Improved Cognitive and Early Reading by Students in the Berlin School District who used Fast ForWord® Products

MAPS for Learning: Educator Reports, 8(31): 1-5

ABSTRACT

Purpose: This study investigated the effects of the Fast ForWord products on the language skills of students who used the products within the curriculum in a school setting. **Study Design:** The study was designed as a single school experimental study with one group that used Fast ForWord products, and a second group that partook in regular classroom instruction. **Participants:** Study participants were 76 students attending an elementary school in the Berlin School District in Wisconsin. **Materials & Implementation:** Following staff training on the Fast ForWord products, a group of students took part in the study during the 2003 – 2004 school year. An experimental design was used with three classes using the products, and one class serving as a comparison group. At the beginning and end of the study, student performance was evaluated with several tests from the Woodcock Johnson Tests of Achievement, Revised. **Results:** On average, students who used the Fast ForWord products made significant improvements in their cognitive and early reading skills. The students in the Fast ForWord participant group made greater gains than the comparison group in Passage Comprehension and Word Attack.

Keywords: Wisconsin, elementary school, suburban district, experimental study, Fast ForWord Language, Fast ForWord Language to Reading, Woodcock Johnson Tests of Achievement.

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 Berlin School District in Wisconsin 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 reading achievement of low-performing 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 at improving the reading achievement of students.

METHODS

Participants

The Berlin School District, a suburban district north of Madison, Wisconsin, serves 1700 students in four schools. One of the two elementary schools, Clay Lamberton Elementary, took part in this study. Clay Lamberton has 650 students enrolled in pre-Kindergarten through fifth grade and is identified as a Title I school. Thirteen percent of the school's students are minorities and approximately 7% are migrant.

During the 2003 – 2004 school year, 76 students took part in the study with students in three classrooms using the products while students in a fourth classroom served as a comparison group. The three classes included two general education classes (one third grade and one fourth grade) and a special education class (second to fourth grade students); the students in the comparison classroom were in the 3rd grade. Students had their cognitive and early reading skills evaluated with the Woodcock-Johnson Tests of Achievement, Revised (WJ-R) before and after participation on the Fast ForWord products. School personnel administered the assessments and reported grade-equivalent scores for analysis.

Implementation

Educators were trained in current and established neuroscience findings on how phonemic awareness

©2004 Scientific Learning Corporation 8(31) 1-5

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 Language and Fast ForWord Language to Reading products are computer-based products that combine an optimal learning environment with a focus on early reading and cognitive skills. The products 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, both 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. They must respond when they hear the 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 syllable or word, and then must identify the identical syllable or word when it is presented later. These exercises improve auditory discrimination skills, increase sound processing speed, improve working memory, and help students identify a specific sound. *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

At the beginning and end of the study, students in the Berlin School District had their early reading skills evaluated with four subtests of the Woodcock-Johnson Tests of Achievement – Revised (WJ-R): Letter/Word Identification, Passage Comprehension, Word Attack, and Phonological Memory. The school reported scores in terms of grade-equivalence.

Woodcock-Johnson Tests of Achievement, Revised (WJ-R): The WJ-R is a wide-range, comprehensive set of individually-administered tests with alternate forms for measuring cognitive abilities, scholastic aptitudes, and achievement. Three of the tests administered evaluate reading skills; the fourth one evaluated phonological memory. The three tests of reading skills are approved by the Institute for Development of Educational Achievement for assessing early reading skills: Letter/Word Identification and Word Attack are appropriate for assessing phonics, and Passage Comprehension is appropriate for assessing comprehension.

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

Analysis
Data was analyzed using a multivariate repeated measures analysis of variance (MANOVA). Post-hoc analyses were done with t-tests. Since data was reported in terms of grade-equivalence, these were used for the analysis. 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 content completed, days of use, and adherence to the chosen protocol (participation level). During the 2003 – 2004 school year, the district used the 50-minute protocols for each product. The 50-minute protocols call for students to use the products for 50 minutes per day, 5 days a week for eight to twelve weeks.

A total of 76 students took part in the study. Of those, 54 students had valid and complete data available for analysis from both the beginning and the end of the study. (The data from 21 students was marked invalid by the school, and data from one student was incomplete.) Fifteen of the students with valid data were in the comparison group and so did not use Fast ForWord products during the time period of the study – although two had used the products previously. On average, students completed 70% of the Fast ForWord Language product content and reached an average participation level of 91%. Twenty-six students also used the Fast ForWord Language to Reading product. Detailed usage information by product is shown in Table 1.

