In Response to a Meta-Analysis by Strong et al.

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Executive Summary

Within the scientific community, it is common for researchers to disagree on the theoretical assumptions that are at the foundation of controlled investigations, to disagree on optimal study methodology, and to disagree on the interpretation of outcomes. Scientific debate of this kind is healthy and, when it is unbiased and factually based, it can propel science forward. However, some debate is biased and not based on facts; occasionally even research publications fall into this category.

A 2010 publication by Strong, Torgerson, Torgerson, & Hulme is a meta-analysis that summarizes six studies. The studies are on two of the eleven FastForWord products. The two products are the first product in the Fast ForWord Language Series (Fast ForWord Language which has been replaced by Fast ForWord Language v2) and the first product in the Fast ForWord Literacy Series (Fast ForWord Middle & High School which has been replaced by Fast ForWord Literacy). The authors refer to these old versions of the two products with the all-encompassing term "Fast ForWord". The authors concluded that "there was no significant effect of Fast ForWord on any outcome measure in comparison to active or untreated control groups." The analysis failed to find positive effects of the Intervention because of issues with the studies the authors selected and problems with the way the results were combined in the analysis.

The publication is misleading in several ways. Most of the studies that were selected had very poor implementations, and therefore are not representative of performance improvements following proper usage. Studies on the effectiveness of educational interventions are inherently difficult, in part because of the many skill sets required to conduct these studies. University-based researchers know how to design studies and analyze the results, while k-12 educators know how to motivate students and implement interventions. Among the many high quality studies of the Fast ForWord products, it is notable that some of the strongest results have occurred when the products were implemented by k-12 educators who had returned to universities for advanced training, while weaker results have often come from studies orchestrated by university academics.

Strong et al. applied extremely restrictive study selection criteria to a corpus of more than two hundred studies on eleven Fast ForWord products – only six studies were included in their report and only five were included in their meta-analysis. The selection criteria were statistically inappropriate (such as excluding randomized studies if the randomly assigned groups did not meet desired criteria) and biased. Published between 2004 and 2009, the five studies looked at the impact of two old Fast ForWord products that students used prior to 2005. By focusing only on selected studies that had been published in peer-reviewed journals, they excluded numerous high quality studies that were reviewed and published elsewhere, including studies published in the dissertations of k-12 educators who had returned to universities for further training (Slattery, 2003; Rogowsky, 2010; Marion, 2004), studies performed by regional consortiums or state education departments (Schultz Center for Teaching & Leadership, 2009; Nevada Department of Education, 2010), and other studies that met the criteria of agencies specifically set up to review educational research (What Works Clearinghouse, 2006, 2007, 2010). These selection choices significantly bias the results of the meta-analysis, and exclude the updated products (Fast ForWord Language v2 and Fast ForWord Literacy) as well as the other nine Fast ForWord products. Furthermore, five of the six studies selected for Strong et al.'s review had poor implementations. In two studies (Borman et al., 2009; Rouse & Krueger, 2004), the researchers acknowledged their implementation problems and conducted additional analyses to examine the relationship between Fast ForWord product use and reading gains. Both groups found greater impacts on reading scores among students who had better product use. For example, Borman et al. found a statistically significant effect of program completion on reading comprehension; completing the program had a moderate to large impact on reading comprehension (effect size of $d = 0.50$). The updated products have proven more efficient, thereby making them easier to implement in school settings, reducing or eliminating some of the challenges faced by these earlier participants.

Of the studies included in the Strong et al. meta-analysis, Gillam, et al.'s 2008 study had the best implementation. In that study, students who used the Fast ForWord Language product achieved statistically significant improvements in language and reading skills – improvements comparable to receiving 50 hours of one-on-one intervention with a certified and licensed speech and language therapist. Discussing the results of this study, the lead author noted, "It is clear that a large majority of the children in our study who received treatment with Fast ForWord Language showed substantial improvements, reversing a long-time trend… 74% of the children in our study who received Fast ForWord Language had follow-up scores that were significantly greater than their pre-test scores six months after treatment ended. I judge that to be a substantial benefit." Overall, the studies reviewed by Strong et al. illustrate that Fast ForWord products positively impact students' language and reading skills – but only if students actually use the products as intended.

