Improved Language and Reading Skills by Students in the Puyallup School District who used Fast ForWord® Products

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ABSTRACT

Purpose: This study investigated the effects of the Fast ForWord products on the language and reading skills of students when used within the curriculum in a school setting. **Study Design:** The design of the study was a multiple school study using nationally normed tests. An analysis of variance (ANOVA) procedure and dependent t-tests were used to evaluate student performance. **Subjects:** Study participants were 21 elementary school students who were attending schools in the Puyallup School District of Puyallup, Washington, who used one or more Fast ForWord products, and whose skills were assessed before and after Fast ForWord use. **Materials & Implementation:** Following staff training on the Fast ForWord products, 21 students used one or more Fast ForWord products for an average total of 47 days. Before and after participation in the Fast ForWord software, student performance was evaluated with the Comprehensive Test of Phonological Processing (CTOPP) and the Test of Language Development (TOLD). **Results:** On average, students made significant improvements in their phonological awareness and oral language skills after using the Fast ForWord products with phonological awareness skills improving an average of 8 percentile ranks, and language skills improving between 16 and 24 percentile ranks.

Keywords: Washington, elementary school, suburban district, observational study, Fast ForWord Language, Fast ForWord Language to Reading, Comprehensive Test of Phonological Processing (CTOPP), Test of Language Development (TOLD)

INTRODUCTION

Early laboratory tests of a prototype of a computer-based product combined an optimal learning environment with a focus on early reading and cognitive skills. The results were dramatic improvements in the auditory processing and language skills of elementary school children who had specific language impairments (Merzenich et al., 1996; Tallal et al., 1996) or were at-risk for academic failure (Miller et al., 1999). The Puyallup School District was interested in evaluating the effectiveness of an optimal learning environment with a focus on early reading and cognitive skills as an approach for improving their curriculum and instruction for elementary school students. In this study, commercially available computer-based products (Fast ForWord Language, Fast ForWord Language to Reading, and Fast ForWord to Reading 3) were used to evaluate the effectiveness of this approach for improving the oral language and early reading skills of children.

METHODS

Participants

During the 2002 – 2003 school year, 114 students from Maplewood Elementary School and Zeiger Elementary School in the Puyallup School District of Puyallup, Washington, used the Fast ForWord products. Twenty-one of participants took part in this study. The students were chosen by teachers and school administrators and were at-risk for reading or academic failure. They were fairly evenly spread between 2nd and 5th grade, with one 6th grade student. School personnel administered the assessments and reported the scores for analysis.

The Puyallup School District, a suburban school district 45 minutes south of Seattle, serves nearly 20,000 students. Maplewood and Zeiger Elementary Schools serve students in kindergarten through sixth grade. The majority of the students (80 – 85%) are White, non-Hispanic, with the remaining students divided between Black, non Hispanic, Asian, Hispanic, and Native American. 20 – 25% of the students are eligible for free or reduce-price lunches.

Implementation

Educators from both schools were trained in current and established findings on the neuroscience of 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 candidates for participation; the selection of appropriate measures for testing and evaluation; effective implementation techniques; approaches for monitoring student performance; and techniques for measuring the gains students have achieved after they have finished using the products.

Materials

Most of the study participants used multiple Fast ForWord products with the most common

combination being the Fast ForWord Language product and the Fast ForWord Language to Reading product. Table 1 shows the breakdown of product use. The two students who used the Fast ForWord Language to Reading product and the Fast ForWord to Reading 3 product during the study had used the Fast ForWord Language product prior to the start of the study. In all, during the study, 19 students used the Fast ForWord Language product, 16 used the Fast ForWord Language to Reading product, and 5 used the Fast ForWord to Reading 3 product. While there are variations across products related to the specific skills targeted and the approaches taken, there are several critical skills developed in all of the products, as detailed in the following exercise descriptions.

Product Combination	Number of Students
Language	5
Language and Language to Reading	11
Language to Reading and Reading 3	2
Language, Language to Reading and Reading 3	3

Table 1. Participant usage between the pre- and post-participation assessments. Most participants used multiple products.

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.

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.

[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 3 product.

