

Improved Reading Achievement by Students in the Washington Local School District who used Fast ForWord® Products 2004-2005

MAPS for Learning: Educator Reports, 9(37): 1-8

ABSTRACT

Purpose: This study investigated the effects of the Fast ForWord products on the reading achievement of students who used the products within the curriculum in a school setting. **Study Design:** The design of this study was a multiple school case study using nationally normed tests and state assessments. **Participants:** Study participants were elementary and junior high school students who were attending nine schools in the Washington Local School District in Toledo, Ohio. **Materials & Implementation:** Following staff training on the Fast ForWord products, a group of students used the products during the 2003-2004 and the 2004-2005 school year. Before and after Fast ForWord participation, student reading performance was evaluated with the Reading Edge, Scantron and/or the Ohio Achievement Test (OAT). **Results:** On average, students made significant improvements in reading ability after Fast ForWord participation, with 86% improving one or more levels on the Ohio Achievement Test and 71% of the students meeting Ohio reading proficiency standards.

Keywords: Ohio, elementary schools, junior high schools, urban district, observational study, Fast ForWord Language, Fast ForWord Middle & High School, Fast ForWord Language to Reading, Fast ForWord to Reading 1, Fast ForWord to Reading 2, Fast ForWord to Reading 3, Fast ForWord to Reading 4, Reading Edge, Scantron, Ohio Achievement Test (OAT).

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).

In a previous study, the Washington Local School District has confirmed these earlier results and demonstrated that students in the district who used the Fast ForWord products attained significant improvements in reading achievement. The district used the Ohio Achievement Test and the Ohio Proficiency Test with third and fourth graders, respectively, and found that after using the Fast ForWord products, 55% of the students improved at least one level on the assessment.

In this study, the Washington Local School District continues to monitor the effectiveness of the optimal learning environment through tests of reading proficiency, reading achievement, and early reading skills. In this study, a larger variety of products were used: Fast ForWord Language, Fast ForWord Middle & High School, Fast ForWord Language to Reading, Fast ForWord to Reading 1, Fast ForWord to Reading 2, Fast ForWord to Reading 3, and Fast ForWord to Reading 4.

METHODS

Participants

The Washington Local School District is located in Toledo, the fourth largest city in Ohio. The city borders Lake Erie to the east and the state of Michigan to the north.

The Washington Local School District is a Kindergarten through twelfth grade district with 12 schools and nearly 7,000 students. Approximately 14% are minority students and 13% have Individualized Education Plans.

During the 2003-2004 and 2004-2005 school years, students from nine schools in the Washington Local School District used the Fast ForWord products and took part in the study reported here. Students had their reading skills evaluated with the Ohio Achievement

Test (OAT), the Reading Edge assessment, and/or the Reading assessment of the Scantron Performance Series before and after Fast ForWord participation. Six hundred seventy-two students had scores from before and after Fast ForWord participation available for analysis. School personnel administered the assessments and reported scores for analysis.

Study participants were first through eighth grade students with an average grade level of 4.3. Approximately 13% of the study participants had Individualized Education Plans (IEP).

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 the Washington Local School District, Fast ForWord Language, Fast ForWord Middle & High School, Fast ForWord Language to Reading, Fast ForWord to Reading 1, Fast ForWord to Reading 2, Fast ForWord to Reading 3, and Fast ForWord to Reading 4 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 all of the products, as detailed in the following exercise descriptions.

Circus Sequence¹, Sweeps², and Trog Walkers³: 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 Farm¹ and Streams²: 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 Identification¹, IDs², Polar Cop³, and Treasure in the Tomb³: 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 Match¹, Matches², and Bug Out³: 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 Words¹ and Cards²: 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 Builder¹: 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 Commander¹: 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

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.

syntax, develops working memory, improves sound processing speed, and increases the ability to follow directions.

Stories² and Start-Up Stories³: Students follow increasingly complex commands, match pictures to sentences, and answer multiple-choice questions about stories that are presented aurally.

Bear Bags⁴ and Bear Bags: More Lunch⁵: In these exercises, the participant is asked to help Mama Bear sort words (on pieces of toast) into phoneme-based categories (in lunch bags). They develop phonemic awareness and decoding of single-syllable words. *Bear Bags* also develops understanding of alphabetic principles (phonics) and *Bear Bags: More Lunch* also develops grapheme/phoneme associations.