In the years since these studies were conducted, Scientific Learning has improved the Fast ForWord software and released a number of new products and services. These changes have helped schools to achieve high-quality implementations and helped students to complete more content in less time. We encourage scientists and educators to consider the entire corpus of more than two hundred studies on Fast ForWord products that are available or summarized on the Scientific Learning website. Those studies demonstrate many benefits that accrue from newer versions of Fast ForWord Language and Fast ForWord Literacy, as well as the benefits from implementing multiple Fast ForWord products in educational and clinical settings.

INTRODUCTION

Studies on the effectiveness of educational interventions are inherently difficult to conduct. University-based researchers have expertise in designing studies and analyzing results. However, they rarely have a classroom teacher's expertise in implementing educational interventions and motivating students. This has lead to a dichotomy in the research results of studies evaluating the impact of the Fast ForWord products with some of the greatest impacts seen in studies conducted by k-12 educators who had returned to universities for further training, while some of the weakest impacts have been seen in studies orchestrated by university academics.

In 2010, Strong, Torgerson, Torgerson, & Hulme published a review that summarized six studies and included a meta-analysis of the Fast ForWord products. All of the studies included in the review were performed by university academics and all but one study had weak product implementations. Neither the implementations nor the observed results were representative of typical product use. If students do not use the Fast ForWord products appropriately, it should be no surprise when their language and reading scores do not improve.

DISCUSSION

The Strong et al. review was narrowly focused on randomized controlled trials or quasi-experimental studies that had been published in refereed journals. In addition, for the study to be included in the review, the students randomly assigned to the Fast ForWord group had to be equivalent to the students in the comparison group. These criteria automatically eliminated numerous high quality studies that were published elsewhere, such as the dissertations of Slattery (2003), Rogowsky (2010), and Marion (2004). They also eliminate many studies that have met the stringent standards of agencies specifically set up to review educational research (What Works Clearinghouse, 2006, 2007, 2010) as well as studies by regional consortiums or state education departments (Schultz Center for Teaching & Leadership, 2009; Nevada Department of Education, 2010). Furthermore, randomized control trials, the gold standard study design, may or maynot have equivalent groups at the outset. The power of the design, allowing one to infer that the results are due to the intervention, is eliminated if the randomization is altered in any way to produce equivalent groups.

Strong et al. started with a search for studies on Fast ForWord product efficacy, and initially identified 79 published studies that were "potentially relevant." They eliminated 73 studies from consideration. The six remaining studies were: Borman, Benson, & Overman (2009); Cohen et al. (2005); Gillam et al. (2008); Given, Wasserman, Chari, Beattie, & Eden (2008); Pokorni, Worthington, & Jamison (2004); and Rouse & Krueger (2004). Only five of these studies were included in the meta-analysis. The Borman et al. study was excluded from the analysis because of a lack of data access, but Strong et al. included this study in their conclusions, stating that its results were consistent with their findings.

Four of the studies incorporated active control groups while four had untreated control groups. It is

important to distinguish between these two kinds of comparisons. Participants in an active control group typically receive some other form of intervention, while participants in an untreated control group receive no intervention. Comparing a treated group to an untreated control group will indicate whether participating in the intervention has an effect, while comparing groups receiving different treatments measures the relative effectiveness of the two interventions. Gillam et al. (2008) found that students who used the Fast ForWord Language product performed as well as students in their active control groups – including students who received 50 hours of one-on-one intervention with a certified and licensed speech and language therapist. As Strong et al. state in their conclusion, there is relatively good evidence demonstrating that conventional therapies have moderate impacts on reading skills -- these conventional therapies include some of the same ones Gillam et al. used as their active controls.

