# Improved Longitudinal Achievement in English Language Arts, Math, Science, and Social Studies by Students in St. Mary Parish Schools who used Scientific Learning Products

## ABSTRACT

**Purpose:**  This longitudinal study investigated the academic achievement of elementary and middle school students in the St. Mary Parish Schools, focusing on the six-year period after the Scientific Learning Products were first used within the district.  The Fast ForWord products were first implemented during the 2006-2007 school year at the elementary schools, followed by implementation at the middle school during the 2008-2009 school year.  Reading Assistant was first implemented during the 2009-2010 school year.

**Results:**  From 2006 to 2012, the number of 4th graders testing at or above the Basic level rose from 51% to 78% in English Language Arts, from 57% to 81% in Math, from 49% to 66% in Science, and from 54% to 66% in Social Studies.  From 2008 to 2011, the number of 8th graders testing at or above the Basic level rose from 57% to 71% in English Language Arts, from 56% to 61% in Math, from 52% to 59% in Science, and from 53% to 66% in Social Studies. In addition, the grade promotion rate for 4th graders improved from 65% to 87% between 2006 and 2012. Finally, there was an 18% decrease in the number of students needing Special Education services district-wide (not including students identified as Gifted and Talented).

**Study Design & Participants:**  The design of this study was a longitudinal district-wide observational study using high stakes tests of English Language Arts, Math, Science, and Social Studies achievement.  Study participants were elementary and middle school students in the St. Mary Parish Schools in St. Mary Parish, Louisiana.

**Materials & Implementation:**  Following staff training on the Fast ForWord products, students in eight elementary schools started using the Fast ForWord products during the 2006-2007 school year.  The rest of the elementary schools and the middle schools implemented the products two years later, during the 2008-2009 school year.   The Scientific Learning Reading Assistant product was first implemented during the 2009-2010 school year.  Each spring, students in 4th grade and 8th grade had their English Language Arts, Math, Science, and Social studies achievement evaluated with the Louisiana Educational Assessment Program (LEAP).

**Keywords:  Louisiana, elementary school, middle school, rural district, observational study, longitudinal study, Title I, Louisiana Educational Assessment Program (LEAP).**

## INTRODUCTION

Numerous research studies have shown that cognitive and oral language skills are under-developed in struggling readers, limiting their academic progress (Lyon, 1996).  University-based research studies reported the development of a computer software product that focused on learning and cognitive skills, and provided an optimal learning environment for building the memory, attention, processing and sequencing skills critical for reading success (Merzenich et al., 1996; Tallal et al., 1996).  This prototype of the Fast ForWord Language software showed that an optimal learning environment and focus on early reading and cognitive skills resulted in dramatic improvements in the auditory processing and language skills of school children who had specific language impairments (Merzenich et al, 1996; Tallal et al., 1996) or were experiencing academic reading failure (Miller et al., 1999).

Further research has demonstrated that the use of an optimal learning environment with a focus on reading and cognitive skills not only benefits the auditory processing and language skills of school children who have specific language impairments, but can benefit the reading achievement of a wide range of students.

Educators at the St. Mary Parish Schools were interested in evaluating the effectiveness of an optimal learning environment with a focus on early reading and cognitive skills as a way to improve the English language arts, math, science, and social studies achievement of their students. In this study, the Fast ForWord products and Scientific Learning Reading Assistant software were used by the district's elementary and middle schools.

## METHODS

### Participants

St. Mary Parish, with a population of 52,000, occupies approximately 1,100 square miles in rural south, central Louisiana. The St. Mary Parish Schools serve approximately 10,000 students, of whom 72% are economically disadvantaged.

At the beginning of the 2006-2007 school year, the St. Mary Parish Schools started school-wide use of the Fast ForWord products at seven elementary schools that were in Academic Assistance (a designation for schools that fail to improve sufficiently). Students at an eighth struggling elementary school started using the products later that year. During the 2008-2009 school year, the remaining elementary schools and the middle schools began using the Fast ForWord products as well. The elementary schools initially focused on students in $3^{rd}$ through $5^{th}$ grades before expanding to the lower grades; the middle schools used school-wide implementations. In addition, during the 2009-2010 school year, the Scientific Learning Reading Assistant product was implemented.

This study focuses on the longitudinal trends of LEAP achievement levels of the St. Mary Parish district as a whole, beginning in 2003 (three years before Fast ForWord implementation) and extending through 2012.