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 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 comprehension, complex morphology, flexible reading, and vocabulary.

Assessments

Student performance was evaluated with the Test of Language Development (TOLD) and the Comprehensive Test of Phonological Processing (CTOPP) before and after using one or more Fast ForWord products. The assessments were administered by school personnel who reported scores in terms of percentiles.

Test of Language Development – 2nd Edition (TOLD:2): The TOLD is a comprehensive test of language skills of children. It is designed to measure a child's language development by assessing the ability to understand word meanings and sentences and the relationships between words. It measures a child's listening, organizing, speaking, semantics, and syntax abilities. Overall performance on this test is indicated by a composite score called the Spoken Language Quotient.

Comprehensive Test of Phonological Processing (CTOPP): The CTOPP measures a student's awareness of, and access to, the phonological structure of oral language as well as phonological memory, ability to rapidly execute a sequence of operations, and ability to blend and segment words and non-words. The Institute for the Development of Educational Achievement recognizes the CTOPP as an appropriate assessment to measure improvement in the phonological awareness skills of children in early elementary school. Phonological awareness is an essential component of language and early reading skills.

Analysis

Student achievement was reported in terms of percentiles. A repeated measures analysis of variance (ANOVA) was performed on the phonological processing subtests, and on the oral language subtests. All analyses used a p-value of 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 days of use, content completed, and adherence to the chosen protocol (participation level). The Fast ForWord Language protocol used by the Puyallup School District called for students to use the product for 100 minutes a day, five days a week, for four to eight weeks. The Fast ForWord Language to Reading and Fast ForWord to Reading 3 protocols were 90 minutes a day, five days a week, for four to eight weeks.

One hundred and fourteen students used the Fast ForWord products. Twenty-one of those students participated in the study and had their phonological processing and language skills assessed before and after using one or more Fast ForWord products.

Overall, during the study, students used one or more products for 47 days over nearly 3 months. Nineteen students used the Fast ForWord Language product for an average of 32 days over a period of 54 calendar days. They achieved an average participation level of 79% and completed an average of 69% of the product content. Sixteen students used the Fast ForWord Language to Reading product and averaged 18 days of use over a period of 38 calendar days. They achieved an average participation level of 69% and completed an average of 58% of the product content. Five students used the Fast ForWord to Reading 3 product and averaged 16 days over a period of 35 calendar days and completed 24% of the product content (Table 2). For information on product combinations, see Table 1.

Product	Number of Students	Average Days Participated	Average Number of Calendar Days	Average Overall Percent Complete	Participation Level
Fast ForWord Language	19	32	54	69%	79%
Fast ForWord Language to Reading	16	18	38	58%	69%
Fast ForWord to Reading 3	5	16	35	24%	NA

Table 2. Usage data showing the number of students who used the Fast ForWord products. Also shown are group averages for the number of days of product use, calendar days between start and finish, the percentage of content covered, and the participation level (percentage of 100 minutes per day, five days per week, that the students actually used the Fast ForWord Language product, or 90 minutes per day, five days per week, that the students actually used the Fast ForWord Language to Reading product).

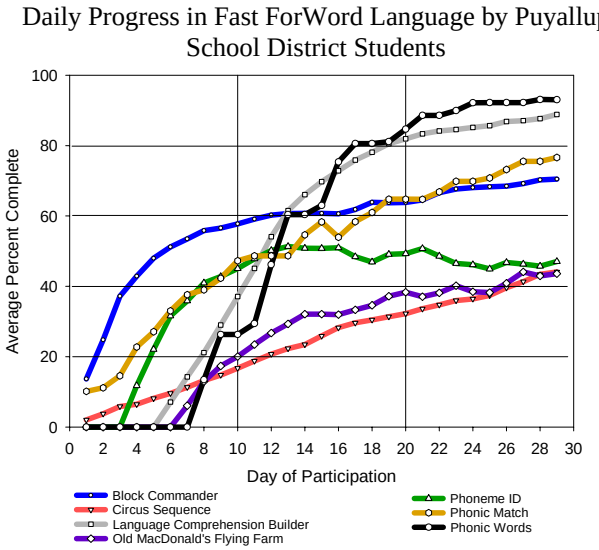

Figure 1. Average daily progress over the first 29 days of use for 19 Puyallup School District students who used the Fast ForWord Language product during the 2002-2003 school year.

