Improved Reading Skills by Students in the Springfield Public Schools who used Fast ForWord® Products

ABSTRACT

Purpose: This study investigated the effects of the Fast ForWord products on the reading skills of students who used the products within the curriculum in a school setting. **Study Design:** The design of this study was a multiple school study using nationally normed tests. **Subjects:** Study participants were first through sixth graders attending Springfield Public Schools in Springfield, MA. **Methods & Implementation:** Before and after participation on the Fast ForWord products, students were evaluated with Reading Progress Indicator. **Results:** On average, before Fast ForWord use, the students' reading skills were below grade level. Following three and a half months of Fast ForWord use, students, on average, improved six months and were reading at a level appropriate for their grade. In addition, for students who were English language learners or eligible for special education services, the average improvement for students who benefitted from Fast ForWord use was one year one month, while it was one year four months for students receiving Title I services.

Keywords: Massachusetts, elementary school, urban, observational study, Fast ForWord Language, Fast ForWord Language to Reading, Fast ForWord to Reading 1, Reading Progress Indicator, Title I, Special Education, English Language Learners.

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 Springfield Public 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 reading skills of students in a school setting. In this study, commercially available computer-based products (Fast ForWord Language, Fast ForWord Language to Reading, and Fast ForWord to Reading 1) were used to evaluate the effectiveness of this approach at improving the reading skills of students.

METHODS

Participants

Located on the banks of the Connecticut River, just north of the border between Massachusetts and Connecticut, Springfield, Massachusetts is one of oldest cities in United States. It was settled by eight of the original Massachusetts Bay Colonists in 1635. Today it is the third largest city in Massachusetts and the fourth largest in New England

The Springfield Public Schools are committed to building a culture of achievement in their community. The district serves nearly 26,000 students at 47 schools. Approximately 51% of the students are Hispanic, 26% are African American and 18% are Caucasian. Many of the schools in the district are Title I schools.

This report focuses on 124 students with an average grade level of 3.6 who used Fast ForWord products at Alfred Glickman Elementary School, Edward Boland Elementary School and Elias Brookings Middle School during the 2006 – 2007 or 2007 – 2008 school year. Students' reading skills were assessed before and after Fast ForWord participation. The assessment administered was Reading Progress Indicator. 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 in this study (Fast ForWord Language, Fast ForWord Language to Reading, and Fast ForWord to Reading 1) include five to seven exercises designed to build skills critical for reading and learning, such as auditory processing, memory, attention, and language comprehension. While there are differences between these products, all help develop certain critical skills as detailed in the following exercise descriptions.

Circus Sequence[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.

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

Phoneme Identification[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.

Phonic Match[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 *Phonic Match* 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.

Phonic Words[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.

Language Comprehension Builder[1]: Students listen to a sentence that depicts action and complex relational themes. Students must match a picture representation with the sentence they just heard. This exercise develops oral language and listening comprehension, improves understanding of syntax and morphology, and improves rate of auditory processing.

Block Commander[1]: In Block Commander, a three-dimensional board is filled with familiar shapes that students select and manipulate. The students are asked to follow increasingly complex commands. This exercise increases listening comprehension, improves syntax, develops working memory, improves sound processing speed, and increases the ability to follow directions.

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

Bear Bags[3]: In this exercise, the participant is asked to help Mama Bear sort words (on pieces of toast) into phoneme-based categories (in lunch bags). This exercise develops phonemic awareness, understanding of alphabetic principles (phonics), and decoding of one- syllable words.

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[1] Exercise from the Fast ForWord Language product.
[2] Exercise from the Fast ForWord Language to Reading product.

[3] Exercise from the Fast ForWord to Reading 1 product.

Magic Rabbit[3]: This exercise combines spelling and word-building practice with spelling patterns and word families commonly studied in 1st grade. The task is designed to emphasize the relationships between words by showing how one word can be turned into another by simply changing a single letter in any position. Using a click and drag interface, the participant must either select the missing letter to complete a partially spelled word or rearrange scrambled letter tiles to spell a word. The rabbit magician does card tricks that present the participant with the answer choices while a picture illustrating the word pops out of the magician's hat. This exercise develops spelling and sensitivity to letter-sound correspondences.

Flying Fish[3]: In this exercise, a fishing pelican pronounces a word. Then a series of spoken and/or written words (on fish) fly across the pond and the participant clicks on the word when it matches the pronounced word. This exercise develops decoding skills, identification of sight words, and auditory memory.

Quail Mail[3]: In Quail Mail, a squirrel mail carrier pulls words out of a mailbag and the participant sorts them into different categories by clicking on the appropriate mailbox. This exercise encourages flexibility during reading and automatic access to the various dimensions of vocabulary.

