

# Improved Reading Skills by Students in the Washington Local School District who used Fast ForWord<sup>®</sup> Products

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## ABSTRACT

**Purpose:** This study investigated the effects of the Fast ForWord products on the reading skills of students who used the products within the curriculum in a school setting. **Study Design:** The design of this study was a multiple school study using nationally normed tests and state assessments. **Participants:** Study participants were kindergarten through sixth grade students attending schools in the Washington Local School District, in Toledo, Ohio. **Materials & Implementation:** Before and after participation on the Fast ForWord products, students were evaluated with Reading Edge and the Ohio Achievement Test (OAT). **Results:** Following Fast ForWord participation, Reading Edge scores improved significantly during the 2005-2006 school year. The average gain was 14 points, with scores increasing from 65 to 79. Performance on the Ohio Achievement Test (OAT) also improved significantly following Fast ForWord participation. On average, students improved their year-over-year performance as well as their performance on a follow-up test given more than one year after Fast ForWord participation. In both cases, the number of students performing at the Proficient level of mastery also increased: 52% for the group with year-over-year scores, and 300% for the group with the follow-up test.

**Keywords:** Ohio, elementary school, urban, observational study, Fast ForWord Language Basics, Fast ForWord to Reading Prep, Fast ForWord Language, 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, 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).

Studies within the Washington Local School District in 2003-2004 and 2004-2005 confirmed these earlier results. Students made significant improvements in reading skills following Fast ForWord participation, with scores on Reading Edge and the Ohio Achievement Test increasing significantly. In the current study, the district continued to monitor the effectiveness of the optimal learning environment through tests of reading achievement and early reading skills. They were also interested in longitudinal results from students who were given a follow-up test more than one year after their initial assessment. The Washington Local School District used commercially available computer-based products (Fast ForWord Language Basics, Fast ForWord to Reading Prep, Fast ForWord Language, 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) to evaluate the effectiveness of this approach at improving the reading skills of students.

## METHODS

### Participants

The Washington Local School District is located in Toledo, Ohio. The district is made up of 12 schools serving nearly 7,000 students in Kindergarten through twelfth grade.

This report focuses on eight schools that used Fast ForWord products during the 2004-2005 and 2005-2006 school years.

Six hundred ten students had their reading skills assessed before or after Fast ForWord participation. The tests that were administered were Reading Edge and the Ohio Achievement Test. School personnel administered the assessments and reported scores for analysis.

### 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 in this study (Fast ForWord Language Basics, Fast ForWord to Reading Prep, Fast ForWord Language, 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) include three 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 the products, all help develop certain critical skills as detailed in the following exercise descriptions.

*Inside the Tummy*<sup>1, 2</sup>: Participants click and drag colored shapes into matching shape outlines in pre-

defined patterns. This task helps participants improve fine motor skills, hand-eye coordination, and computer mousing skills.

*Hungry Tummy*<sup>2</sup>: Participants follow spoken directions to feed shapes of different colors and sizes to “Hungry Tummy” the bear. This task develops knowledge of basic colors (red, blue, green, yellow, and white), shapes (square, circle, and triangle) and relative size (big and small). Participants also develop their working memory, verbal decoding skills, and mousing skills as they practice following spoken instructions.

*Flying Saucer*<sup>1</sup>: Participants identify sounds presented in a sequence, then click on graphic icons associated with those sounds to reproduce the sequence. This task builds auditory discrimination ability, auditory working memory, and sequencing skills.

*Drag Racer*<sup>1</sup>: Participants point and click on a (sometimes moving) graphic, then hold the mouse button down to hear a stream of identical sounds. Participants release the mouse button when there is a sound change. This task is designed to improve auditory discrimination and sustained auditory attention. It also develops mousing skills, and the ability to withhold a response until an auditory cue is presented.

*Packing Pig Goes to Work*<sup>2</sup>: The name of a letter is presented aurally, and then that letter, along with up to four other letters, is displayed on the screen. The participant must click on the letter that was aurally presented. This task develops letter-name knowledge, auditory working memory, and visual-spatial memory abilities.

