Significant Gains in Reading for Second Language Learners and Special Education Students using Fast ForWord® Software: Dallas Independent School District

ABSTRACT

Purpose: This study investigated the effects of the Fast ForWord products on the reading skills of high school students who were either English Language Learners or were receiving services for special education and who used the products within the curriculum in a school setting. **Study Design:** The design of this study was a multiple school case study using nationally normed tests. **Participants:** Study participants were ninth through twelfth grade students attending high schools in the Dallas Independent School District of Dallas, Texas. The students covered in this report were receiving special education services or were English Language Learners. **Materials & Implementation:** Following staff training on the Fast ForWord products, a group of students used the products during the 2004-2005 school year. Student reading ability was assessed with the Gates-MacGinitie Reading Tests (GMRT) before and after Fast ForWord participation. **Results:** On average, students made significant improvements in reading ability, achieving eleven months growth in comprehension skills and four months improvement in vocabulary after Fast ForWord product use. Students who were English Language Learners improved an average of two years in comprehension ability and students receiving special education services gained an average of nine months in comprehension skills after Fast ForWord participation. Results from a subset of students re-evaluated four months later demonstrated that the benefits were maintained.

Keywords: Texas, public high schools, urban district, observational study, longitudinal results, ELL, special education, Fast ForWord Middle & High School, Fast ForWord Language to Reading, Fast ForWord to Reading 3, Gates-MacGinitie Reading Tests (GMRT).

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). The Dallas Independent School District was interested in evaluating the effectiveness of an optimal learning environment with a focus on early reading and cognitive skills as a way for improving the reading skills of students in certain

hard-to-reach demographic groups: students who had English as a second language and students receiving services. In this study, commercially available computer-based products (Fast ForWord Middle & High School, Fast ForWord Language to Reading, and Fast ForWord to Reading 3) were used to evaluate the effectiveness of this approach at improving the reading ability of high school students, and, specifically, to determine the effects of the Fast ForWord products on students who were receiving special education services or had English as a second language.

METHODS
Participants
Located in north central Texas, Dallas is a large urban city of 384 square miles, making it the ninth largest city in the United States. Dallas has a diverse blend of cultures and people including African-American, Asian and Hispanic.

The Dallas Independent School District reflects this diversity and Texas's deep Hispanic roots in its students. Of the over 160,000 students in the district,

31% are African-American and 61% are Hispanic. An estimated 58 different languages are spoken by students in the public school system.

The Dallas Independent School District serves grades pre-Kindergarten through twelfth in 228 schools. Around 80% of the student population is considered economically disadvantaged and 31% is Limited English Proficient while another 29% percent of the students are bilingual or have English as a second language. Seven percent of the students receive special education services.

The 138 students included in this report were receiving services either for learning English or for special education and used Fast ForWord products during the 2004-2005 school year. The students were from seven high schools in Dallas ISD. Twelve percent were classified as ELL, 88% as special education.

The Gates-MacGinitie Reading Tests (GMRT) was used to evaluate student reading ability before and after Fast ForWord participation. School personnel administered the assessments and reported scores for analysis.

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 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 Progress Tracker reports to monitor student performance; and techniques for measuring the gains students have achieved after they have finished using Fast ForWord products.

Materials
The Fast ForWord products are computer-based products that combine an optimal learning environment with a focus on early reading and cognitive skills. The products used by the school, Fast ForWord Middle & High School, Fast ForWord Language to Reading, and Fast ForWord to Reading 3, include five to six exercises designed to build skills critical for reading and learning, such as auditory processing, memory, attention, and language comprehension. While there are differences between the products, all help develop certain critical skills as detailed in the following exercise descriptions.

Sweeps[1], and Trog Walkers[2]: Students hear a series of short, non-verbal tones. Each tone represents a different fragment of the frequency spectrum used in spoken language. Students are asked to differentiate between these tones. The exercises improve working memory, sound processing speed, and sequencing skills.

Streams[1]: Students hear a single syllable that is repeated several times, and then interrupted by a different syllable. Students must respond when they hear the change in the syllable. This exercise improves auditory processing, develops phoneme discrimination, and increases sustained and focused attention.