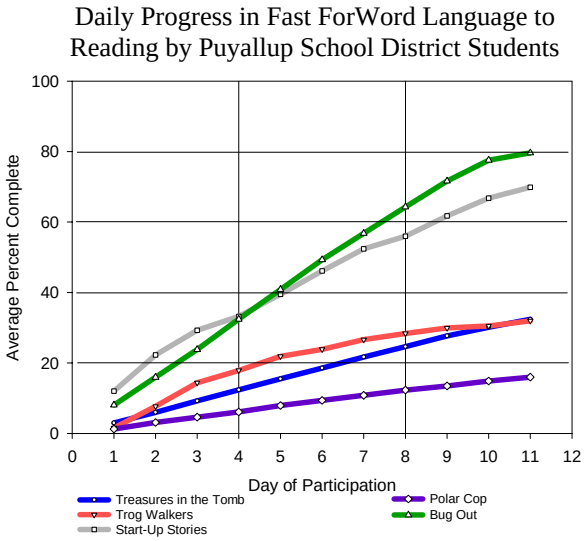

Figure 2. Average daily progress over the first 11 days of use for 16 Puyallup School District students who used the Fast ForWord Language to Reading product during the 2002-2003 school year.

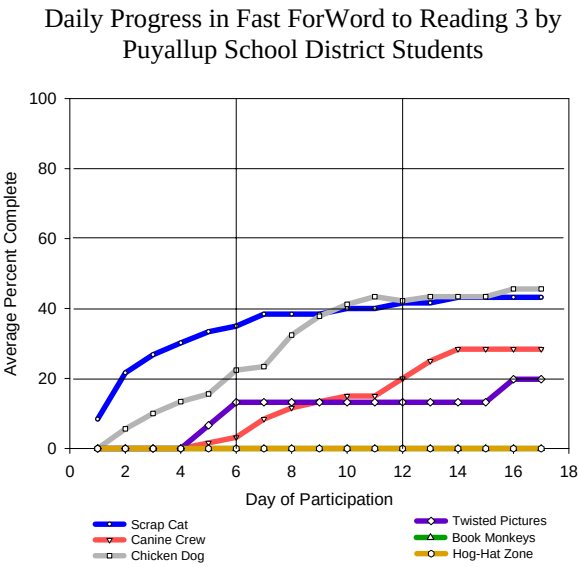

Figure 3. Average daily progress over the first 30 days of use for 5 Puyallup School District students who used the Fast ForWord to Reading 3 product during the 2002-2003 school year.

Assessment Results

Test of Language Development (TOLD): The TOLD was used to measure the language skills (Sentence Combining, Characteristics, Word Ordering, Generals, and Grammatic Comprehension) for 13 elementary school students who used the Fast ForWord products. Student scores were reported in terms of percentile. An ANOVA showed that, on average, students made statistically significant improvements in their percentile rank after using the Fast ForWord products (Table 3). The ANOVA also showed that the improvements made on the various subtests were statistically different from each other. Post hoc dependent t-tests were performed to evaluate the changes on the subtests: improvements on all subtests were statistically significant with some improvements (Sentence Combining and Grammar Comprehension) larger than others (General). Across all subtests, mean scores improved from the 16th percentile to the 24th percentile with the mean post-test scores on the individual subtests ranging from the 28th percentile to the 45th (Figure 4). A reference line in Figure 4 shows

the percentile at which students are within one standard deviation of the mean (the 16th percentile). Students within one standard deviation of the mean are considered in the average range; students below this are considered below average.

Comprehensive Test of Phonological Processing (CTOPP): Phonological Awareness (Elision, Blending Words, Memory for Digits, Rapid Naming of Digits, Nonword Repetition, and Rapid Naming of Letters) was assessed for 20 elementary school students. An ANOVA showed that across all subtests, on average, students made statistically significant improvements in their phonological awareness as measured by their percentiles (Table 4 and Figure 5). The improvements across the subtests were not statistically different. A reference line in Figure 5 shows the percentile at which students are within one standard deviation of the mean (the 16th percentile). Students within one standard deviation of the mean are considered in the average range; students below this are considered below average.