### Implementation

Educators were trained in current and established neuroscience findings on how phonemic awareness and the acoustic properties of speech impact rapid development of language and reading skills; the importance of guided oral reading practice for building reading fluency; the scientific background validating the efficacy of the products; methods for assessment of potential candidates for participation; the selection of appropriate measures for testing and evaluation; effective implementation techniques; approaches for using the online reporting tools, Scientific Learning® Progress Tracker and MySciLEARN™, to monitor student performance; and techniques for measuring the gains students have achieved after Fast ForWord and Reading Assistant participation.

### Materials

The Fast ForWord products are computer-based products that combine an optimal learning environment with a focus on early reading and cognitive skills. Each product includes several exercises designed to build cognitive skills critical for all learning, such as attention and memory. These exercises simultaneously develop academic skills critical for reading, such as English language conventions, phonemic awareness, vocabulary, and comprehension.

Scientific Learning Reading Assistant is a computer-based tutor for guided oral reading. Combining advanced speech recognition technology with research-based interventions, Reading Assistant helps elementary and secondary students strengthen their reading fluency, vocabulary and comprehension.

Some of the primary skills developed by these products are outlined below in Table 1. More detailed descriptions of the exercises and learning modes within each product can be found online at http://www.scientificlearning.com/exercises.

### Assessments

In the spring of 2003 through 2012, the English language arts, math, science, and social studies achievement of students in $4^{th}$ and $8^{th}$ grade was assessed with the Louisiana Educational Assessment Program (LEAP).

**Louisiana Educational Assessment Program (LEAP):**
The LEAP is part of Louisiana's criterion-referenced state testing program. School personnel administer the LEAP to students in grades 4 and 8 to measure how well a student has mastered the state content standards. Students receive a scaled score and one of five achievement ratings: Unsatisfactory, Approaching Basic, Basic, Mastery, and Advanced. To be promoted to the next grade, students must score Basic or above on either the English Language Arts or Math tests of the LEAP.

### Analysis

Scores from the LEAP were reported in terms of the percent at each achievement level. Analyses were conducted on the percentages using the statistical test of two proportions and all statistical analyses used a p-value of less than 0.05 as the criterion for identifying statistical significance.

| Product Name | Listening Accuracy & Auditory Sequencing | Auditory Word Recognition | English Language Conventions | Following Directions | Listening Comprehension | Phonological Skills / Phonemic Awareness | Phonics / Word Analysis | Fluency | Vocabulary | Reading Comprehension |
|---|---|---|---|---|---|---|---|---|---|---|
| **Primary Skills** | | | | | | | | | | |
| Fast ForWord Language Basics | • | | | | | | | | | |
| Fast ForWord Language (v1 and v2) | • | • | • | • | | • | | | • | |
| Fast ForWord Literacy | • | • | • | • | • | • | | | • | |
| Fast ForWord Literacy Advanced | • | | • | • | • | • | • | | • | |
| Fast ForWord Language to Reading (v1 and v2) | • | | • | • | • | • | • | | • | |
| Fast ForWord Reading Level 1 | | | | | • | • | • | • | • | • |
| Fast ForWord Reading Level 2 | | | | | • | • | • | • | • | • |
| Fast ForWord Reading Level 3 | | | | | | • | • | • | • | • |
| Fast ForWord Reading Level 4 | | | | | | • | • | • | • | • |
| Fast ForWord Reading Level 5 | | | | | | • | • | • | • | • |
| Reading Assistant | | | | | | | | • | • | • |

*Table 1: The Fast ForWord products work on numerous cognitive and early reading skills. The primary skills focused on by each product are noted in the table.*

## RESULTS

### Participation Level

Research conducted by Scientific Learning shows a relationship between product use and the benefits of the product. Product use is composed of content completed, days of use, and adherence to the chosen protocol (participation and attendance levels). From the beginning of Fast ForWord implementation in St. Mary Parish through 2012, students used the 30-, 40-, and 50-minute protocols. These protocols call for students to use Fast ForWord products for 30, 40, or 50 minutes a day, five days per week for eight to sixteen weeks. It is recommended that students complete two products each year. Detailed product use is shown in Table 2 (for Reading Assistant) and Table 3 and 4 (for Fast ForWord). Overall, nearly half the students (47%) completed three or more Fast ForWord products.

| Reading Assistant Use | | | |
|---|---|---|---|
| Product | n | Days Participated | Number of Calendar Days |
| Reading Assistant | 5707 | 52 | 469 |