IDs[1], Polar Cop[2], and Treasure in the Tomb[2]: Students hear a target phoneme, and then must identify the identical phoneme when it is presented later. These exercises improve auditory discrimination skills, increase sound processing speed, improve working memory, and help students identify a specific phoneme. *Polar Cop* also develops sound-letter correspondence skills. *Treasure in the Tomb* also develops grapheme recognition.

Matches[1], and Bug Out[2]: Students choose a square on a grid and hear a sound or word. Each sound or word has a match somewhere within the grid. The goal is to find each square's match and clear the grid. The *Matches* exercise develops auditory word recognition and phoneme discrimination, improves working memory, and increases sound processing speed. The *Bug Out!* exercise develops skill with sound-letter correspondences as well as working memory.

Cards[1]: Students see two pictures representing words that differ only by the initial or final consonant (e.g., "face" versus "vase", or "tack" versus "tag"). When students hear one of the words, they must click the picture that matches the word. This exercise increases sound processing speed, improves auditory recognition of phonemes and words, and helps students gain an understanding of word meaning.

Stories[1] and Start-Up Stories[2]: Students follow increasingly complex commands, match pictures to sentences, and answer multiple-choice questions about stories that are presented aurally.

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[1] Exercise from the Fast ForWord Middle & High School product.
[2] Exercise from the Fast ForWord Language to Reading product.

Scrap Cat[3]: In Scrap Cat, a series of words is visually presented and participants are asked to sort each word into the correct semantic, phonological, syntactic, or morphological category. For this exercise only, the participant can click a button to hear any word and see it defined. This exercise trains decoding, vocabulary, and word recognition skills.

Canine Crew[3]: In Canine Crew multiple words are presented together in a grid and participants are asked to find pairs that match on the basis of the current criterion. This criterion shifts from words that rhyme, to synonyms, to antonyms, to homophones, as the participant progresses. This exercise trains vocabulary, decoding, and automatic word recognition.

Chicken Dog[3]: Participants hear a word and see it partially spelled. They must complete the word by filling in the missing letter or letter group. Five options are always provided, including options that represent common visual and phonological errors. This exercise trains basic spelling patterns, letter-sound correspondences, and decoding.

Twisted Pictures[3]: Participants are presented with a variety of pictures and asked to select the sentence that most accurately describes each picture from among four alternatives. The descriptive sentences incorporate a wide range of syntactic structures. As the participant progresses, the sentences get longer and more difficult vocabulary is included. This exercise builds sentence comprehension by developing syntax, working memory, logical reasoning, and vocabulary.

Book Monkeys[3]: Participants read narrative and expository passages and answer comprehension questions about each passage. The multiple-choice questions demand that the participant use memory for literal detail, generation of inferences, or grasp of causal relationships to select the best answer from among four alternatives. This task develops paragraph comprehension, inferential and cause-and-effect reasoning, working memory, flexible reading, and vocabulary.

Hog Hat Zone[3]: In Hog Hat Zone, short passages from classic children's literature are presented, with occasional gaps in the text where words are missing. Participants are asked to fill in each gap with the correct word from among four alternatives. The missing words are morphologically important items such as pronouns, auxiliary verbs, and words with suffixes and prefixes. This task develops paragraph

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[3] Exercise from the Fast ForWord to Reading 3 product.

comprehension, complex morphology, flexible reading, and vocabulary.

Assessments
Students were evaluated with the Gates-MacGinitie Reading Tests (GMRT) before Fast ForWord participation and after most students had completed the Fast ForWord Middle & High School product; about one-third of students had also completed the Fast ForWord Language to Reading product at the time of post-testing.

Depending on the school, different types of scores were reported (NCEs and/or grade equivalents) and scores from different subtests were reported (Vocabulary and/or Comprehension). The majority of schools focused on Comprehension.

Gates-MacGinitie Reading Tests (GMRT): The GMRT is used to assess a child's decoding, vocabulary, and passage comprehension skills. The test has two components, independently assessing reading vocabulary and comprehension.

In the Vocabulary subtest, the child must sound out and recognize words corresponding to a picture. This subtest measures a child's word decoding ability as well as vocabulary.

In the Comprehension subtest, the child must read passages of progressively increasing difficulty. This subtest measures a child's understanding of complex written material.