Magic Rabbit⁴ and Magic Bird⁵: These exercises combine spelling and word-building practice with spelling patterns and word families commonly studied in 1st grade for *Magic Rabbit* and in 2nd grade for *Magic Bird*. The task is designed to emphasize the relationships between words by showing how one word can be turned into another by simply changing a single letter in any position. Using a click and drag interface, the participant must either select the missing letter to complete a partially spelled word or rearrange scrambled letter tiles to spell a word. These exercises develop spelling and sensitivity to letter-sound correspondences.

Flying Fish⁴ and Fish Frenzy⁵: In these exercises, a fishing pelican pronounces a word. Then a series of spoken and/or written words (on fish) fly across the pond and the participant clicks on the word when it matches the pronounced word. These exercises develop decoding skills, identification of sight words, and auditory memory.

Quail Mail⁴: In Quail Mail, a squirrel mail carrier pulls words out of a mailbag and the participant sorts them into different categories by clicking on the appropriate mailbox. This exercise encourages flexibility during reading and automatic access to the various dimensions of vocabulary.

Bedtime Beasties⁴ and Leaping Lizards⁵: These exercises use the “cloze task,” in which a written and aurally presented sentence has a word missing. The participant must select the correct word to complete the sentence from four choices. Vocabulary skills and sentence comprehension are developed in these exercises.

Buzz Fly⁴ and Dog Bone⁵: In these exercises, the participant listens to a passage and answers comprehension questions relating to each passage. The questions are aurally presented and written, and the response choices are presented as pictures. Responses are presented as words or short phrases in *Dog Bone*. These exercises develop listening comprehension and working memory skills as measured by performance on multiple-choice questions.

Ant Antics⁵: The participant will be presented with a picture and then asked to pick one of the four alternatives that best describes an aspect of that picture. This exercise improves vocabulary skills and sentence comprehension.

Scrap Cat⁶: 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 develops decoding, vocabulary, and word recognition skills.

Canine Crew⁶: 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 develops vocabulary, decoding, and automatic word recognition.

Chicken Dog⁶: 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 develops basic spelling patterns, letter-sound correspondences, and decoding.

Twisted Pictures⁶: 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 Monkeys⁶: Participants read narrative and expository passages and answer comprehension questions about each passage. The multiple-choice

⁴ Exercise from the Fast ForWord to Reading 1 product.

⁵ Exercise from the Fast ForWord to Reading 2 product.

⁶ Exercise from the Fast ForWord to Reading 3 product.

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*⁶: 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.

*Hoof Beat*⁷: The participant is presented with a question and four possible answers. The participant must choose the most appropriate answer. The questions relate to semantics, phonology, morphology, orthography, and syntax. The exercise encourages flexibility during reading and automatic access to the various dimensions of vocabulary and is designed to build vocabulary by showing the participant how words function.

*Jitterbug Jukebox*⁷: The participant hears a word spoken aloud and letters appear on the keys of a jukebox. The participant must spell the word by clicking on the jukebox keys. Jitterbug Jukebox helps participants improve spelling and sensitivity to letter-sound correspondences. This exercise includes many of the 500 most commonly used words in written English including most word families found in 3rd and 4th grade content standards.

*Goat Quotes*⁷: In Goat Quotes four newspapers paraphrase a headline at the top of a news kiosk. The participant must select the correct paraphrase. The exercise is designed to sample the basic syntactic (i.e., grammatical) structures of spoken English generally mastered in the early elementary grades. The exercise develops logical thinking and working memory skills as well as careful reading.

*Book Monkeys: Book Two*⁷: Participant reads a passage, chart, or schedule and then answers questions related to the material. This exercise develops a participants' ability to read for literal meaning, cause-and-effect relationships, and inferential comprehension. It also develops a participant's working memory as well as vocabulary skills, which are crucial for flexible, fluent reading.

*Stinky Bill's Billboard*⁷: Participants must select the word that accurately completes a sentence. In this exercise, participants improve sentence comprehension while practicing the decoding of words in realistic contexts. This exercise also helps build vocabulary and awareness of word structure.

*Lulu's Laundry Line*⁷: Short passages are presented with occasional gaps where punctuation is missing. The participant must read the words and understand the passage in order to determine the correct punctuation. The exercise develops punctuation skills as well as automaticity for decoding and sentence comprehension.

Assessments

Students were evaluated with the Reading Edge, Scantron or Ohio Achievement Test (OAT) before and after Fast ForWord participation. Students were assessed with the OAT in October and March of the 2004-2005 school year. No test dates were available for the Reading Edge assessment, or for the majority of the Scantron assessment scores.

