Improved Reading Skills by Students in School District 16 who used Fast ForWord® Products

ABSTRACT

Purpose: This study investigated the effects of the Fast ForWord products on the reading skills of elementary school students who used the products within the curriculum in a school setting. **Study Design:** The design of this study was a multiple school two-group study using nationally normed assessments. **Participants:** Study participants were second grade students who were attending elementary schools in School District 16 of Miramichi, New Brunswick, Canada. Participants were in one of two groups: a Fast ForWord group that used products or a comparison group that did not use products. **Materials & Implementation:** Following staff training on the Fast ForWord products, the Fast ForWord group of students used the products during the 2005-2006 school year. Both groups were evaluated with the Test of Auditory Comprehension of Language-Third Edition (TACL-3) before and after the Fast ForWord group used the Fast ForWord products. **Results:** On average, the Fast ForWord group significantly outperformed the comparison group on the TACL-3 subtests. Average improvement on the subtests for the Fast ForWord group was nearly one standard deviation, with the group's overall language score moving from the 45th percentile to the 81st percentile.

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). School District 16 was 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 reading achievement of students in a school setting. In this study, commercially available computer-based products (Fast ForWord Language and Fast ForWord Language to Reading) were used to evaluate the effectiveness of this approach for improving the early reading skills of elementary school students.

METHODS

Participants

School District 16 in New Brunswick, Canada has 21 schools and 3 alternate sites, with a student population of approximately 7,000 Anglophones and 600 First Nations students.

Four schools in School District 16 were selected to participate in the study reported here. They were selected based upon convenience and demographics. Ian Baillie Primary, one of the schools selected to use the products, has new computers and offers an Early French Immersion program to its students. Croft Elementary was selected to be the comparison school because it also offers the Early French Immersion program and had students who were performing at a level similar to that of the Ian Baillie students. St. Andrew's Elementary, the other school selected to use Fast ForWord products, is a unilingual English school located nearby to the District office. The comparison school, Harkins Elementary, is unilingual and has demographics and skill levels similar to St. Andrew's.

Students at St. Andrew's and Ian Baillie used the Fast ForWord products during the 2005-2006 school year. Students attending Harkins Elementary and Croft Elementary did not use products and served as the comparison group. One hundred twenty-one 2nd grade students participated in this study. Seventy-five

students were in the Fast ForWord group and 46 students were in the comparison group.

The early reading skills of the students were evaluated with the Test of Auditory Comprehension of Language-Third Edition (TACL-3) before and after the Fast ForWord group participated in the products. School personnel administered the assessment 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 School District 16, Fast ForWord Language and Fast ForWord Language to Reading, 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 variations across products related to the specific skills targeted and the approaches taken, there are several critical skills developed in both of the products, 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

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

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.

Assessments

Students were assessed with the Test of Auditory Comprehension of Language-Third Edition (TACL-3) before and after the Fast ForWord group used products. Pre-testing occurred at the beginning of the school year for Ian Baillie and Croft (September or October) and during the Winter for St. Andrew's and Harkins (January or February). Post-tests were given an average of four and one-half months later, after the Fast ForWord group had completed the products.

The Test of Auditory Comprehension of Language-Third Edition (TACL-3): The TACL-3 is a standardized, norm-referenced measure of receptive spoken vocabulary, grammar, and syntax. The test consists of three subtests: Vocabulary, Grammatical Morphemes, and Elaborated Phrases and Sentences.

Grammatical Morphemes include prepositions, noun number and case, verb number and tense, noun-verb agreement, derivational suffixes, and the meaning of pronouns. Elaborated Phrases and Sentences is the understanding of syntactically based word relations and elaborated phrase and sentence constructions (e.g. negative sentences, passive and active voice, and partially and completely conjoined sentences).

Scores can be reported in terms of percentiles, age equivalents, and standard scores. TACL-3 subtests have a standard score mean of ten and a standard deviation of three.

Analysis

Scores were reported in terms of standard scores, percentiles, and age equivalents. Standard scores were analyzed using a multivariate analysis of variance (MANOVA). All analyses used a p-value of less than 0.05 as the criterion for identifying statistical significance.

RESULTS

Product Use

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). During the 2005-2006 school year, School District 16 chose to use the 50-minute protocols for the Fast ForWord products. These protocols called for students to use the products for 50 minutes a day, five days per week for eight to twelve weeks.

Table 1 shows detailed product use for the Fast ForWord group of students. Total across products reflects the total number of students in the study and the total number of days that students used products.