TOLD-I		Before		After		ANOVA F	
	n	Mean	SE	Mean	SE	Time	Time x Test
Overall						76.1*	3.7*
						t-value	
Sentence Combining	13	8.4	3.6	32.2	6.7	3.5*	
Characteristics	13	25.3	5.6	45	5.3	5.9*	
Word Order	13	6.9	2.3	28.9	5.1	6.0*	
General	13	18.5	5.8	36.5	6.7	5.3*	
Grammatic Comprehension	13	15.7	3.5	41.5	6.8	3.5*	

*Table 3. Results of an ANOVA table show that there were significant improvements in student percentile rank as well significant differences in improvement between subtests. *p< 0.05*

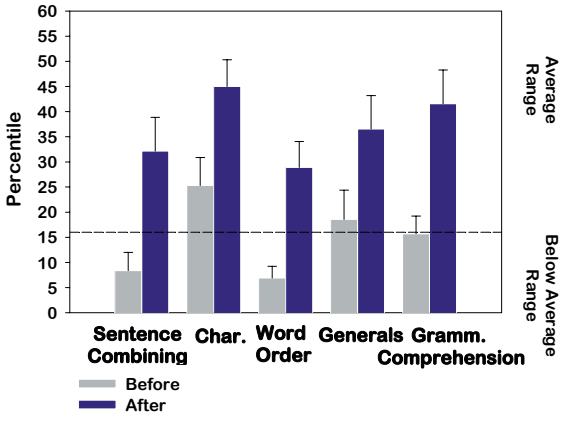

Figure 4. Percentile scores on the TOLD show that, on average, students made significant improvements in their oral language skills after using the Fast ForWord products.

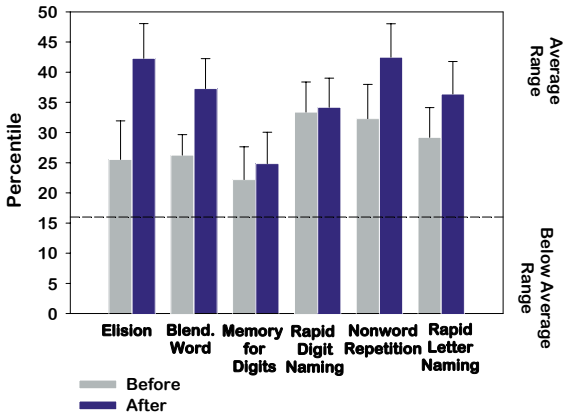

Figure 5. Scores on the CTOPP show that students, on average, had significant improvements in their phonological awareness skills after using the Fast ForWord products.

CTOPP	N	Before		After		ANOVA F	
		Mean	SE	Mean	SE	Time	Time x Test
Overall						12.1*	2.5
Elision	20	25.6	6.4	42.3	5.8		
Blending Words	20	26.3	3.4	37.3	5.0		
Memory of Digits	20	22.2	5.4	24.8	5.2		
Rapid Naming of Digits	20	33.4	5.0	34.2	4.8		
Nonword Repetition	20	32.3	5.7	42.5	5.5		
Rapid Naming of Letters	20	29.2	4.9	36.4	5.4		

*Table 4. Students made significant improvements in their phonological awareness skills after using the Fast ForWord products. *p< 0.05*

DISCUSSION

During the 2002 – 2003 school year, 114 students in the Puyallup School District used the Fast ForWord products. Twenty-one students participated in this study and made significant improvements in their language and reading skills after using the products. These findings demonstrate that, within the Puyallup School District, an optimal learning environment coupled with a focus on cognitive and early reading skills, can help students attain a higher level of academic achievement.

CONCLUSION

Receptive and expressive language skills are critical for all students, 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. On average, the students who participated in this study made significant gains in their scores on both the TOLD and the CTOPP assessments. After using Fast ForWord products, students improved their critical early reading and cognitive skills and increased their ability to benefit from the classroom curriculum.

Notes:

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