Reading Edge: Reading Edge is a software program for evaluating phonological/early reading skills, including phonological processing, phonological awareness, phonemic decoding, and letter-sound identification. The Reading Edge composite score reflects a student's overall performance on the various phonological and reading tests in Reading Edge taking into account the relative importance of each test in predicting reading ability.

Scantron Performance Series: The Scantron Performance Series assessment is a standards-based, norm- and criterion-referenced computer-adaptive measurement that assesses and tracks student academic growth. It adapts to a student's instructional level by changing the difficulty of questions based on previous answers. It can also measure different academic assessments of individual state standards. The Reading portion of this assessment is appropriate for students in grades 2-12.

Ohio Achievement Test (OAT): The OAT tests are criterion-referenced, and compare student academic performance to Ohio's selected curriculum in five areas: reading, math, citizenship, science, and writing. Test items include multiple choice, short answer, and extended response style questions.

Scores on the OAT are reported in terms of scale scores. The Ohio State Board of Education has established performance standards (cut scores) based on these scores. These standards divide test scores into performance levels ranging from Limited to Advanced. The established proficiency standard (performance level of Proficient) for the Ohio Achievement Test for 3rd graders is a scale score of 400.

⁷ Exercise from the Fast ForWord to Reading 4 product.

Analysis

Scores were reported in terms of percentages for the Reading Edge assessment, in scale scores for the Scantron assessment, and in scale scores and performance levels for the Ohio Achievement Test (OAT). Percentages and scale scores were analyzed using paired t-tests. All analyses used a p-value of less than 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 and attendance level). The Washington Local School District used Fast ForWord products during the 2003-2004 and 2004-2005 school years. Of the 672 students in this study, 184 used products in the 2003-2004 school year; the remaining students participated during the 2004-2005 school year.

The Washington Local School District chose to use a combination of various protocols during both school

years. These protocols called for students to use the products for 48, 50, 75, 90 or 100 minutes a day, five days per week, for four to twelve weeks. Nearly all students started with either the Fast ForWord Language product or the Fast ForWord Middle & High School product. Most then went on to use the Fast ForWord Language to Reading product. Detailed product use is shown in Table 1; the usage data shown is from the 672 students included in the study regardless of which school year they used the Fast ForWord products.

Figures 1 through 7 show the average daily progress through the Fast ForWord Language, Fast ForWord Middle & High School, Fast ForWord Language to Reading, Fast ForWord to Reading 1, Fast ForWord to Reading 2, Fast ForWord to Reading 3, and Fast ForWord to Reading 4 product exercises for students who had scores available for analysis. 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 product 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 | Days Participated | Number of Calendar Days | Percent Complete | Participation Level | Attendance Level |
|-----------------------------------|--------------------|-------------------|-------------------------|------------------|---------------------|------------------|
| Fast ForWord Language | 485 | 31 | 73 | 73% | 93% | 65% |
| Fast ForWord Middle & High School | 148 | 25 | 43 | 85% | 68% | 81% |
| Fast ForWord Language to Reading | 407 | 35 | 110 | 63% | 86% | 58% |
| Fast ForWord to Reading 1 | 19 | 10 | 33 | 65% | 92% | 75% |
| Fast ForWord to Reading 2 | 47 | 21 | 72 | 71% | 90% | 64% |
| Fast ForWord to Reading 3 | 205 | 26 | 93 | 58% | 78% | 59% |
| Fast ForWord to Reading 4 | 122 | 30 | 75 | 70% | 80% | 65% |

Table 1. Usage data showing the number of students who used each Fast ForWord product during the 2003 – 2005 school years, 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.

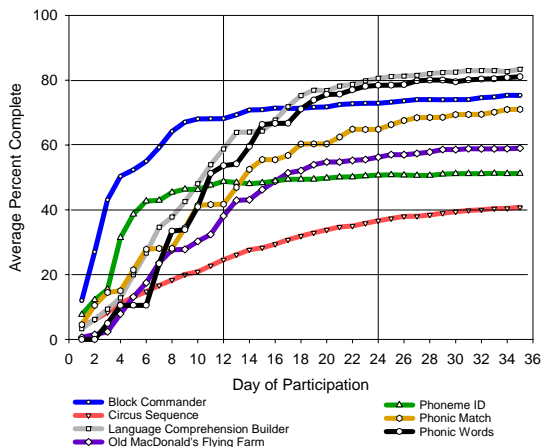


Figure 1. Average daily progress through the Fast ForWord Language product exercises. Results from 485 students are shown.