The results of the six studies ranged from ambiguous to strongly positive. As noted earlier, several of the studies with ambiguous results had the same primary challenge: weak implementations. The rest of this section will describe some of the implementation issues that can affect this kind of study, giving examples from the six studies that Strong et al. chose for their review.

Borman et al.

During the 2000-2001 school year, Borman et al. (2009) carried out a moderate-sized study (n = 415) in an urban district (Baltimore City Public School System). The researchers chose an "intent-to-treat" study design, which meant that their analysis was supposed to include all students initially enrolled in the study, regardless of the students' compliance or attendance, or the credibility of their test scores.

The timing of the study made it difficult for the researchers to obtain credible test scores from before and after the intervention. The pre-test was the April administration of the state's Reading assessment, the CTBS/5.An alternate form of the CTBS/5 was administered in June as a post-test (notably, the post-test was administered during the last week of school). Approximately 31% of the students were dropped from the analyses because they lacked post-test scores. An additional 8% of the students were included in the main analysis, but excluded from additional analyses because their test scores were considered "highly influential outliers." The authors suggest that many students with "highly influential outliers" did not take the post-test seriously since it was administered at the very end of the school year. As a result, the students had "precipitous" achievement losses between pre-test and post-test.

The authors report that, when using the "intent-to-treat" analysis, the Fast ForWord products did not appear to help the students improve their language or reading comprehension scores. However, by including non-participants and partial participants in the "treatment group", the intent-to-treat design obscures the impact of the intervention on actual participants.. Including invalid scores in an analysis can also distort the apparent impact of an intervention.

The authors conducted additional analyses to control for these influences. Using the intent-to-treat design, but excluding test scores they deemed "not credible," Borman et al. reported that seventh graders who were in the Fast ForWord group had statistically higher scores on their Reading Comprehension post-test, with a small to moderate effect size (effect size of d = 0.21).

The authors also reanalyzed the data and accounted for implementation factors: participation, attendance, days participated, and percent complete. This analysis revealed that implementation had a statistically significant impact on the Reading Comprehension scores of seventh graders, with a moderate to large effect size (d = 0.50). In other words, students who actually used the software appropriately showed significant benefits, whereas students who did not use the software as intended showed little benefit.

Cohen et al.

In the Cohen et al. study, students participated at home and there was considerable variability in their Fast ForWord usage – student use ranged from 7 to 42 days.. Students were supposed to be tested at three times (before, after, and follow-up). Using an "intent-to-treat" model, all students were included in the analysis and estimates were used in cases of missing scores (which accounted for 8% of all scores analyzed). Between the small sample size and the missing scores, the Cohen et al. study was only capable of detecting changes with a very large effect size. Given the wide variability in product use, and the inclusion of students who used the products for fewer than 10 days, it is not surprising that the average gains were not large enough to reach statistical significance.

Pokorni et al.

Pokorni et al. (2004) ran their study during the summer of 2000, in the context of an academic enrichment program. Three interventions were included in the study: 20 students were assigned to the Fast ForWord Language product, and other students were assigned to use Lindamood Phoneme Sequencing (LiPS) or Earobics. Numerous prior studies have found improvements attributable to all three of these interventions. However, Pokorni et al. found almost no effect for any of the three, suggesting that there were systemic implementation problems across all of the interventions. In fact, the unorthodox product use protocol created by the researchers called for students to complete three one-hour sessions each day for 20 days. Product use information was not included in the report, but it seems likely that students were unable to stay motivated and complete this highly non-standard protocol.

Gillam et al.

The Gillam et al. study (2008) shows the kind of results that can follow from a better implementation. In this medium-sized (n = 216) randomized comparison trial, students were randomly assigned to one of four groups: Fast ForWord Language, an academic enrichment group, a computer-aided language intervention group, or an individual language intervention group. All four interventions were intense, with highly trained clinicians and research assistants working with the students.

