Improved Reading Vocabulary and Comprehension Skills by Students in the School District of Philadelphia who used Fast ForWord® Language

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ABSTRACT

Purpose: This study investigated the effects of the Fast ForWord Language software on the reading skills of students when implemented within the curriculum in a school setting. **Study Design:** The design of the study is a multiple school case study using a standardized, nationally-normed independent test of reading achievement. Dependent t-tests and a multivariate analysis of variance were used to evaluate changes in student performance and determine whether improvements differed based on reading subtest (vocabulary and comprehension). **Subjects:** Study participants were 94 third to fifth graders, enrolled in summer school in the School District of Philadelphia, Pennsylvania, who used the software for 15 or more days. Many of the students were receiving services for special education. **Materials & Implementation:** Following staff training on the Fast ForWord products, the study participants, on average, used the Fast ForWord Language product for 17 days over 33 calendar days. Before and after Fast ForWord Language participation, student performance was evaluated by examining progress on the Group Reading Assessment and Diagnostic Evaluation (GRADE). The Normal Curve Equivalent (NCE) scores were used for all statistical analyses. **Results:** On average, the students who used the Fast ForWord Language product made significant improvements in both reading vocabulary and reading comprehension as measured by the GRADE. On average, Total Reading scores improved 7.0 NCEs (one-third of a standard deviation) with significant improvements for Comprehension (i.e. 6 months) outperforming the significant improvements for Vocabulary (i.e. 2 months) over the five week participation period.

Keywords: Pennsylvania, elementary schools, urban district, observational study, special education, Fast ForWord Language, Group Reading Assessment and Diagnostic Evaluation (GRADE).

INTRODUCTION

Early laboratory tests of a prototype of a computer-based product (Fast ForWord Language) 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 School District of Philadelphia was interested in evaluating the effectiveness of this approach at improving reading achievement of low-performing students and those receiving services for special education in a school setting. The district was also interested in investigating interaction of special education services with product use. In this study, a commercially available computer-based product (Fast ForWord Language) was used to evaluate the effectiveness of this approach at improving the reading achievement of students in summer school.

METHODS

Participants

During the summer of 2003, 322 students from ten elementary schools in Philadelphia, Pennsylvania, used the Fast ForWord Language product for five or more days. Ninety-four of those students from nine schools participated in a pilot study involving the assessment of reading achievement before and after participation. The students in the study were in 3rd, 4th, or 5th grade and used the product for at least 15 days. Approximately one-third of the students (29) were receiving special education services, and one-third were not (35). The status of the remaining 30 students is not known.

Implementation

At each school, educators were trained in current and established findings on the neuroscience of how phonemic awareness and 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 product participants; the selection of appropriate standardized language measures for testing and evaluation; effective implementation techniques; instruction on the product and on Progress Tracker, the reports generated by the product that allow educators and coaches to monitor student performance; and techniques for measuring the progress and gains

students achieve after they have finished using the product.

The study took place during the summer school session with the pre-participation assessment taking place the fourth week in June, and the post-participation assessment occurring five weeks later, during the final week of July. During the six-week summer school, students were in session four days a week.

Materials
Fast ForWord Language, a computer-based product combining an optimal learning environment with a focus on early reading and cognitive skills, was used in conjunction with the school curriculum. The product includes seven exercises designed to build skills that are critical for reading and learning, such as auditory processing, memory, attention, and language comprehension.

Circus Sequence: 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 then asked to differentiate between these tones. This exercise improves working memory, sound processing speed, and sequencing skills.

Old MacDonald's Flying Farm: Students use the computer mouse to catch and hold a flying animal. The animal repeats a single syllable several times, and students must release the animal when they hear a change in the syllable. This exercise improves auditory processing, develops phoneme discrimination, and increases sustained and focused attention.

Phoneme Identification: Students listen as one animal character utters a phoneme, and then two new animals utter similar phonemes. The students must identify which of the latter two sounds was identical to the first phoneme. This exercise improves auditory discrimination skills, increases sound processing speed, improves working memory, and helps students identify a specific phoneme.