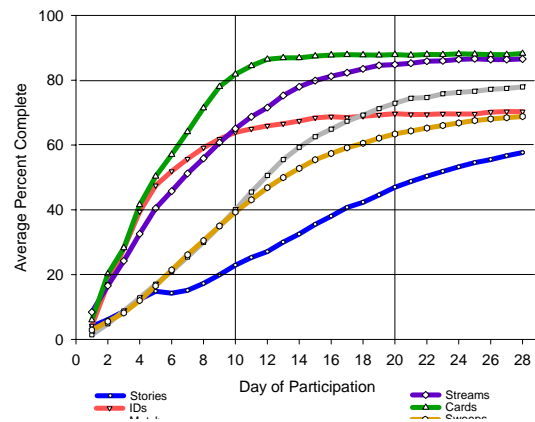


Figure 2. Average daily progress through the Fast ForWord Middle & High School product exercises. Results from 148 students are shown.

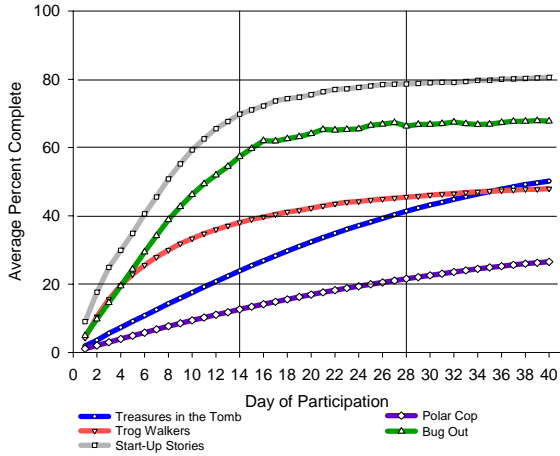


Figure 3. Average daily progress through the Fast ForWord Language to Reading product exercises. Results from 407 students are shown.

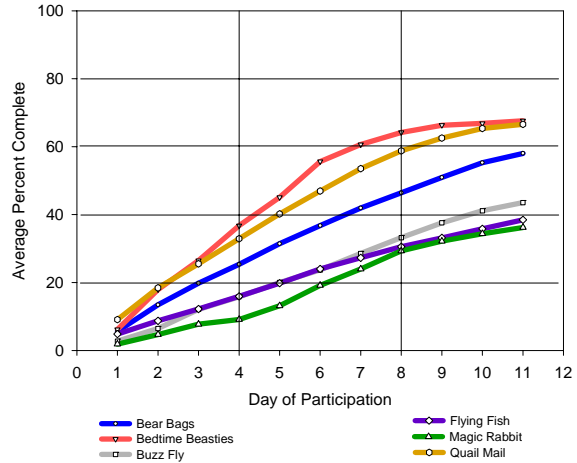


Figure 4. Average daily progress through the Fast ForWord to Reading 1 product exercises. Results from 19 students are shown.

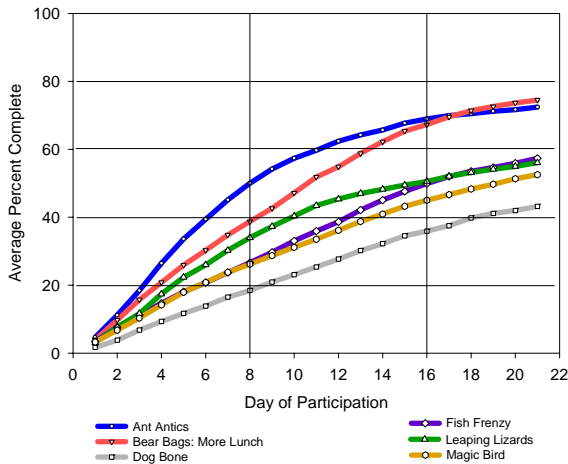


Figure 5. Average daily progress through the Fast ForWord to Reading 2 product exercises. Results from 47 students are shown.

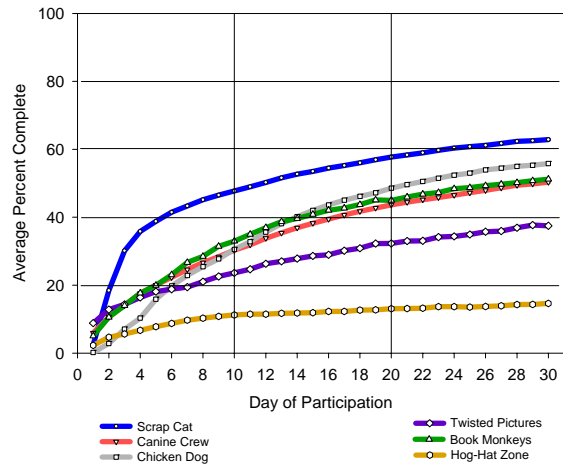


Figure 6. Average daily progress through the Fast ForWord to Reading 3 product exercises. Results from 205 students are shown.