In all four groups, student received 1 hour and 40 minutes of intervention five days a week, for six weeks. On average, students attended 28 of the 30 sessions. Only three students dropped out of the study before completing the intervention and only ten other students were missing scores from any of the four testing sessions (2.3% of tests were missing).

The results showed that all groups made statistically significant improvements in several areas (phonics, language, the Token Test, and/or backward masking), with most effect sizes in the moderate range. When asked about the impact of the study, Dr. Gillam, the lead author, said, “The results of longitudinal studies consistently show that only about 25% of school-age children with poor language skills show significant improvements after two, four, or even ten years of school services. Conversely, 74% of the children in our study who received Fast ForWord Language had follow-up scores that were significantly greater than their pre-test scores six months after treatment ended. I judge that to be a substantial benefit,” (Scientific Learning Corporation, 2008a).

CONCLUSION

Based on their meta-analysis of five studies, Strong et al. showed that when poorly implemented, the Fast ForWord products do not impact reading achievement. However, as shown by the Gillam et al. (2008), Rouse & Krueger (2004), and Borman et al. (2009) studies, when there is a good implementation, the Fast ForWord products do impact students. Gillam et al. found the effect of Fast ForWord use to be as large as 50 hours of one-on-one work with a speech and language therapist, and Borman et al. found a moderate to large effect.

These findings show the importance of good implementations. In an effort to help schools achieve consistently strong results, Scientific Learning continually works to improve their products, and to reduce barriers to successful product use.

The studies reviewed by Strong et al. were completed six to ten years ago. Since the publication of those studies, some of the concerns expressed by those researchers have been addressed. For instance, Rouse & Krueger noted that students in their study had “a surprisingly difficult time completing the program,” but their analyses indicated “larger effects of actually completing the program.” Likewise, Borman et al. acknowledged that Fast ForWord products were effective when implemented well, but questioned the “viability of scheduling and implementing the demanding training schedule of 90-100 minutes per day.”

Over the past decade, Scientific Learning has used the extensive body of research on the Fast ForWord products to improve the products and make successful implementations easier. The current Fast ForWord products are much easier to implement correctly, at scale, in a wide variety of school settings. The following list describes some of the enhancements to the Fast ForWord products that have been released in the last ten years:

- Alternative protocols (30, 40, 50, and 90 minutes per day) that give schools flexibility in their implementations while maintaining the efficacy of the Fast ForWord products.
- Progress Monitors, who alert schools to deviations from recommended Fast ForWord implementation standards

- Daily Intervention Flags delivered electronically and giving teachers feedback on student performance and implementation
- Progress Tracker, a web-based reporting system to track student achievement and performance
- Revised products with higher trial counts and dramatically faster product completion rates
- Added content and improved movement through the content based on student performance
- Enhanced motivational feedback for participants and more engaging graphics

These changes have helped numerous school districts reliably and effectively implement the Fast ForWord products with large numbers of students.

Studies performed by regional and state education organizations (Schultz Center for Teaching & Leadership, 2009; Nevada Department of Education, 2010) have reported substantial improvements in the reading achievement of Fast ForWord participants. These results, and similar findings from studies carried out by school districts, are representative of the results typically seen with good implementations (see Appendix).