Figures 1 - 2 show the average daily progress through the Fast ForWord Language and the Fast ForWord Language to Reading exercises for all the students in the study who used the Fast ForWord products during the Spring of 2003-2004 and had valid data. The final day shown on each graph 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.

	Number of Students	Percent Complete	Participation Level	Number of Days
Fast ForWord Language	39	70%	91%	28
Fast ForWord Language to Reading	26	37%	87%	10

Table 1: Usage data for Berlin Elementary School students who used the Fast ForWord Language and Fast ForWord Language to Reading products in the Spring of 2004, were in the study, and had valid and complete assessment results. Data includes group averages for the number of days of use, percentage of content covered, and participation level (the percentage of 50 minutes per day, five days per week, that the students actually used the products).

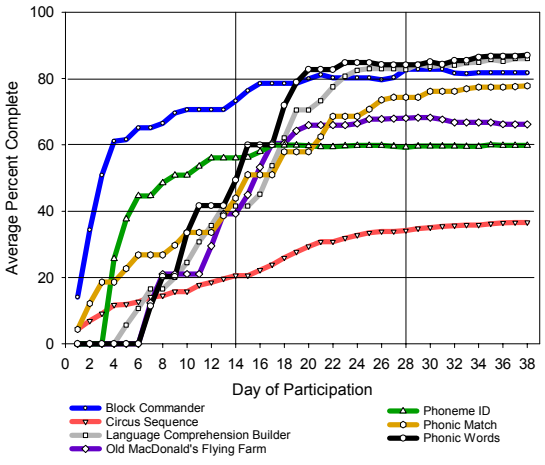

Figure 1. Average daily progress through the Fast ForWord Language exercises for students during the 2003 – 2004 school year. Results from the 39 students with valid assessment data are shown.

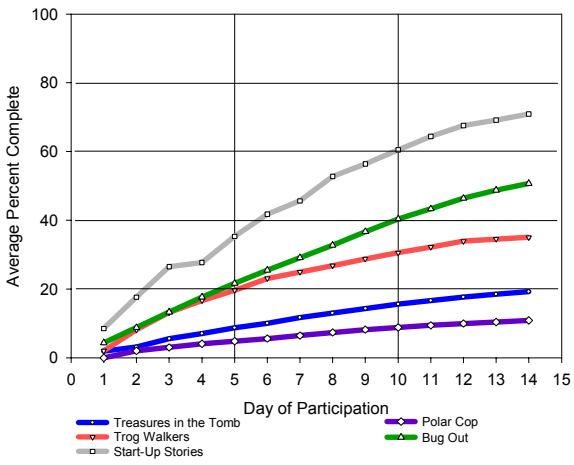

Figure 2. Average daily progress through the Fast ForWord Language to Reading exercises for students during the 2003 – 2004 school year. Results from 26 students are shown.

©2004 Scientific Learning Corporation 8(31) 1-5

Assessment Results
Student data was reported in terms of grade-equivalence for the WJ-R. The study showed that, on average, students who used Fast ForWord products achieved significant improvements on their cognitive and early reading skills.

Woodcock-Johnson Tests of Achievement (WJ-R):
Three months passed between the two assessments for both the experimental and the comparison group. The repeated measure MANOVA indicated that there was an effect of both test and time, and there was a test by time interaction (Table 2).

Note that scores for 54 students are included in the analysis. Twenty-one students (seventeen in the experimental group and four in the comparison group) had scores that were deemed 'not-representative' or 'unusable' by the test administrator.

Including these extra students lowered the averages on the test scores -- an expected result since all scores below 1st grade level were marked unusable -- and eliminated the significance of the Test x Time interaction, but did not alter the relative improvements of the groups, or the subtests.

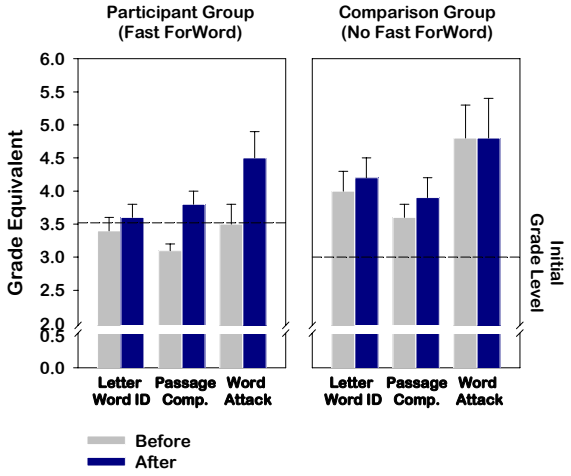

Figure 3. Standard scores from before and after participation on the Fast ForWord products show that, on average, students made significant improvements in their early reading skills. These results are from 40 students who were in the 3rd and 4th grades (participant group), and 15 students who were in 3rd grade (comparison group).