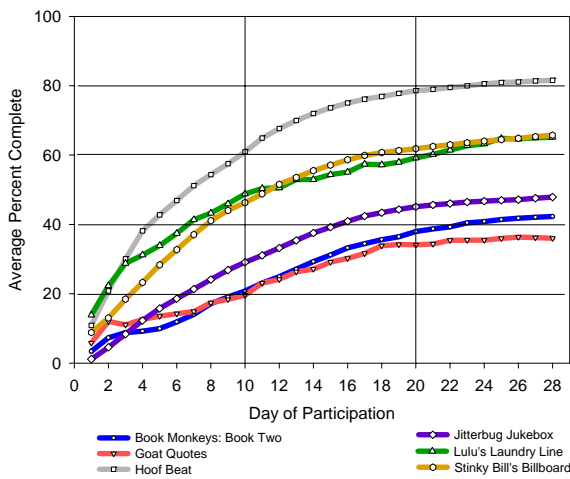


Figure 7. Average daily progress through the Fast ForWord to Reading 4 product exercises. Results from 122 students are shown.

Assessment Results

Ohio Achievement Test (OAT): Scores on the OAT were reported in terms of scale scores and performance levels. Fourteen third grade students had scores from before and after Fast ForWord participation available for analysis. The OAT is given to third grade students in October and March of the school year. Students started participating in the Fast ForWord products in the Fall of 2005 and most had completed the Fast ForWord Language product by the time of post-testing in March of 2005.

For third graders, a scale score of 400 or higher is required for OAT Reading proficiency. On average, before Fast ForWord product use, students were reading below Ohio proficiency standards. After Fast ForWord participation, students overall made significant improvements and reached an average

score of 405, meeting state standards for reading proficiency (Table 2).

Performance levels were also reported. The OAT has five performance levels: Limited, Basic, Proficient, Accelerated, and Advanced. Before Fast ForWord use, only 14% of the students were at a level of Proficient or above. After participation, 86% of the students improved one or more levels and the percentage who reached proficiency rose to 71%. Table 3 shows the percentages of students at each OAT performance level before and after Fast ForWord product use.

| | n | Before | | After | | t-statistic |
|-----|----|--------|------|-------|------|-------------|
| | | Mean | SE | Mean | SE | |
| OAT | 14 | 388.0 | 3.91 | 405.2 | 4.70 | 4.96* |

Table 2. On average, students made significant improvements in reading achievement after using the Fast ForWord products. * $p < 0.05$.

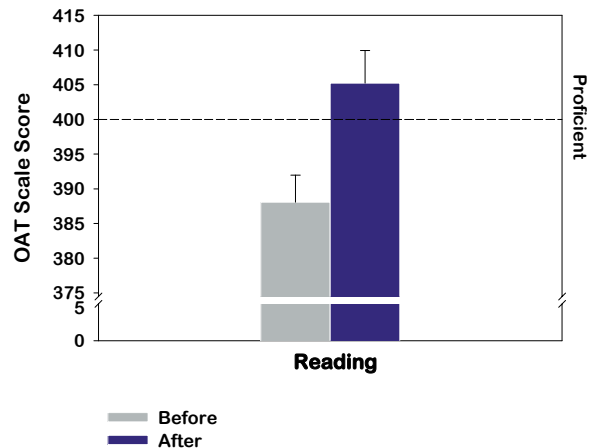


Figure 8. On average, students had significant gains in reading achievement after Fast ForWord participation. Results from 14 students are shown.

| | Performance Level | | | | |
|-------------|-------------------|-------|------------|-------------|----------|
| | Limited | Basic | Proficient | Accelerated | Advanced |
| Before FFWD | 36 | 50 | 7 | 7 | 0 |
| After FFWD | 7 | 21 | 43 | 21 | 7 |

Table 3. The percentage of students meeting Ohio reading proficiency standards increased from 14% to 71% after Fast ForWord participation.

Reading Edge: Scores for the Reading Edge assessment were reported in percentages; across the two years, 508 scores were reported. On average, students made significant improvements after Fast ForWord use, raising their score from 67% to 81% (Table 4; Figure 9).