*Table 2. Product use data for Reading Assistant. First use on the Reading Assistant product was during the 2009-2010 school year.*

| Fast ForWord Use | | | | | | |
|---|---|---|---|---|---|---|
| **Product** | **n** | **Days Participated** | **Number of Calendar Days** | **Percent Complete** | **Attendance Level** | **Participation Level** |
| Fast ForWord Language Basics | 924 | 12 | 25 | 97% | 78% | 96% |
| Fast ForWord Language | 1690 | 36 | 82 | 75% | 82% | 97% |
| Fast ForWord Language v2 | 4912 | 46 | 105 | 88% | 81% | 97% |
| Fast ForWord Literacy | 3109 | 35 | 140 | 88% | 77% | 94% |
| Fast ForWord Language to Reading | 1098 | 44 | 129 | 72% | 81% | 98% |
| Fast ForWord Language to Reading v2 | 3695 | 58 | 150 | 83% | 79% | 97% |
| Fast ForWord Literacy Advanced | 2492 | 48 | 169 | 78% | 76% | 92% |
| Fast ForWord Reading 1 | 4383 | 24 | 73 | 93% | 79% | 97% |
| Fast ForWord Reading 2 | 5388 | 34 | 108 | 90% | 80% | 97% |
| Fast ForWord Reading 3 | 5270 | 53 | 178 | 80% | 78% | 96% |
| Fast ForWord Reading 4 | 3332 | 49 | 160 | 77% | 77% | 96% |
| Fast ForWord Reading 5 | 1611 | 62 | 181 | 41% | 75% | 95% |
| Total | 9428 | 171 | 519 | -- | 77% | 95% |

*Table 3. Product use data for Fast ForWord participants who started a product from fall 2006 through fall 2013. Data shown: total number of participants, average number of days participated, average calendar days between start and finish, average percentage of content completed, average participation and attendance levels. Note that many students (61%) completed two or more products.*

| Number of Products Completed | Percent of Students |
|---|---|
| 0 | 22.8% |
| 1 | 15.9% |
| 2 | 14.0% |
| 3 | 14.5% |
| 4 | 14.0% |
| 5 | 11.7% |
| 6 or more | 7.2% |

*Table 4. Nearly half the students in this study (47%) completed three or more products.*

**Assessment Results**

Analysis of District-Wide LEAP Performance
Students at eight struggling elementary schools started using the Fast ForWord products during the 2006-2007 school year. Since that year, fourth graders in the St. Mary Parish Schools have shown dramatic improvements in their LEAP achievement. Since the implementation of Fast ForWord products in St. Mary Parish middle schools during the 2008-2009 school year, eighth graders have shown improvements in their LEAP achievement as well.

In 2008, for the first time in a decade, the district exceeded the state average for the percentage of

fourth graders performing at or above the Basic level on the initial LEAP ELA test; for all testers, the district's percentage exceeded those statewide a couple years later. During the 2008-2009 and 2009-2010 school years, Fast ForWord was extended to the rest of the district, including eighth graders, and the schools began using Reading Assistant.

Table 5 shows the annual percentages of St. Mary Parish fourth and eighth grade students who scored at or above the Basic level on their initial LEAP tests for English Language Arts, Math, Science, and Social Studies.

| Grade | Subject | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | Net Change* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4th | ELA | 50% | 49% | 56% | 51% | 61% | 68% | 69% | 75% | 81% | 78% | + 27%† |
| | Math | 52% | 49% | 58% | 57% | 57% | 67% | 66% | 76% | 78% | 81% | + 24%† |
| | Science | 42% | 53% | 55% | 49% | 56% | 61% | 63% | 67% | 68% | 66% | + 17%† |
| | Social Studies | 53% | 53% | 50% | 54% | 62% | 57% | 58% | 69% | 68% | 66% | + 12% † |
| 8th | ELA | 51% | 42% | 45% | 52% | 57% | 57% | 65% | 62% | 64% | 71% | + 14%† |
| | Math | 50% | 53% | 57% | 51% | 58% | 56% | 60% | 61% | 58% | 61% | + 5% |
| | Science | 45% | 43% | 50% | 46% | 55% | 52% | 58% | 57% | 59% | 59% | + 7% † |
| | Social Studies | 44% | 47% | 47% | 51% | 55% | 53% | 60% | 58% | 61% | 66% | + 13%† |