Figures 1 and 2 show the average daily progress through the Fast ForWord Language and Fast ForWord Language to Reading product exercises. 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 products fewer than the number of days shown, percent complete is maintained at the level achieved on their final day of product use.

The focus of the District's study was the Fast ForWord Language product and nearly all students started with it. However, in order to keep the classes together in the computer lab, as students completed the Fast ForWord Language product, they were switched to the Fast ForWord Language to Reading product. In addition, a few students who were struggling with motivational issues were encouraged to work diligently with the promise that they could switch to Fast ForWord Language to Reading for the last few days of the session. The focus of the District's study is reflected in the students' high completion level on Fast ForWord Language.

	Number of Students	Days Participated	Number of Calendar Days	Percent Complete	Participation Level	Attendance Level
Fast ForWord Language	70	40	73	73%	99%	78%
Fast ForWord Language to Reading	58	20	37	45%	99%	78%
Total Across Products	75	53	96	--	--	--

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 percentage of product completed, the participation level, and the attendance level. Note: Most students used multiple products.
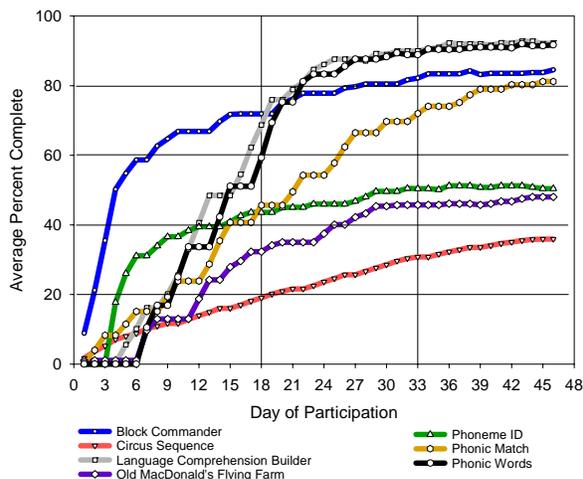
Learning Curve: Fast ForWord Language

Figure 1. Average daily progress through the Fast ForWord Language product exercises. Results from 70 students are shown.

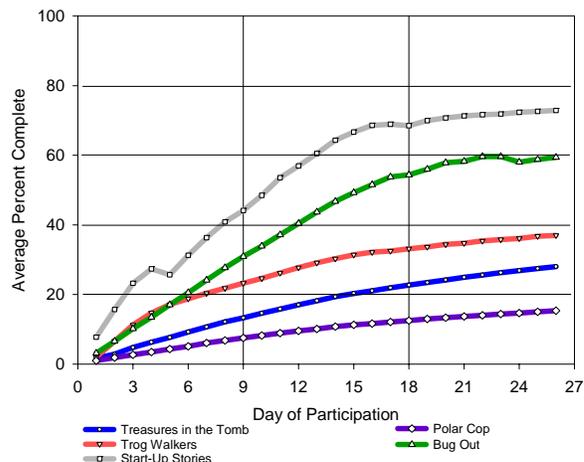Learning Curve: Fast ForWord Language to Reading

Figure 2. Average daily progress through the Fast ForWord Language to Reading product exercises. Results from 58 students are shown.

Assessment Results

<u>Test of Auditory Comprehension of Language-Third Edition (TACL-3)</u>: Scores were reported in terms of standard scores for the subtests. One hundred twenty-one second graders (46 comparison students, 75 Fast ForWord users) had TACL-3 subtest scores available for analysis. A MANOVA of these standard scores found significant differences in the improvements between the comparison and Fast ForWord groups (Table 2). Further analyses showed that the Fast ForWord group made greater gains than the comparison group on all three TACL-3 subtests (Table 3, Figure 3). For both groups, the greatest improvement was on Grammatical Morphemes, on which the Fast ForWord group gained more than one standard deviation and the comparison group gained more than one-third of a standard deviation. In terms of percentiles, the Fast ForWord group improved from the 42nd to the 85th percentile, and the comparison group improved from the 48th to the 64th percentile.

MANOVA f					
Test	Test x Group	Time	Time x Group	Test x Time	Test x Time x Group
4.32*	1.29	131.0*	28.3*	11.6*	3.90*

*Table 2. On average, significant differences were found in the performance on measures of early reading skills between the Fast ForWord group and the comparison group. *p<0.05.*

Some students, in both the comparison group and Fast ForWord group, took part in the Early French Immersion program offered at their schools. This variable was inserted into the model as a between-subjects factor. There was not a significant effect, indicating that the gains made by the students in the French Immersion program were not significantly different from the gains made by students in the English language program.

