impact with teachers' years of experience. It appears as though a benefit occurs for students whose teachers have three years of experience with MathForward.



**Figure 5. Estimated Scale Score for Grade 9 Teachers with Different Years of Experience with MathForward**

## Conclusion

Although the results of this study cannot be generalized beyond the particular teachers participating in MathForward at RISD, the study found evidence that the strongest application of MathForward was at grade 7 and a positive, but smaller, result was found for grade 8. This report also finds that 9<sup>th</sup> grade Algebra I students who used MathForward scored lower than a similar group of 9<sup>th</sup> grade Algebra I students from previous years. While there is no evidence that 9<sup>th</sup> grade Algebra I students achieve higher after having participated more years in MathForward, students appear to achieve higher if their teachers have more experience using MathForward. It could be the case, that teachers who joined the program early may have already been more successful math teachers. While the Interrupted Time Series (ITS) methodology that was used for this study accounts for many factors, all sources of variation cannot be controlled completely. As with any ITS, the results could be the result of other changes occurring at the same time. The study should be repeated next year to confirm these results and to determine if 9<sup>th</sup> grade student scores continue to improve when their teachers have more experience with MathForward.

## Study Description



### Study Design

The design used to address this study's questions is an Interrupted Time Series (ITS). Within each grade level, the mathematics achievement of students who used TI MathForward is compared to the achievement of comparable students who used other materials during the years prior to the introduction of MathForward. Since RISD rolled out MathForward beginning at the 2005-2006 school year and gradually expanded to more grades and teachers, some students and teachers had more exposure to MathForward than others. The study first called for identifying all classes that used MathForward and then identifying teachers who taught using MathForward in any of the school years and who taught the same classes prior to using MathForward. This ensured that the teachers were kept constant so any differences associated with MathForward would not be accounted for by teacher differences. It was found that students who repeated a grade were unevenly distributed between MathForward and other classes and therefore dropped from the study. The study then estimated for each grade level the difference between student achievement in MathForward and achievement of comparable students taught by the teacher prior to MathForward. Also, since by 9<sup>th</sup> grade it was possible for students to have participated in MathForward in 7<sup>th</sup> and 8<sup>th</sup> grade, it was of interest whether there might be a cumulative effect. Similarly for teachers, the study examined whether years of experience with MathForward was associated with higher student achievement.

### Outcome measure

Findings of this study are based on data from the TAKS Mathematics administered in the spring of the 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, and 2008-2009 academic years. Since the TAKS was designed to be horizontally equated, student scores can be compared across years within a single grade level without additional adjustment.

**Levels of confidence in our results:** Results are reported based on statistical calculations that give a measure of confidence expressed as a probability or *p* value. A low *p* value indicates a low probability that we would detect a difference like the one found in the study if no difference actually existed. A *p* value less than .05 gives us strong confidence in the result (a level conventionally called statistically significant), while a *p* value greater than .20 gives no confidence. Between the two we may have some or limited confidence. Bar graphs use the conventions shown in the table to the right. The confidence intervals on two adjacent bars are to be interpreted as: "an 80% probability exists that the tops of the bars simultaneously fall somewhere within their respective interval." Where the *p* value is greater than .20, the intervals overlap. Estimates of the size of the difference are generally in the measurement scale and may also be expressed as percentile ranks.

Results for the <b>control or comparison</b> group are shown as	
Results for the group using the <b>program</b> being tested are shown as	
We also provide the 80% confidence intervals for some bar graphs	