Improved Reading Achievement by Students in the School District of Philadelphia who used Fast ForWord® Products

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ABSTRACT

Purpose: This study investigated the effectiveness of using the Fast ForWord software as a reading intervention, for academically low-performing students. **Study Design:** The design of the study is a multiple school, case-controlled study using a standardized, nationally-normed independent test of reading achievement. Statistical analyses using dependent t-tests and an analysis of variance procedure were used to evaluate changes in student reading performance and determine whether students who used Fast ForWord products had greater reading improvements than students who did not use Fast ForWord products. **Subjects:** Study participants were 315 students enrolled in the School District of Philadelphia, Pennsylvania. Students were primarily from the 4th and 5th grades with a range of 2nd through 8th grades. Reading skills were assessed in all students during September, December, and March. Prior to intervention, all students had been academically struggling in reading with the ability level of the group lagging their average grade level by almost 2 years (i.e., 1.8 years). Students were divided into three groups: Group 1 – Fall Fast ForWord students, Group 2 – Winter Fast ForWord students, and Group 3 – a control group that did not use the Fast ForWord products until the present study was completed. **Materials & Implementation:** Following staff training on the Fast ForWord products, the Fast ForWord participants (those in the first two groups), on average, used the Fast ForWord products for 32 school days. Student performance was evaluated by examining reading achievement as measured by performance on the Gates-MacGinitie Reading Tests in September, December, and March. The Grade Equivalent scores were used for all statistical analyses. **Results:** Two main results from the study were identified: 1) **Fast ForWord products had a positive benefit on student reading performance.** Results from the study found that students who used Fast ForWord products showed a significant gain in reading skills as compared to the control group; 2) **Fast ForWord software more than doubled the positive benefits of classroom reading instruction.** On average, students who used the products prior to March made nine months of improvement between September and March. The control group made four months improvement in reading performance over the same time period.

Keywords: Pennsylvania, elementary school, middle school, urban district, experimental study, Fast ForWord Language, Fast ForWord Middle & High School, Fast ForWord Language to Reading, Fast ForWord to Reading 3, Gates-MacGinitie Reading Tests.

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 School District of Philadelphia 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, Fast ForWord Middle & High School, Fast ForWord Language to Reading, and Fast ForWord to Reading 3) were used to evaluate the effectiveness of this approach at improving the reading achievement of students.

METHODS

Participants

During the 2003 – 2004 school year, 315 students from sixteen elementary and middle schools in Philadelphia, Pennsylvania, were assessed at three time points (September, December, and March) and their scores were reported for evaluation. The students have been divided into three groups. One hundred twenty-five students in Group 1 started using the products in September, October, or November and used the products for at least five days. In September, their average grade level was 4.8, and their average performance level was 2.8. One hundred thirty-one students in Group 2 started using the products in December, January, or February, and used the products for at least five days. In September, their average grade level was 4.8, and their average performance level was 3.1. Thirty-seven students in Group 3 served as a comparison group since they started using the products in March, April, or May. In September, their average grade level was 4.4, and their average performance level was 2.7. Another 22 students are not included in the analysis since they started using the products prior to March, but used them for five days or less. The students were in the 2nd through 8th grades with the majority (94%) being in 4th or 5th.

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 2003 – 2004 school year. Students were assessed three times: September, December, and March. Students were divided into three groups: those who started using Fast ForWord products in the Fall (September through November), those who started in the Winter (December through February) and those whose Fast ForWord use would not have affected their assessment scores (those who started in March or later).

Materials

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

Circus Sequence[1]*, Sweeps*[2]*, and Trog Walkers*[3]*:* 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] *and Streams*[2]*:* 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]*, IDs*[2]*, Polar Cop*[3]*, and Treasure in the Tomb*[3]*:* 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]*, Matches*[2]*, and Bug Out*[3]*:* 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,

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[1] Exercise from the Fast ForWord Language product.

[2] Exercise from the Fast ForWord Middle & High School product.

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

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] and Cards[2]: 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.

Stories[2] and Start-Up Stories[3]: Students follow increasingly complex commands, match pictures to sentences, and answer multiple-choice questions about stories that are presented aurally.

Scrap Cat[4]: 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[4]: 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.

Chicken Dog[4]: 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[4]: 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[4]: 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[4]: 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

Every three months, starting in September, schools in the School District of Philadelphia administer the Gates-MacGinitie Reading Tests to their fourth and fifth grade students to evaluate reading achievement. Many of the schools using Fast ForWord products reported the students' grade-equivalent scores for analysis.

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

Gates-MacGinitie Reading Tests: There are two parts to the GMRT: a vocabulary test and a comprehension test. These tests are used to assess a child's decoding skills and understanding of words and passages. The scores from the two tests can be combined to give an overall reading score, that can be reported in terms of a grade-equivalent score.

Analysis

Student achievement was reported in terms of grade-equivalents (GE). All statistical analyses were done using these GEs. An analysis of variance (ANOVA) was performed to analyze whether improvements differed depending upon when the students used Fast ForWord products (Group 1: early in the study, Group 2: late in the study, Group 3: after the study[5]). 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

The 256 students who used the Fast ForWord products all used either the Fast ForWord Language or Fast ForWord Middle & High School product for an average of 25 days, completing 61% of the content (see Table 1). One hundred twenty-five students went on to use the Fast ForWord Language to Reading product, and 26 students used the Fast ForWord to Reading 3 product. In all, there were 407 product starts.