		Comparison Group					Fast ForWord Group				
		Before		After		t-statistic		Before		After		t-statistic
	n	Mean	SE	Mean	SE		n	Mean	SE	Mean	SE	
Vocabulary	46	9.6	0.35	10.4	0.25	1.93	75	9.7	0.30	11.9	0.20	8.13*
Grammatical Morphemes	46	9.9	0.36	11.1	0.30	3.71*	75	9.4	0.27	13.2	0.19	14.4*
Elaborated Phrases and Sentences	46	10.1	0.32	11.1	0.25	2.87*	75	9.9	0.26	12.2	0.18	8.08*

*Table 3. Students who used the Fast ForWord products made greater gains on the TACL-3 subtests than a comparison group. *p<0.05.*
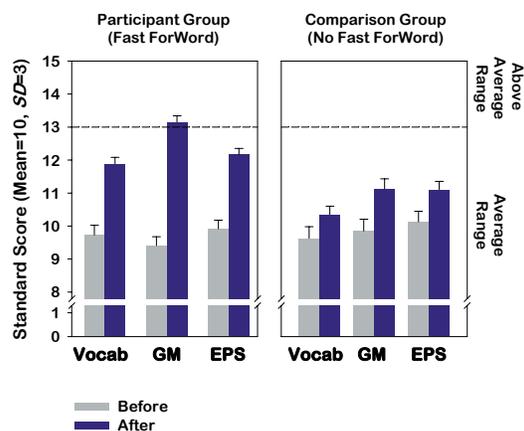
Figure 3. On average, students who used Fast ForWord products outperformed a comparison group. Results from 121 students are shown.

A group of 11 third graders who used Fast ForWord products had TACL-3 subtest scores available but were not included in the analyses because of a lack of third grade students in the comparison group. Like the second graders, these students also improved their early reading skills after Fast ForWord participation. Across the three subtests, they improved an average of nearly two-thirds of a standard deviation. Due to the small size of the group, statistical analyses were not performed and the results shown in Figure 4 are for descriptive purposes only.
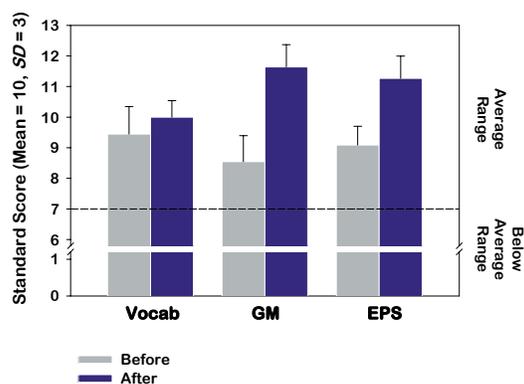

Figure 4. Third graders, overall, had gains of up to one standard deviation in early reading skills after Fast ForWord use. Results from 11 students are shown.

DISCUSSION

During the 2005-2006 school year, elementary school students in School District 16 of New Brunswick, Canada, participated in the study reported here. The students were in one of two groups, a Fast ForWord group or a comparison group. Analyses of TACL-3 scores from before and after the Fast ForWord group used the products showed significant differences in the gains made between the two groups, with the Fast ForWord group making greater improvements on the three TACL-3 subtests than the comparison group. Average improvement on the subtests for the Fast ForWord group was nearly one standard deviation compared to one-third of a standard deviation gain made by the comparison group.

Greatest improvement for both groups was in Grammatical Morphemes, with the Fast ForWord group improving, on average, from the 42nd to the 85th percentile. For the Vocabulary subtest, the Fast ForWord group improved from the 46th to the 73rd percentile and on the Elaborated Phrases and Sentences subtest, improvement was from the 48th to the 76th percentile.

These findings demonstrate that, within School District 16, an optimal learning environment coupled with a focus on cognitive and early reading skills can help students become more proficient at skills critical for high reading achievement.

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. In this study, students in School District 16 whose language and early reading skills were solidly in the middle of the average range, used Fast ForWord products. After Fast ForWord use, students made significant gains in their skills moving them into the high average or above average range. This suggests that using the Fast ForWord products strengthened the students' foundational skills and better positioned them to benefit from the classroom curriculum.

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