*Table 5. Changes in percentage of St. Mary Parish students testing at or above the Basic level on the LEAP assessment. Data are from all tested St. Mary Parish students. Periods of Fast ForWord/Reading Assistant implementation are shaded green. *: Net Change is measured from the year before Fast ForWord participation to 2012, i.e. 2006-2012 for 4th graders, and 2008-2012 for 8th graders. †: Using the statistical test of two proportions, the longitudinal changes between the year prior to use and 2012 are statistically significant (p<0.05).*

### District-Wide 4th Grade LEAP Performance

In the six years of elementary school Fast ForWord implementations and three years of Reading Assistant implementations, the percentage of fourth graders in the district performing at or above Basic on the LEAP ELA test, including all testers, increased from 51% to 78% (Figure 1).
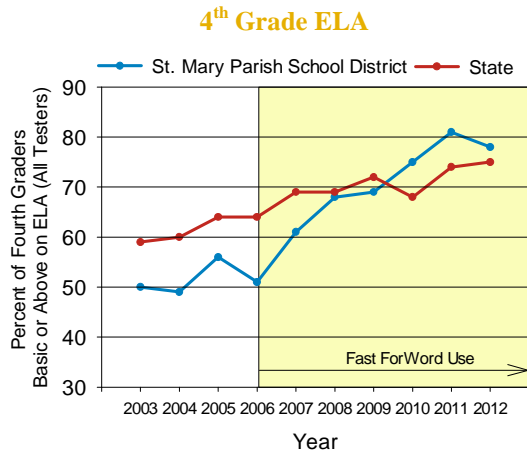


*Figure 1. Longitudinal LEAP English Language Arts trends for St. Mary Parish 4th grade all testers (blue) and the statewide average for 4th grade all testers (red).*

Similarly, the percentage of fourth graders in the district performing at or above Basic on the LEAP Math test, including all testers, increased from 57% to 81% (Figure 2).

The percentage of fourth graders in the district performing at or above Basic on the LEAP Science test, including all testers, increased from 49% to 66% (Figure 3).
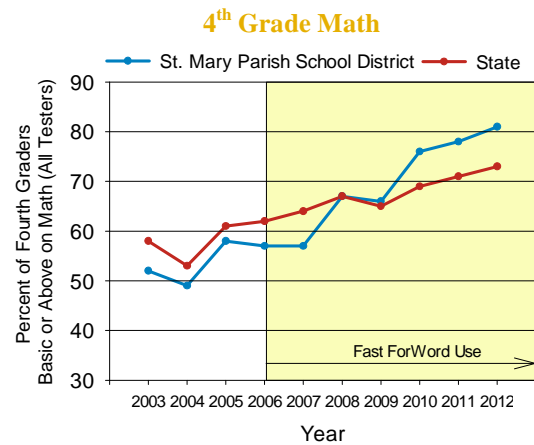


*Figure 2. Longitudinal LEAP Math trends for St. Mary Parish 4th grade all testers (blue) and the statewide average for 4th grade all testers (red).*
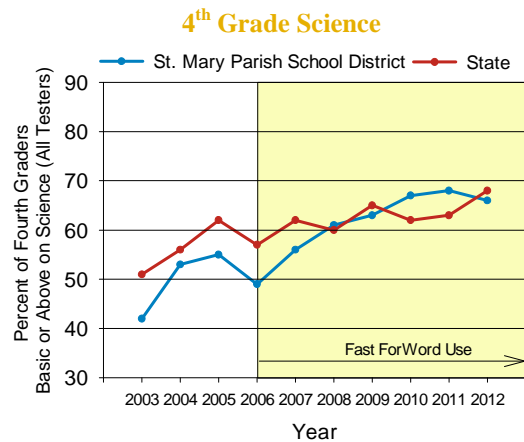


*Figure 3. Longitudinal LEAP Science trends for St. Mary Parish 4th grade all testers (blue) and the statewide average for 4th grade all testers (red).*

The percentage of fourth graders in the district performing at or above Basic on the LEAP Social Studies test, including all testers, increased from 54% to 66% (Figure 4).
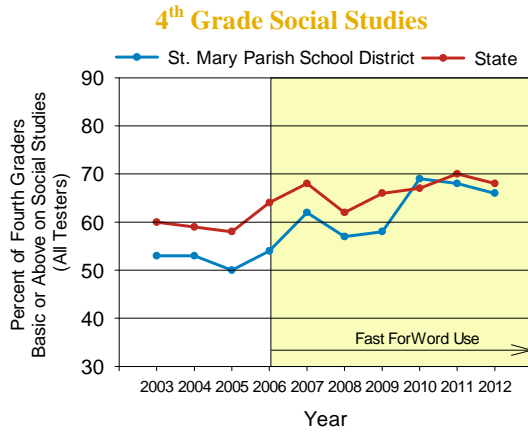
**4th Grade Social Studies**



*Figure 4. Longitudinal LEAP Social Studies trends for St. Mary Parish 4th grade all testers (blue) and the statewide average for 4th grade all testers (red).*

These district-wide results show that St. Mary Parish 4th graders made dramatic improvements in their achievement across LEAP subject areas between 2006 and 2012, the six-year period corresponding to the use of Scientific Learning products.