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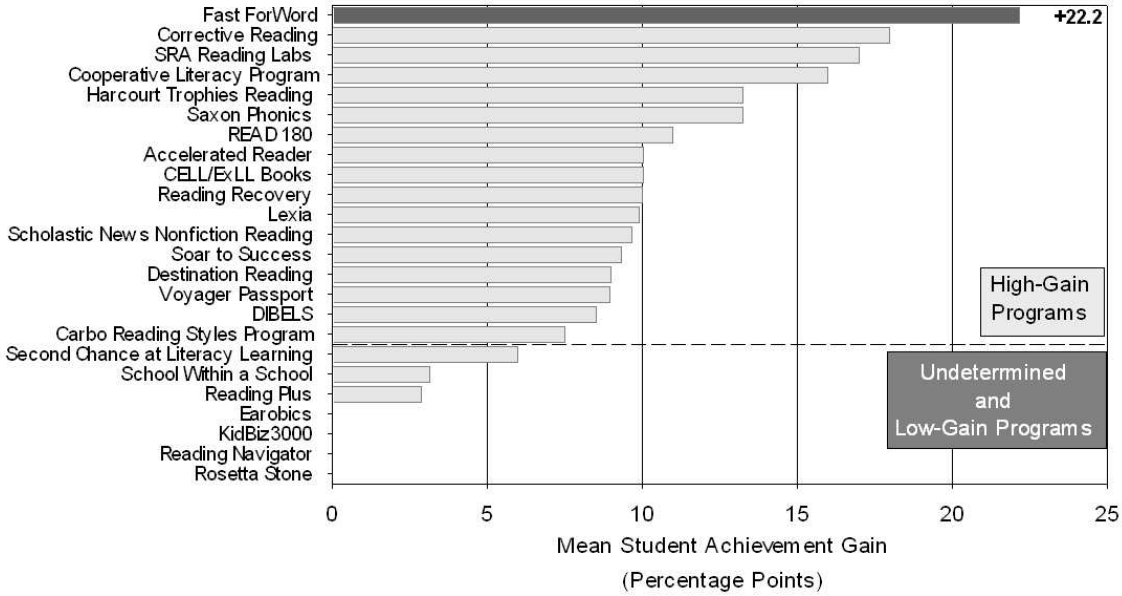

Figure 1: The Nevada Department of Education commissioned the Colorado-based Leadership and Learning Center to conduct an in-depth analysis of programs purchased with Nevada State Bill 185 funds. The report concludes that the Fast ForWord products increased student reading achievement by an average of 22.2 percentage points. This was the greatest increase of all the programs reviewed, and qualified Fast ForWord as a "High-Gain Program" (Nevada Department of Education, 2010).

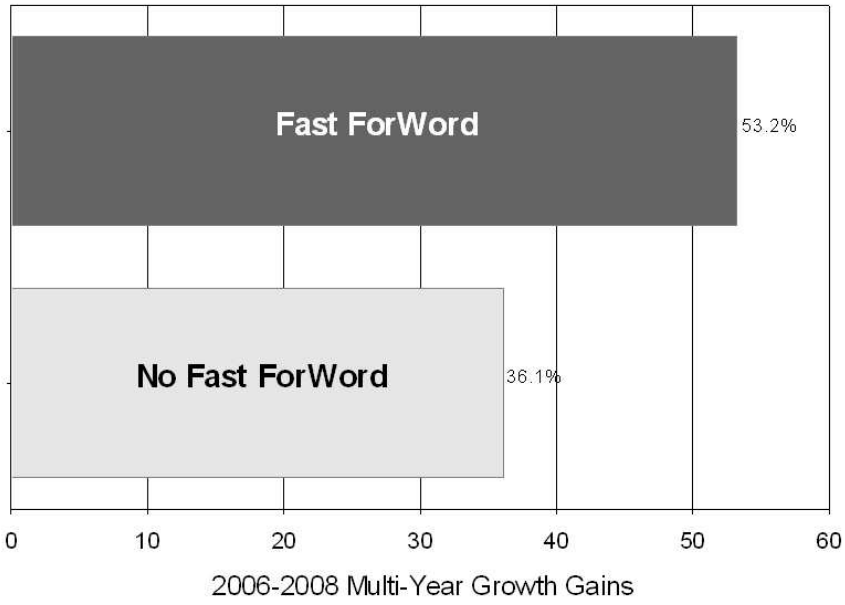

Figure 2: The Schultz Center for Teaching and Leadership, in conjunction with the Duval County Public Schools, studied the impact of the Fast ForWord products on the Florida Comprehensive Achievement Test (FCAT). More than 23,000 students in 1st – 12th grade in the Duval County Public Schools used the Fast ForWord products between 2006 and 2008. 5,219 participants had FCAT scores from 2006, 2007, and 2008; 5,010 students served in a comparison group. The FCAT's Annual Learning Gains (ALG) provided the students' expected gains. Cumulative data showed that in 2008, 53.2% of the Fast ForWord participants had made the expected gains compared to 36.1% of the students who did not participate resulting in 970 more Fast ForWord participants making expected gains than comparison students (Schultz Center for Teaching & Leadership, 2009).