Analysis
Scores were reported in terms of raw scores, grade equivalents and normal curve equivalents (NCE). NCEs are the most appropriate units to use for statistical analyses. Scores from students with multiple tests were analyzed using a repeated measures multivariate analysis of variance (MANOVA). Scores from students with only GMRT Comprehension scores available were analyzed using dependent t-tests. All analyses used a p-value of less than 0.05 as the criterion for identifying statistical significance.

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 level). During the 2004 – 2005 school year, the Dallas Independent School District chose to use a combination of the 48- and 90-Minute Fast ForWord Middle & High School Protocols, the 50- and 90-Minute Fast ForWord Language to Reading Protocols, and the 48- and 90-Minute Fast ForWord to Reading 3 Protocols. These protocols call for students to use the products for 48, 50 or 90

minutes a day, five days per week for four to twelve weeks. Almost all students started with the Fast ForWord Middle & High School product and most went on to use the Fast ForWord Language to Reading product. Detailed product use is shown in Tables 1 and 2.

Figures 1 through 4 show the average daily progress through the Fast ForWord Middle & High School and

Fast ForWord Language to Reading product exercises for students who had scores available for analysis. The final day shown is determined by the maximum number of days that at least two-thirds of the students participated. For students who used the product fewer than the number of days shown, percent complete is maintained at the level achieved on their final day of product use.

English Language Learners	Number of Students	Days Participated	Number of Calendar Days	Percent Complete	Participation Level
Fast ForWord Middle & High School	16	52	116	67%	68%
Fast ForWord Language to Reading	8	37	127	59%	65%
Fast ForWord to Reading 3	9	9	157	8%	31%

Table 1. Usage data showing the number of students who were English Language Learners who used each Fast ForWord product along with group averages for the number of days participated, the number of calendar days between start and finish, the percentage of product completed and the participation level.

Special Education	Number of Students	Days Participated	Number of Calendar Days	Percent Complete	Participation Level
Fast ForWord Middle & High School	113	42	105	65%	74%
Fast ForWord Language to Reading	85	26	74	47%	74%
Fast ForWord to Reading 3	59	13	65	15%	35%

Table 2. Usage data showing the number of students who were receiving special education services who used each Fast ForWord product along with group averages for the number of days participated, the number of calendar days between start and finish, the percentage of product completed and the participation level.

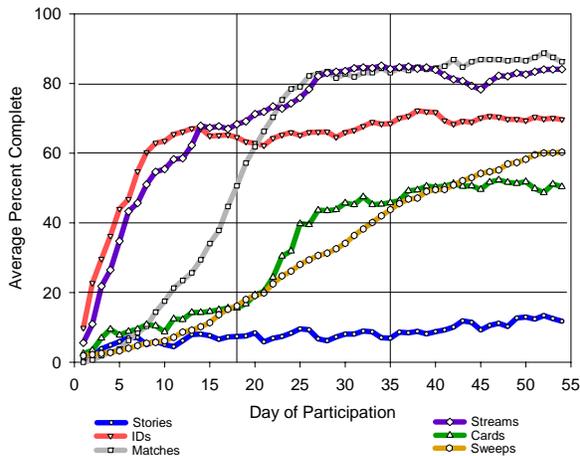English Language Learners: Fast ForWord Middle & High School

Figure 1. Average daily progress through the Fast ForWord Middle & High School product exercises. Results from 16 students are shown.

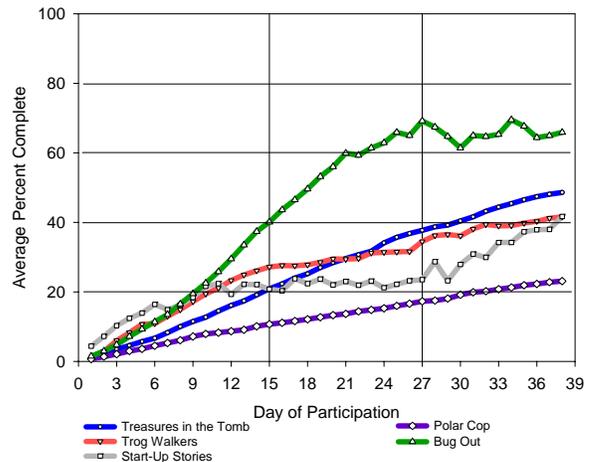English Language Learners: Fast ForWord Language to Reading

Figure 2. Average daily progress through the Fast ForWord Language to Reading product exercises. Results from 8 students are shown.