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). In the majority (90%) of the 407 product starts, the School District of Philadelphia chose to use the protocols that required 90 - 100 minutes a day, five days a week, for four to eight weeks. The remaining product starts used an alternative schedule: 48 – 50 minutes each day, five days a week, for 6 – 10 weeks.

Assessment Results

Gates-MacGinitie Reading Tests

The GMRT was used to measure the reading achievement of 293 elementary and middle school students. Statistical analyses were done on the grade-equivalent scores evaluating the scores at the three time points and across the three groups. An ANOVA showed that the scores were significantly different at the three time points (Table 2). A *post hoc* comparison indicated that the differences were partly attributable to the September scores of Group 2 (3.1), which were significantly higher than those of Group 1 (2.8) and Group 3 (2.7). To reduce the influence of different initial scores, change scores were evaluated. Table 3 shows change scores for September to March for students who used Fast ForWord products, and those who did not. On average, students who used the products made significantly greater gains between September and March with the participants improving 0.76 years and the non-participants improving 0.35 years. Figure 1 shows academic achievement for each group at each assessment session. There is not a significant difference between the performance level of Group 1 and Group 3 in September, and there is not a significant difference between the lag in academic achievement (the difference between grade level and performance) of Group 2 and Group 3 in September. In September, Group 1 had a greater discrepancy between grade level and reading performance – on average, Group 1 was reading 2 years below grade level.

Fast ForWord Software Product use by Group 1 and 2 students	Number of Students	Average Days Participated	Average Overall Percent Complete	Average Participation Level
Fast ForWord Language or Fast ForWord Middle & High School	256	25	61%	42%
Fast ForWord Language to Reading	125	11	34%	51%
Fast ForWord to Reading 3	26	10	33%	46%

Table 1. Participant usage showing the number of students in Groups 1 and 2 who used each of the Fast ForWord products, the average number of days they participated, the percent of content covered, and their participation level (the percent of time they spent using the protocol relative to the protocol chosen.)

[5] The exact date of the assessment at each school was not known, so it is possible that some of the students in the control group had a few days of Fast ForWord use prior to the March assessment.

Gates-MacGinitie			September		March			
	n	Grade	Mean	SE	Mean	SE	df	F-Statistic
Time							2	68.8*
Time x Group							4	3.9*
Group 1 (FFWD)	125	4.8	2.8	0.07	3.5	0.1		
Group 2 (FFWD)	131	4.8	3.1	0.07	3.9	0.1		
Group 3 (Comparison)	37	4.4	2.7	0.1	3.0	0.2		

Table 2. Overall, 293 low-performing elementary and middle school students made statistically significant gains from September to March on reading achievement, as measured by the Gates-MacGinitie Reading Tests. These improvements in Time were significantly different by Group. *p < 0.05

		Change Score from September to March (years)		F-Statistic
	n	Mean	SE	
Participants	256	0.76	0.06	8.0*
Non-Participants	37	0.33	0.08	

Table 3. Overall, 256 students who used Fast ForWord products improved significantly more than students in a comparison group.
*p < 0.05

DISCUSSION

Students in this study were in 2nd – 8th grades with 94% of the students in 4th or 5th grade. The average grade level for the three groups was between 4.4 and 4.8, with the average performance level, in September, between 2.7 and 3.1. By fourth grade, many of these students were two or more years behind. And yet, on average, in the six months from September to March, students who used Fast ForWord products achieved an average improvement of 0.76 years – a greater improvement than the number of months that had passed, and a significantly greater improvement than that of a comparison group. It is important to note that the comparison group was formed of similar students – ones who were chosen as good candidates for Fast ForWord products, but who had not used the products by the time of the study. Previously, these students had not been mastering the academic material at the desired rate (one year in 12 months). Given the previous low achievement of these students, and their history of slow improvement, the students made impressive gains in their reading achievement. 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 and middle school.

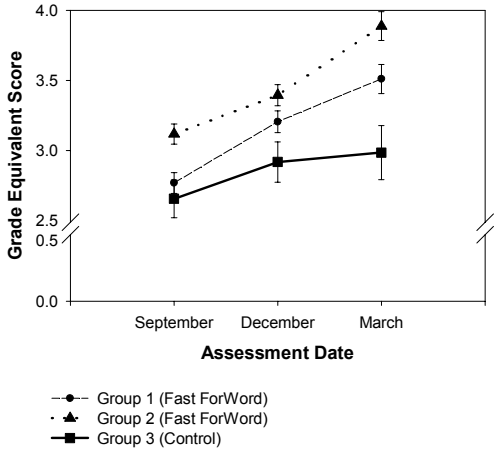

Figure 1. In this case study of 293 elementary and middle school students, the students who used Fast ForWord products made significantly greater improvements in their reading achievement than a comparison group.

CONCLUSION

Low performing students made significantly more progress in their reading development following the use of Fast ForWord software for an average of 32 school days. The use of a comparison group and independent repeated measures of reading progress support the theory that these significant changes in elementary and middle school readers were due to the effects of combining classroom reading instruction with cognitive and language development software (Fast ForWord products).

These results replicate the University-based published research that demonstrates that the development of oral language and cognitive skills is linked to reading skills and allows students to be better positioned to be successful in the classroom curriculum.

Notes:

1. To cite this report: Scientific Learning Corporation. (2004). Improved Reading Achievement by Students in the School District of Philadelphia Who Used Fast ForWord® Products, MAPS for Learning: Educator Reports, Vol. 8, No. 21: pp. 1-6.

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