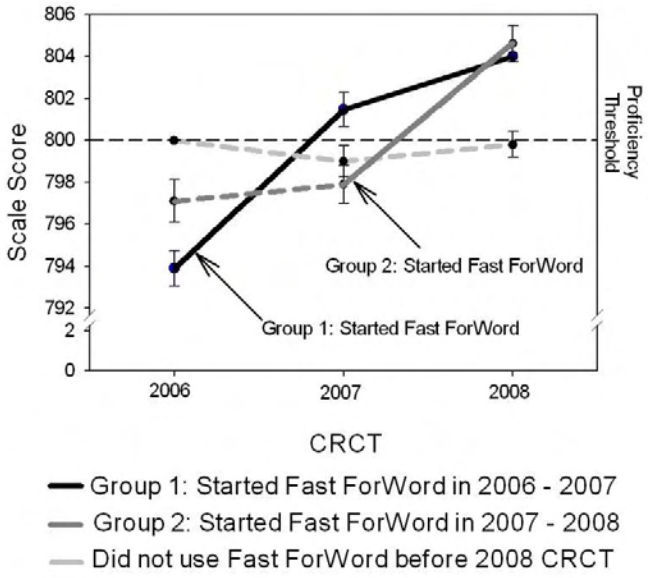

Figure 3: More than 1,300 students in the Clarke County School District in Georgia used the Fast ForWord products between 2006 and 2008 (Group 1 and 2). Another 900 were scheduled to start in 2008 (Group 3). In the graph above, dashed lines indicate the period prior to participation. Students who started using the Fast ForWord products during the 2006-2007 school year made significant improvements on the 2007 administration of the CRCT, the state assessment. Students who started during the 2007-2008 school year made significant improvements in 2008. In 2007, 38% of the non-proficient participants reached proficiency; in 2008 42% reached proficiency. In the comparison groups, 27% and 29% reached proficiency in 2007 and 2008 (Scientific Learning Corporation, 2009).

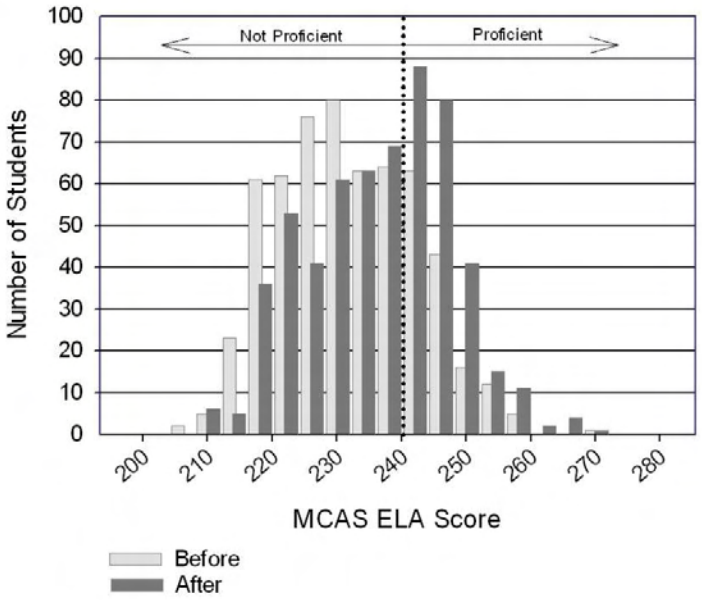

Figure 4: The Everett Public Schools, a small urban district in Massachusetts, has a high number of students who are English language learners (54%) and/or economically disadvantaged (64%). During the 2007-2008 school year, 581 students in fifth through eighth grade used the Fast ForWord products and were evaluated before and after participation on the MCAS, Massachusetts' state assessment. The students made significant improvements with the number achieving Proficient levels increasing from 23% to 36% (Scientific Learning Corporation, 2008c).