Bedtime Beasties[3]: This exercise uses the "cloze task," in which a written and aurally presented sentence has a word missing. The participant must select the correct word and accompanying picture to complete the sentence from four choices, presented as text and pictures. Vocabulary skills and sentence comprehension are developed in this exercise.

Buzz Fly[3]: In this exercise, the participant listens to a passage and answers comprehension questions relating to each passage. The questions are aurally presented and written, and the response choices are presented as pictures. This exercise develops listening comprehension and working memory skills as measured by performance on multiple choice.

Assessments
Before and after Fast ForWord participation, students were evaluated with Reading Progress Indicator.

Students took the initial assessment just prior to beginning the Fast ForWord products. Follow-up testing occurred immediately following completion of each Fast ForWord product.

Reading Progress Indicator: Reading Progress Indicator is a computer-based assessment designed to rapidly measure the effects of the Fast ForWord products. There are four levels of the assessment, each designed for a specific grade range. Each test level measures phonological awareness, decoding, vocabulary and comprehension. Scores are reported as grade equivalents and percentiles.

Analysis
Scores were reported in terms of grade equivalents and percentiles. Scaled scores and normal curve equivalents were generated and used for more statistically appropriate analyses but were converted to grade equivalents and percentiles for reporting purposes. Data were analyzed using paired 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 and attendance level). During the 2006-2007 and 2007-2008 school year, the Springfield Public Schools chose to use the 30- and 50-Minute Protocols for Fast ForWord Language, Fast ForWord Language to Reading and Fast ForWord to Reading 1. These protocols call for students to use the products for 30 or 50 minutes a day, five days per week for six to twelve weeks. Detailed product use is shown in Table 1. Some students used multiple products.

Figure 1 shows the average daily progress through the Fast ForWord Language product exercises. This graph represents the learning curve of the students as they progress through the product. The other product used in this study, Fast ForWord Language to Reading, has a similar learning curve. 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

	Number of Students	Days Participated	Number of Calendar Days	Percent Complete	Participation Level	Attendance Level
Fast ForWord Language	119	35.0	84.4	81.0 %	97.9%	75.6%
Fast ForWord Language to Reading	30	44.8	123.7	73.1%	98.8%	70.4%
Fast ForWord to Reading 1	7	27.6	69.4	86.7%	94%	66.1%
Total	124	39.1	114.9	--	97.9%	74.2%

Table 1. Usage data showing the number of students 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 participation level, and the attendance level. Total values reflect the average total number of days that students used products. Note: Students often use multiple products.
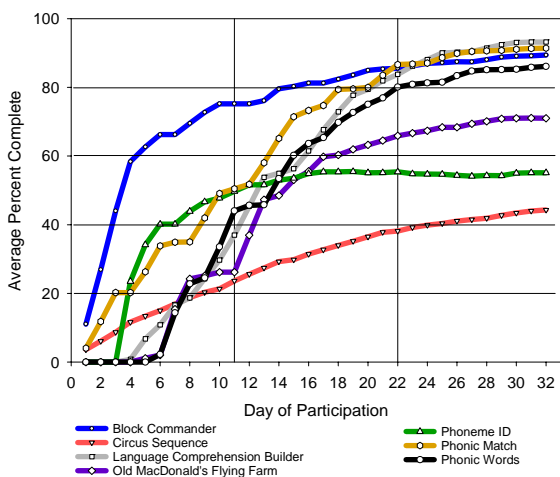

Figure 1. Average daily progress through the Fast ForWord Language product exercises. Results from 119 students are shown
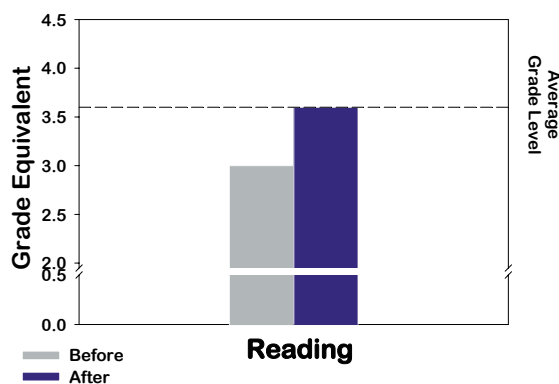

Figure 2. Students had average gains of more than four months in reading skills after using the Fast ForWord products. Results from 124 students are shown.

