



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

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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, published by Texas Instruments, is a systematic mathematics reform program designed to enrich, expand, and integrate with a typical middle school or algebra mathematics curriculum. MathForward incorporates technology, student assessment, on-going teacher professional development, and fosters collaboration among teachers to improve student achievement and increase teacher content knowledge.

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

*Seventh 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.

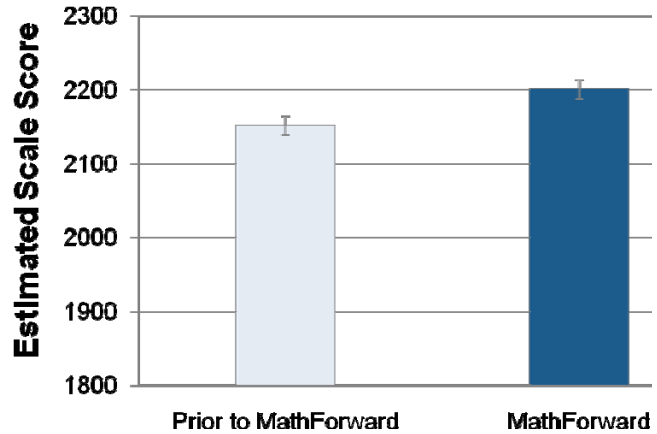


Figure 1. Estimated Scale Score for Grade 7 Prior To and After MathForward

*Eighth 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.

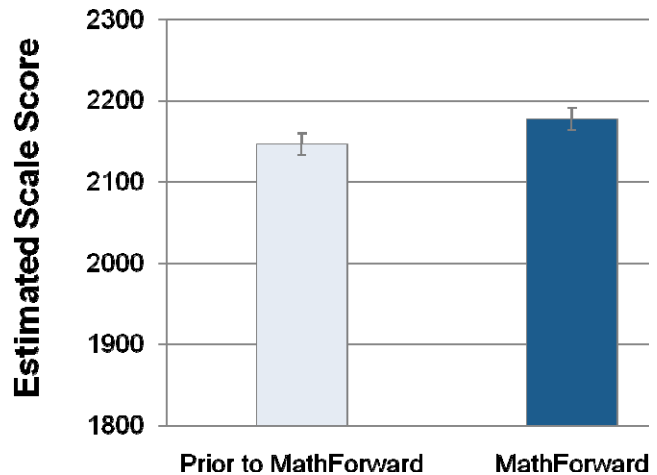


Figure 2. Estimated Scale Score for Grade 8 Prior To and After MathForward

*Ninth 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.

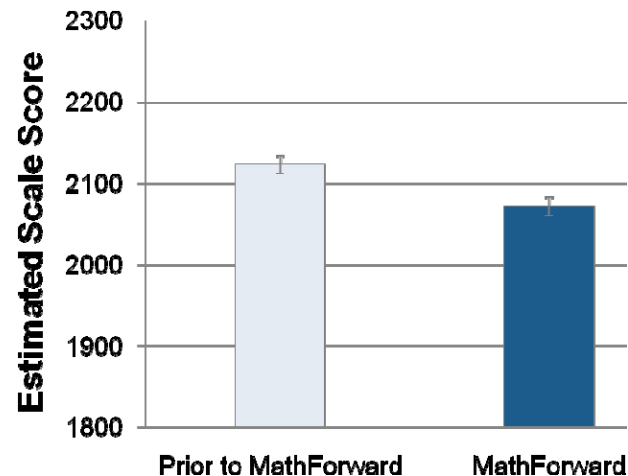


Figure 3. Estimated Scale Score for Grade 9 Prior To and After MathForward

*Ninth 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.

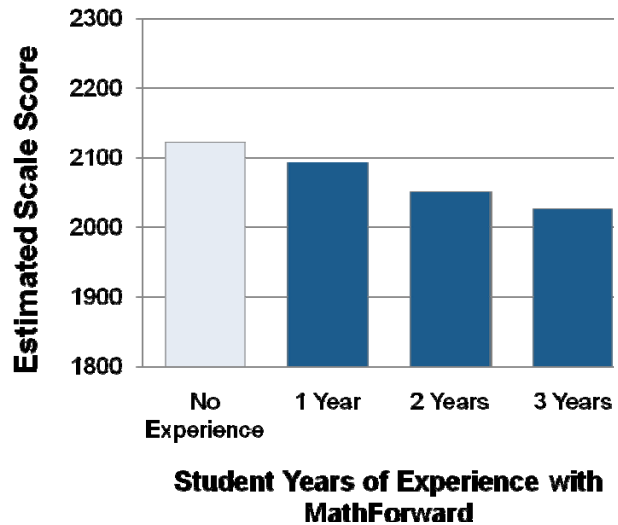


Figure 4. Estimated Scale Score for Grade 9 Students After Receiving Different Years of MathForward

*Ninth 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.

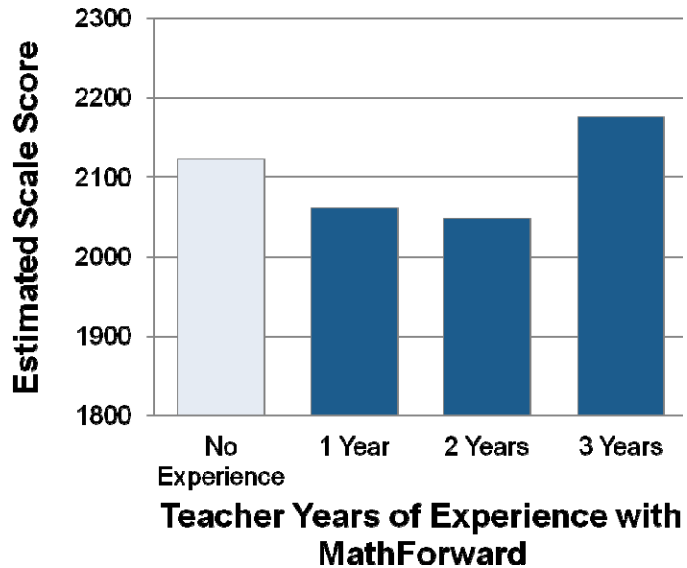


Figure 5. Estimated Scale Score for Grade 9 Teachers with Different Years of Experience with MathForward

## 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.