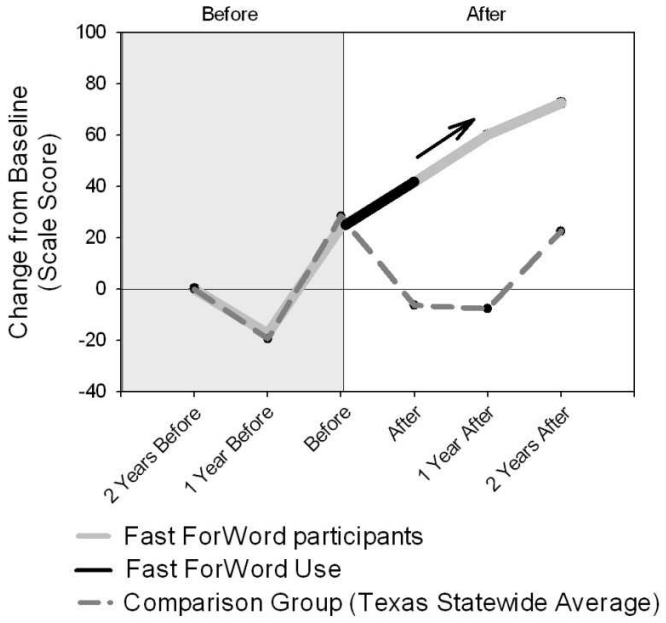

Figure 5: High school students in the Dallas Independent School District, a large urban district in Texas, used the Fast ForWord products. Students were evaluated each spring on the TAKS, the Texas state assessment. During the three test administrations prior to Fast ForWord use, participants' TAKS Reading scores moved in the same manner as their peers' scores, statewide. After using the Fast ForWord products, the students made significant improvements in their TAKS scores. The Fast ForWord participants initially had an achievement gap of approximately 200 points. After participation, the 544 students showed a decrease in the gap of 25% (Scientific Learning Corporation, 2008b).

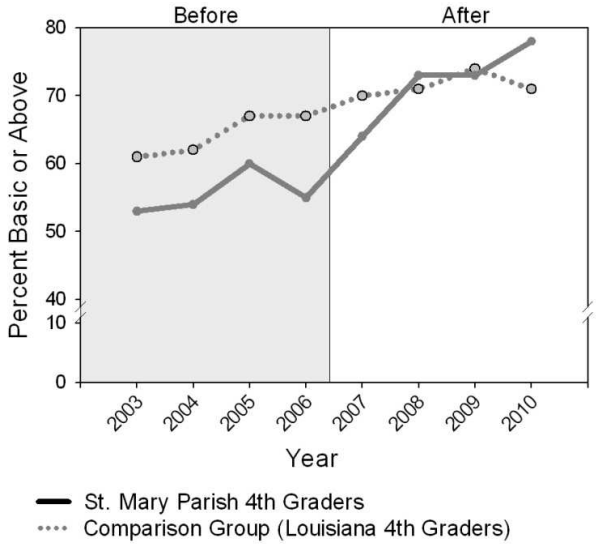

Figure 6: The St. Mary Parish School System, a rural district in southern Louisiana, started using the Fast ForWord products during the 2006-2007 school year with seven elementary schools that were in Academic Assistance (a designation for schools that fail to improve sufficiently). At the start of the 2008-2009 school year, for the first time in years, no schools in the district were rated "Academically Unacceptable". Each year approximately 700 fourth graders from St. Mary Parish take the LEAP, Louisiana's state assessment; the graph shows the improved achievement of those fourth graders compared to fourth graders statewide, (Scientific Learning Corporation, 2010).