Phonic Match: 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. This exercise develops auditory word recognition and phoneme discrimination, improves working memory, and improves rate of auditory processing.

Phonic Words: Students see two pictures representing two similar words that differ only by initial or final consonant ("tack" versus "tag"). When students hear the word representing one of the pictures, 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: 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: In Block Commander, a three-dimensional board game is filled with familiar shapes that students select and manipulate. The students are asked to follow increasingly complex commands. This exercise increases listening comprehension and the ability to follow directions, improves syntax, develops working memory, and improves sound processing speed.

Assessments
Before and after participation, the Group Reading Assessment and Diagnostic Evaluation (GRADE) was used to evaluate the students' reading achievement. The two assessments were given five weeks apart. The levels were grade-appropriate, and parallel forms were used for the two assessments. The schools administered the assessments, and reported the scores for analysis.

Group Reading Assessment and Diagnostic Evaluation: The Group Reading Assessment and Diagnostic Evaluation (GRADE) is a nationally-normed reading assessment that measures vocabulary and comprehension skills using grade-appropriate tests. Results are reported in terms of a Vocabulary Composite and a Comprehension Composite, as well as an overall Reading Score.

Analysis
Student achievement was reported in terms of normal curve equivalents (NCE), percentiles, and grade-equivalents. All statistical analyses were done using the NCE values. The grade-equivalent and percentile scores were used for descriptive purposes only. A multivariate analysis of variance (MANOVA) was performed to analyze whether improvements differed based on subtest. The analyses used a p-value of 0.05 as the criterion for significance.

RESULTS

Participation Level of Students in the School District of Philadelphia
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 participated, and adherence to the chosen protocol

(participation level). The Fast ForWord Language protocol used by the School District of Philadelphia called for students to use the product for 100 minutes a day, five days a week, for four to eight weeks.

The ninety-four students in the pilot study used the Fast ForWord Language product for an average of 17 days, completing just over half the content (see Table 1). The average daily progress through the exercises is charted in Figure 1 and shows progress during the first 17 days. The final day shown on the chart 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 days shown, percent complete is maintained at the level achieved on their final day of product use.

	Number of Students	Average Days Participated	Average Number of Calendar Days	Average Overall Percent Complete	Average Participation Level
Students in Study	94	17	33	55%	66%

Table 1. Participant usage showing the number of students who used the Fast ForWord Language product, the average number of days they participated, the calendar days between start and finish, the percent of content covered, and their participation level (the percent of 100 minutes per day, five days per week, that the students actually used the Fast ForWord Language product.)

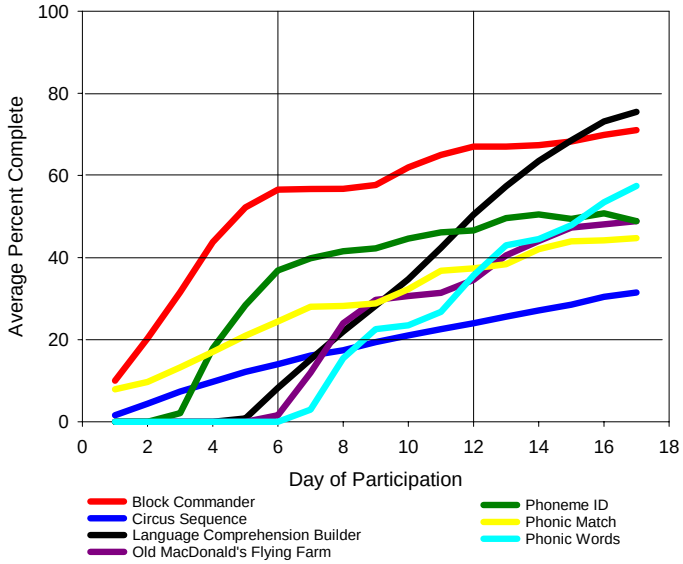

Figure 1. Average daily progress of students in the pilot study. The graph shows daily progress of 94 students through the Fast ForWord Language exercises.

Assessment Results

Group Reading Assessment and Diagnostic Evaluation

The GRADE was used to measure the reading achievement of 94 elementary school students. Statistical analyses were done on the NCEs. A MANOVA showed that students made statistically significant improvements between the two assessment times (Table 2). The MANOVA also showed that the improvements made on the two subtests were statistically different from each other.