District-Wide 8th Grade LEAP Performance

Across four years of middle school Fast ForWord implementations and three years of Reading Assistant implementations, the number of eighth graders in the district performing at or above Basic on the LEAP ELA test, including all testers, increased from 57% to 71% (Figure 5).
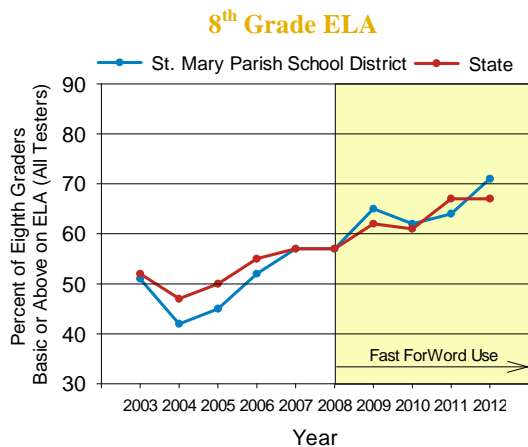
**8th Grade ELA**



*Figure 5. Longitudinal LEAP English Language Arts trends for St. Mary Parish 8th grade all testers (blue) and the statewide average for 8th grade all testers (red).*

The percentage of eighth graders performing at or above Basic on the LEAP Math test, including all testers, increased from 56% to 61% (Figure 6).
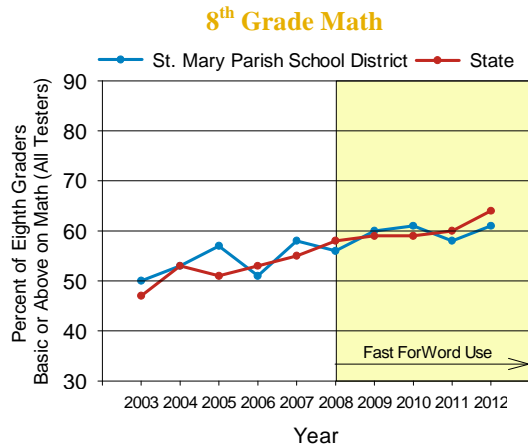
**8th Grade Math**



*Figure 6. Longitudinal LEAP Math trends for St. Mary Parish 8th grade all testers (blue) and the statewide average for 8th grade all testers (red).*

The percentage of eighth graders performing at or above Basic on the LEAP Science test, including all testers, increased from 52% to 59% (Figure 7).
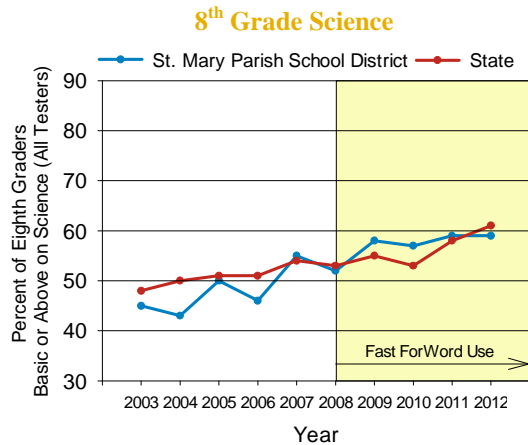
**8th Grade Science**



*Figure 7. Longitudinal LEAP Science trends for St. Mary Parish 8th grade all testers (blue) and the statewide average for 8th grade all testers (red).*