		Before		After		t-statistic
	n	Mean	SE	Mean	SE	
RPI	124	37.8	1.2	45.2	1.5	5.27*

*Table 2. Students, on average, made significant improvements on their reading skills after Fast ForWord participation. Analyses were done, and results are shown in terms of Normal Curve Equivalents. *$p<0.05$.*

Assessment Results

Reading Progress Indicator: Reading Progress Indicator was used to evaluate students before and after Fast ForWord participation. Two or more scores were available for 155 students. Of those students, at least two valid scores were available for 124 students in first through sixth grade. The test is multi-choice and scores are considered invalid when a student does not demonstrate better than chance performance as determined by scoring at least 30% correct.

The 124 students had an average grade level of 3.6 and overall, their reading skills were in the lower part of the average range – the bottom of the 2nd quartile. Three and one-half months later, the students' skills were reevaluated. A t-test showed that the group of students made statistically significant improvements with average student performance moving up into the middle of the 2nd quartile (Table 2). When presented as percentiles, the group's improvement corresponds to an increase from the 28th percentile to the 40th percentile.

For descriptive purposes, average improvements across all students were also calculated in terms of grade equivalents, indicating that the average improvement was six months (Figure 2).

Seventy-two percent of the students (89 of the 124) showed improvements in their reading skills. The average gain for students who made improvement was one year three months, with scores improving from a grade equivalent of 2.6 to a grade equivalent of 3.9.

The District was quite interested in the impact of the Fast ForWord products on various demographic groups. The groups of interest were students who were English Language Learners, students who were eligible for receiving special education services, and students who were eligible for Title I services.

English Language Learners:

The 19 English language learners who used the Fast ForWord products and had two or more valid scores were in 2nd to 6th grade. Sixty-three percent of them (12) improved their reading skills after using the Fast ForWord products. The students who benefited had an average grade level of 3.4 and improved their reading skills from a level of 2.3 to 3.4.

Special Education:
Eighteen students who were eligible to receive special education services used the Fast ForWord products and had two or more valid scores were. Seventy-three percent of them (13) improved their reading skills after using the Fast ForWord products. The students who benefitted were in 3rd to 5th grade with an average grade level of 4.1. On average, these students improved their reading skills from 2.4 to 3.5.

Title I:
Sixty-six students who were eligible for Title I services used the Fast ForWord products and had two valid scores. The students were in 1st through 5th grades. Eighty-three percent (55) of the students eligible for Title I services improved their reading skills following Fast ForWord use. The average grade level of the students who benefitted was 3.5 and on average, the students improved their reading skills from a level of 2.5 to 4.0.

There was also great interest by the District in knowing the improvement for students at the various schools. The two schools with the strongest implementations (Alfred Glickman and Edward Boland) had both the greatest percentage of students who benefitted (80% and 81% respectively), and the largest impact on the students who benefitted (one year three months for both schools) (Table 3).

School	Students who Benefitted	% of Students who Benefitted	Grade Level	Reading Skill: Initial Level	Reading Skill: Final Level
Alfred Glickman	28	80%	3.4	2.7	4.0
Edward Boland	42	81%	3.7	2.6	3.9
Elias Brookings	19	51%	3.4	2.7	3.6

Table 3. Across the three schools in the District that had students with at least two valid scores, average improvement for students who benefited varied from 9 months (at Elias Brookings) to one year three months (at both Alfred Glickman and Edward Boland).

DISCUSSION

On average, across all students with both pre- and post-participation tests available, students improved from the 28th percentile to the 40th corresponding to 6 months improvement during the 3 ½ months between the tests. These results focus on the 80% of the students with two valid tests. Twenty-nine of the 31 students without two valid tests had an invalid pre-test. Twelve of them performed well enough to have a valid post-test indicating that their performance had improved even though it was not possible to determine the students' initial skill level. The other 17 students with invalid pre-tests may have improved, but they were still below the floor of the assessment.

In each demographic group, students improved. The average improvement for students who benefited in the English language learner and the students receiving services for special education groups was one year one month, while it was one year four months for students receiving Title I services. These are extremely impressive improvements for groups that were between seven months (Title I) and one year seven months (Special Education) behind grade level.

CONCLUSION

Language and reading skills are critical for all students, impacting their ability to benefit from instruction, follow directions, and participate in class discussions. Strong linguistic skills also provide a critical foundation for building reading and writing skills. After Fast ForWord use, students in the Springfield Public Schools made significant gains in their reading performance. Overall improvement across all students was 6 months during the 3 ½ month period. For students who showed benefit, average improvement was more than a whole grade level for students receiving special education or Title 1 services, as well as for students who were English language learners. This suggests that using the Fast ForWord products strengthened the students' foundational skills and helped them benefit more from the classroom curriculum.

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