Overall, on Vocabulary, the students improved from a NCE of 21.1 to 25.1. On Comprehension, students improved from a NCE of 18.5 to 27.2. This improvement of 8.7 NCEs is over one-third of a standard deviation (standard deviation = 21.1 NCEs).

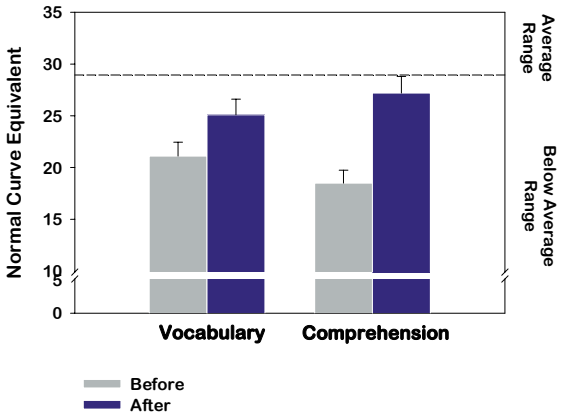

Figure 2. In this case study of 94 elementary school students, the students made significant improvements in their reading achievement.

For descriptive purposes, the grade-equivalents and percentile scores for each student were averaged. In Vocabulary, students' mean grade-equivalent improved from the 11th percentile (*SE* = 1.39) to the 16th percentile (*SE* = 1.82) and from a grade-equivalent of 2.5 (*SE = 0.*10) to a grade-equivalent of 2.7 (*SE* = 0.10). In Comprehension, students, on average, improved from the 9th percentile (*SE* = 1.02) to the 18th percentile (*SE* = 1.82), and from a grade-equivalent of 2.1 (*SE* = 0.07) to a grade-equivalent of 2.6 (*SE* = 0.10). Figure 2 shows the average improvement, in terms of NCE, on the Vocabulary and the Comprehension Composites. Although it was most appropriate to use NCEs for the statistical analyses, using grade-equivalents or percentiles in the calculations also demonstrated significant improvements.

GRADE		Before		After			Test Statistic	
	n	Mean	SE	Mean	SE	df	t	F
Time						93		27.3*
Subtest						93		0.1
Time x Subtest						93		9.5*
Vocabulary	94	21.1	1.4	25.1	1.5	93	2.8*	
Comprehension	94	18.5	1.2	27.2	1.6	93	6.1*	

Table 2. Overall, 94 elementary school students made statistically significant gains on reading achievement, as measured by the GRADE. Students improved on both the Vocabulary and the Comprehension subtests, with greater gains on Comprehension. Note that the scores are reported in terms of NCE. *p < 0.05

DISCUSSION

Students in the pilot study were in summer school following their third, fourth, or fifth grade year. The average grade level they had just completed was 3.7. Therefore, the students should have been performing close to the level of the grade they were entering (on average, 4.7). Yet, on average, they were performing close to the beginning of the second grade. Despite the low achievement of these students, and their history of slow improvement, after an average of 17 days of Fast ForWord participation, the students made significant improvements on both their vocabulary skills (2 months) and comprehension skills (6 months). These improvements demonstrate that within the School District of Philadelphia, an optimal learning environment coupled with a focus on early reading and cognitive skills can have significant improvements on the reading achievement of students in elementary school.

CONCLUSION

Scores from this study show that on average, elementary school students from the School District of Philadelphia who were low-performing or receiving special education services demonstrated statistically significant increases in their reading achievement as evidenced by improvements in vocabulary and comprehension. These results support the original studies on improved language skills, and demonstrate that Fast ForWord products also result in strengthened reading skills, allowing students to be better positioned to partake in the classroom curriculum.

Notes:

1. To cite this report: Scientific Learning Corporation. (2003). Improved Reading Vocabulary and Comprehension Skills by Students in the School District of Philadelphia Who Used Fast ForWord® Language, MAPS for Learning: Educator Reports, Vol. 7, No. 6: pp. 1-4.

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