The percentage of eighth graders in the district performing at or above Basic on the LEAP Social Studies, including all testers, increased from 53% to 66% (Figure 8).
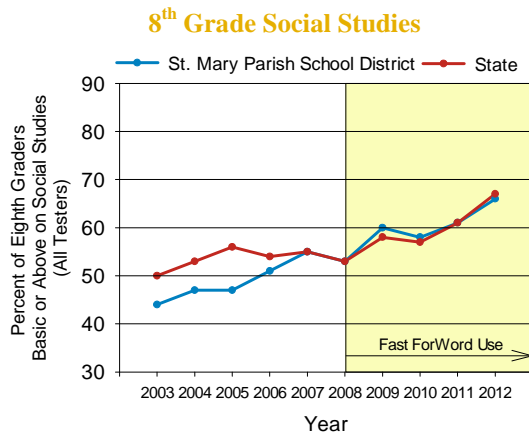
## 8th Grade Social Studies



*Figure 8. Longitudinal LEAP Social Studies trends for St. Mary Parish 8th grade all testers (blue) and the statewide average for 8th grade all testers (red).*

These district-wide results show that St. Mary Parish 8th graders made improvements in their achievement across LEAP subject areas between 2008 and 2012, the four-year period corresponding to Fast ForWord implementation.

Analysis of 4th Grade Promotion Rates

In addition to the achievement gains demonstrated by the analyses above, St. Mary Parish collected longitudinal data on the percentage of 4th grade students who met the promotional standards each year after the spring administration of the LEAP. Figure 9 shows the trend in 4th grade promotion rates from 2006-2012, during which time the rate improved from 65% to 87%.
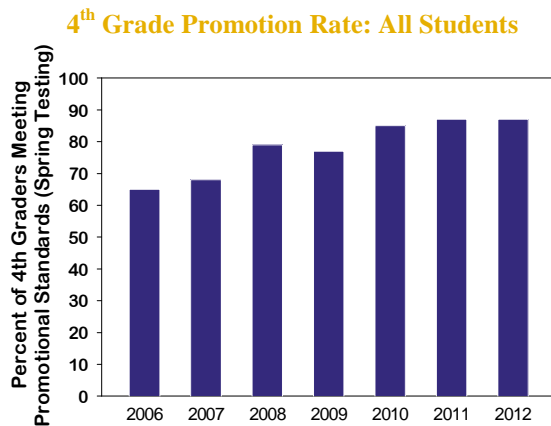
## 4th Grade Promotion Rate: All Students



*Figure 9. Percentage of St. Mary 4th graders meeting promotional standards from 2006-2012.*

By moving students from the General Education population into the Special Education population, it would be possible to increase the percentage of proficient students in each, without making any changes in the promotion rate of individual students.

Between 2006 and 2013, the St. Mary Parish Schools did just the opposite; not only did they increase the overall promotion rate, but the number of students requiring Special Education services underlined decreased by 18% (not including students receiving services for Gifted and Talented) (Figure 10).
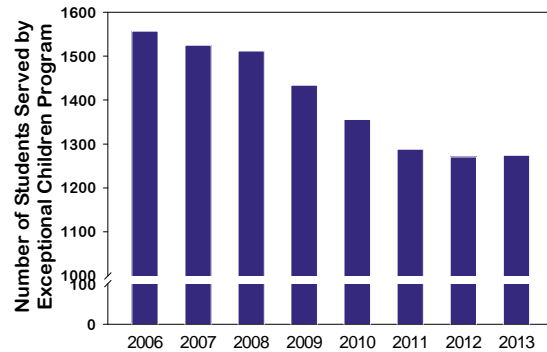


*Figure 10. The number of students served by the Exceptional Children Program, excluding those who are Gifted and Talented, has decreased by 18% since 2006.*

## DISCUSSION

Over the past nine years (2003 to 2012), the St. Mary Parish Schools has increased the overall proficiency of their elementary and middle school students on the LEAP English Language Arts, Math, Science, and Social Studies tests.

The students' improvements have impacted the district performance with the District Performance Score (DPS). Using the current A-F system for grading district performance, between 2006 and 2012, the St. Mary Schools' DPS score improved from a D to a B.

These findings demonstrate that, within the St. Mary Parish Schools, an optimal learning environment coupled with a focus on cognitive and early reading skills can help students attain a higher level of English Language Arts, Math, Science, and Social Studies achievement.

## CONCLUSION

Cognitive and language skills are critical for all students, impacting their ability to benefit from instruction, follow directions and participate in class discussions. Strong cognitive skills also provide a critical foundation for building language, reading, and math skills. After Fast ForWord and Reading Assistant use, students in the St. Mary Parish Schools made significant gains in their English language arts and math achievement. These results replicate other

studies and suggest that using the Scientific Learning products strengthened the students' foundational skills and better positioned them to benefit from the classroom curriculum.

**Notes:**

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