One hundred eighty-three of the 508 students used the products during the 2003-2004 school year and had scores available for analysis. These 183 students significantly improved their Reading Edge scores from an average of 72% to 83% after product use. Of the remaining 325 students who used Fast ForWord products during the 2004-2005 school year, these students also, on average, showed significant gains and improved from 64% correct before participation to 79% correct after Fast ForWord participation.

| | n | Before | | After | | t-statistic |
|--------------|-----|--------|------|-------|------|-------------|
| | | Mean | SE | Mean | SE | |
| Reading Edge | 508 | 67.6 | 1.25 | 81.1 | 0.99 | 15.0* |

Table 4. After using the Fast ForWord products, students, on average, made significant gains in reading skills. * $p < 0.05$.

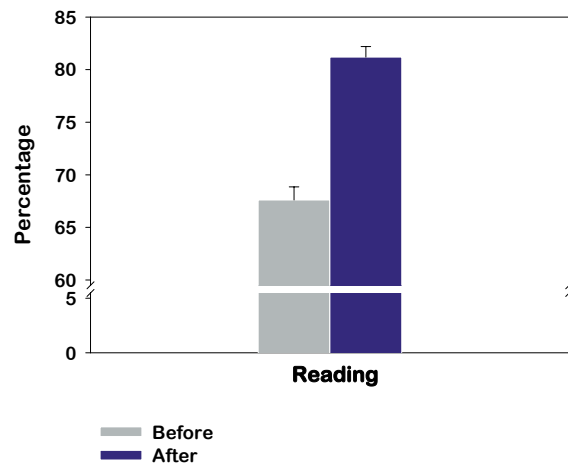


Figure 9. On average, students significantly improved their reading performance after Fast ForWord product use. Results from 508 students are shown.

Scantron Performance Series: Scores for the reading portion of the Scantron assessment were reported in terms of scale scores. One hundred sixty-two scores were included in the analysis; due to unavailable pre- and post-assessment dates for nearly all of the reported scores, it is possible some students started using Fast ForWord products before their pre-test or were still using products at the time of their post-test.

On average, in the time between pre- and post-test, students made significant improvements in their reading skills, improving their scale score by 18 points (Table 5; Figure 10).

| | n | Before | | After | | t-statistic |
|----------|-----|--------|------|--------|------|-------------|
| | | Mean | SE | Mean | SE | |
| Scantron | 162 | 2908.7 | 16.1 | 2927.5 | 16.0 | 2.23* |

Table 5. On average, students made significant improvements in reading performance after using the Fast ForWord products.

* $p < 0.05$.

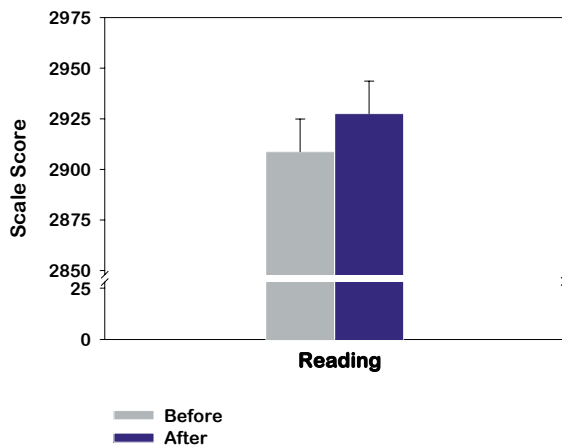


Figure 10. Students, on average, had significant improvements after Fast ForWord participation. Results from 162 students are shown.

DISCUSSION

During the 2003-2004 and 2004-2005 school years, students in the Washington Local School District used the Fast ForWord products and participated in the study reported here. On average, students made significant gains in reading ability after Fast ForWord product use, with students meeting Ohio reading proficiency standards. These findings demonstrate that, within the Washington Local School District, an optimal learning environment coupled with a focus on cognitive and early reading skills can help students attain a higher level of 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. This study, in combination with the district's previous one, further demonstrates the strong positive impact on the district's reading achievement of using an optimal learning environment to build cognitive skills in the context of reading and language

After Fast ForWord use, students in the Washington Local School District made significant gains in their reading skills. Seventy-one percent of students met Ohio proficiency standards and 86% increased at least one performance level after Fast ForWord participation. This continues to demonstrate 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. (2005). Improved Reading Achievement by Students in the Washington Local School District who used Fast ForWord® Products 2004-2005, MAPS for Learning: Educator Reports, 9(37): 1-8.

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