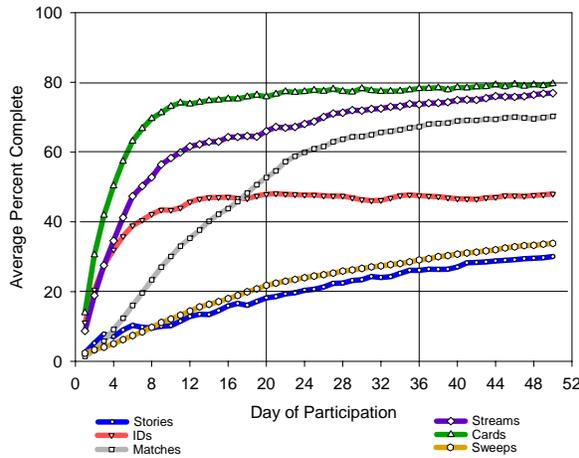Special Education Services: Fast ForWord Middle & High School

Figure 3. Average daily progress through the Fast ForWord to Reading 3 product exercises. Results from 113 students are shown.

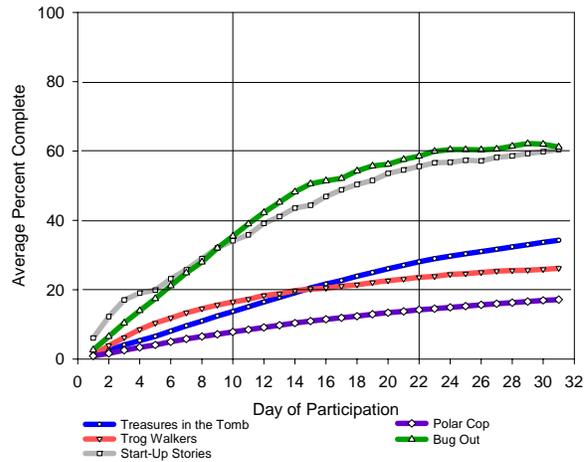Special Education Services: Fast ForWord Language to Reading

Figure 4. Average daily progress through the Fast ForWord Language to Reading product exercises. Results from 85 students are shown.

Assessment Results

Gates-MacGinitie Reading Tests (GMRT): The GMRT was used to evaluate the reading ability of students before and after Fast ForWord use. The GMRT has both Comprehension and Vocabulary subtests. Most schools only reported Comprehension scores although a few also reported Vocabulary scores.

Most schools reported the scores in terms of normal curve equivalents (NCEs) and grade equivalents although a few reported NCEs only. NCEs, which allow for comparisons across grades, were used in the statistical analysis.

English Language Learners: Sixteen of the 138 participants were reported as students with English as a second language. On average, these students had a NCE score of 3.63 before Fast ForWord use, over two standard deviations below the mean. After participating in the Fast ForWord products, students improved to an average NCE score of 25.8—gaining over one standard deviation in measures of reading ability (Table 3). In terms of grade equivalents, students gained over two years in reading grade level after using Fast ForWord products (Figure 5).

ELL	n	Before		After		t-statistic
		Mean	SE	Mean	SE	
Comprehension	16	3.63	1.48	25.8	3.34	6.61*

*Table 3. On average, students who had English as a second language made significant improvements and gained over one standard deviation in comprehension skills after Fast ForWord use. *p<0.05.*
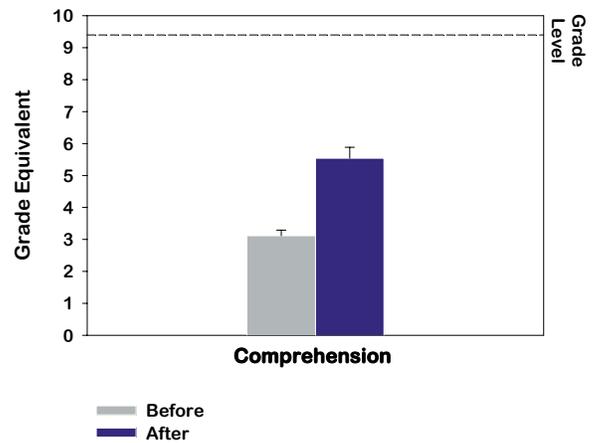

Figure 5. Overall, students with English as a second language significantly improved their reading comprehension skills following Fast ForWord participation. Results from 16 students are shown. Not all students had grades available; grade level was calculated from 15 students who had reported grades.