Post hoc analyses were used to evaluate individual subtests. These analyses showed that students who used the Fast ForWord products made significant improvements on three of the four subtests (Passage Comprehension, Word Attack, and Phonological Memory), while the comparison group only achieved significant improvements in Phonological Memory (Table 3, Figure 3).

WJR	df	MANOVA-F
Test	51	5.4*
Test x Group	51	0.9
Time	53	20.4*
Time x Group	53	0.6
Test x Time	51	2.9*
Test x Time x Group	51	2.5

*Table 2. For students in the study during the 2003 – 2004 school year, there was an interaction between time and subtest. *p<0.05.*

			Before		After	
		n	Mean	SE	Mean	SE
Experimental	Letter-Word Identification	39	3.5	0.2	3.7	0.2
	Passage Comprehension	39	3.2	0.1	3.8	0.2
	Word Attack	39	3.5	0.3	4.6	0.4
	Phonological Memory	39	3.5	0.3	4.5	0.4
Comparison	Letter-Word Identification	15	4.0	0.2	4.2	0.3
	Passage Comprehension	15	3.6	0.2	3.9	0.3
	Word Attack	15	4.8	0.5	4.8	0.6
	Phonological Memory	15	3.9	0.5	5.3	0.7

Table 3. Results from the experimental and comparison groups are shown for each of the subtests at the beginning and end of the study.

DISCUSSION

During the 2003 – 2004 school year, students in the Berlin School District used the Fast ForWord products. On average, students made significant improvements in their early reading and cognitive skills after using Fast ForWord products.

Before using the products, students in the participant group were, on average, performing at a mid-third grade level. Three months later, they were performing at a low-fourth grade level. It is important to note that the students in the comparison group were academically stronger than those in the participant group; overall, the students in the comparison group were in a lower grade, but had stronger skills. This was not unexpected given the make-up of the two groups.

The participant group consisted of students from three classrooms: a third grade class, a fourth grade class, and a 2nd – 4th grade class for students receiving special education services. The comparison group consisted of students from a third grade class. To achieve a more closely matched participant and comparison group, the use of only the third grade general education class for the participant group was considered. However, the participant and the

experimental groups then differed significantly at pre-test with the comparison group scoring significantly better.

CONCLUSION

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. Scores from before and after Fast ForWord participation show that, on average, students made significant increases in their early reading and cognitive abilities. This suggests that using the Fast ForWord products strengthened the students' foundational skills and helped them benefit more from the classroom curriculum.

Notes:

To cite this report: Scientific Learning Corporation. (2004). Improved Cognitive and Early Reading by Students in the Berlin School District who used Fast ForWord Products, MAPS for Learning: Educator Reports, Vol. 8, No. 31: pp. 1-5.

REFERENCES

Merzenich MM, Jenkins WM, Johnston P, Schreiner CE, Miller SL, & Tallal P (1996). Temporal processing deficits of language-learning impaired children ameliorated by training. *Science*, 271, 77-80.

Miller, S.L., Merzenich, M.M., Tallal, P., DeVivo, K., Linn, N., Pycha, A., Peterson, B.E., Jenkins, W.M., (1999). Fast ForWord Training in Children with Low Reading Performance, *Nederlandse Vereniging voor Lopopedie en Foniatrie: 1999 Jaarcongres Auditieve Vaardigheden en Spraak-taal*. (Proceedings of the 1999 Dutch National Speech-Language Association Meeting).

Tallal P, Miller SL, Bedi G, Byma G, Wang X, Nagarajan SS, Schreiner C, Jenkins WM, Merzenich MM (1996) Language comprehension in language-learning impaired children improved with acoustically modified speech. *Science* 271:81-84.

Woodcock, R & Johnson, M. B. (1989, 1990). *Woodcock-Johnson Psycho-educational Battery- Revised.* Itasca, IL: Riverside Publishing.

©2004 Scientific Learning Corporation 8(31) 1-5