Special Education: One hundred and twenty-two students who were receiving special education services had Comprehension NCE scores available for analysis. Students achieved significant gains of one-fourth of a standard deviation in reading comprehension skills after Fast ForWord participation (Table 4). Grade equivalent scores were also reported for 109 students. These showed that students gained over nine months in reading grade level in the four months between test administrations (Figure 6).

Special Education	n	Before		After		t-statistic
		Mean	SE	Mean	SE	
Comprehension	122	11.7	1.08	17.2	1.13	5.10*

*Table 4. Students who were receiving special education services significantly improved their comprehension skills by a quarter of a standard deviation following use of the Fast ForWord products. *p<0.05.*
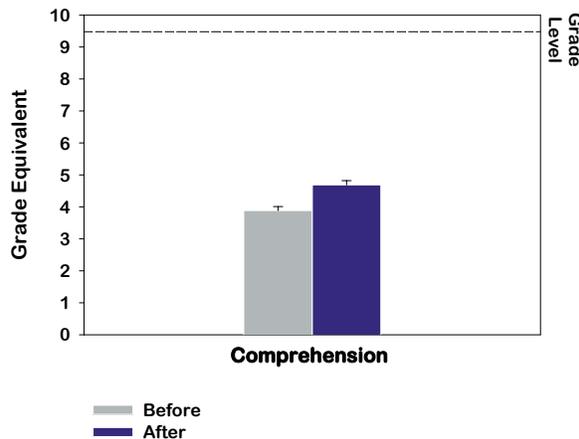

Before
After

Figure 6. On average, after Fast ForWord use, students who were receiving special education services gained nine months in reading performance. Results from 109 students are shown. Not all students had grades available; grade level was calculated from 106 students who had reported grades.

The results of a MANOVA for 35 students who had both Comprehension and Vocabulary scores available are shown in Table 5. There was a significant time effect with students improving between test administrations. Changes in score between the Comprehension and Vocabulary subtests were not significant.

	MANOVA f		
n	Subtest	Time	Subtest x Time
35	0.15	5.58*	2.01

*Table 5. Results of a MANOVA showed that students, on average, had significant improvements at the time of post-testing. *p<0.05.*

<u>Longitudinal Results:</u> A group of 22 students who were receiving special education services had results available from approximately four months after their initial post-test. The students achieved significant gains of more than one-third of a standard deviation from the time of their pre-Fast ForWord testing to their post-Fast ForWord testing. Four months later, students continued to show improvements after their initial post-test (Table 6).

Special Education	n	Before		After		Follow-up	
		Mean	SE	Mean	SE	Mean	SE
Comprehension	22	11.1	2.5	19.2	1.8	21.2	3.8

Table 6. Scores from before Fast ForWord participation, after participation, and four months after the initial post-test showed that students, on average, made improvements in their comprehension skills, and maintained or increased those improvements.

DISCUSSION

During the 2004 – 2005 school year, high school students in the Dallas Independent School District used the Fast ForWord products. An evaluation of the effects of Fast ForWord for students in different demographic groups indicated that, on average, students significantly improved their reading skills after Fast ForWord product use. Students who were learning English had amazing gains of over two years in reading performance after using Fast ForWord products. For students who were receiving special education services, gains of over nine months in reading ability were achieved and the benefits were maintained four months later. These findings demonstrate that, within the Dallas Independent School District, an optimal learning environment coupled with a focus on cognitive and early reading skills can help both students receiving special education services and students who have English Language Learners attain a higher level of reading achievement.

CONCLUSION

Language and reading skills are critical for students in all demographic groups, impacting their ability to benefit from instruction, follow instructions, and participate in class discussions. Strong linguistic skills also provide a critical foundation for building reading and writing skills. The impressive gains by English Language Learners (2 years growth) and students receiving special education services (9 months growth) suggest that Fast ForWord products are particularly helpful for students with greater educational needs. Overall, the improvements made by students in hard-to-reach demographic groups in the Dallas Independent School District suggest that using the Fast ForWord products strengthened the students' foundational skills and helped them benefit more from the classroom curriculum.

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