*Packing Pig Has Lunch*<sup>2</sup>: Participants match upper and lower case letter tiles in progressively larger grids. At the easiest levels, the tiles are face-up, with the letters visible throughout the trial. At the hardest levels the tiles are face-down, and letters are only briefly visible when clicked, so that it becomes a memory challenge. This task develops letter-name knowledge, association of upper and lower case letters, auditory working memory, and visual-spatial memory abilities.

*Ghost Coaster*<sup>2</sup>: The participant works to associate a set of consonant phonemes (speech sounds) with the letters that represent them. Each phoneme/letter pair is presented in several trials, along with examples of

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<sup>1</sup> Exercise from the Fast ForWord Basics product.

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<sup>2</sup> Exercise from the Fast ForWord to Reading Prep product.

words that start with the phoneme. This task builds letter-sound association skills and understanding of the alphabetic principle in written English.

*Houndini*<sup>2</sup>: Participants listen to sets of words, and must select the odd-one-out based on either beginning sounds or ending sounds. This task improves phonological processing skills including phoneme analysis and phonological working memory.

*Circus Sequence*<sup>3</sup> and *Trog Walkers*<sup>4</sup>: 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*<sup>3</sup>: 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*<sup>3</sup>, *Polar Cop*<sup>4</sup>, and *Treasure in the Tomb*<sup>4</sup>: 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*<sup>3</sup> and *Bug Out*<sup>4</sup>: 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*<sup>3</sup>: 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*<sup>3</sup>: 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*<sup>3</sup>: 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*<sup>4</sup>: Students follow increasingly complex commands, match pictures to sentences, and answer multiple-choice questions about stories that are presented aurally.

*Bear Bags*<sup>5</sup> and *Bear Bags: More Lunch*<sup>6</sup>: 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 Rabbit*<sup>5</sup> and *Magic Bird*<sup>6</sup>: These exercises combine spelling and word-building practice with spelling patterns and word families commonly studied in 1st grade for *Magic Rabbit* and in 2<sup>nd</sup> 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 Fish*<sup>5</sup> and *Fish Frenzy*<sup>6</sup>: In these exercises, a fishing pelican pronounces a word. Then a series of spoken and/or written words (on fish) fly across the

<sup>3</sup> Exercise from the Fast ForWord Language product.

<sup>4</sup> Exercise from the Fast ForWord Language to Reading product.

<sup>5</sup> Exercise from the Fast ForWord to Reading 1 product.

<sup>6</sup> Exercise from the Fast ForWord to Reading 2 product.

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 Mail*<sup>5</sup>: 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 Beasties*<sup>5</sup> and *Leaping Lizards*<sup>6</sup>: 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 Fly*<sup>5</sup> and *Dog Bone*<sup>6</sup>: 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 Antics*<sup>6</sup>: 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 Cat*<sup>7</sup>: 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 Crew*<sup>7</sup>: 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 Dog*<sup>7</sup>: 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 Pictures*<sup>7</sup>: 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*<sup>7</sup>: 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*<sup>7</sup>: 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*<sup>8</sup>: 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*<sup>8</sup>: 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-

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<sup>7</sup> Exercise from the Fast ForWord to Reading 3 product.

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<sup>8</sup> Exercise from the Fast ForWord to Reading 4 product.

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*<sup>8</sup>: 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 careful reading.

*Book Monkeys: Book Two*<sup>8</sup>: 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*<sup>8</sup>: 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*<sup>8</sup>: 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:

Reading Edge was administered in the fall of 2005, before *Fast ForWord* participation, and again in the spring of 2006, after students had used the products.

The Ohio Achievement Test (OAT) was administered in multiple years to students in various grades. Scores from the third graders are fall scores, scores from other grades are spring scores. Information on the administration of the OAT is shown in Table 1.

**Reading Edge:** Reading Edge is a software program for evaluating phonological and 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.

**Ohio Achievement Test (OAT):** The OAT is the criterion-referenced state achievement test based on Ohio's Academic Content Standards. The test is given to students in third through eighth grade. The OAT is administered to third graders in both the fall and the spring, and is administered to other grades only in the spring.

Scores on the OAT are reported in terms of scaled 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.

	3 <sup>rd</sup> grade	4 <sup>th</sup> grade	5 <sup>th</sup> Grade
2003-2004	X		
2004-2005	X		
2005-2006		X	X

*Table 1. The OAT was phased in such that the different grades were administered the OAT in different years. The above table shows the grades that had pre- or post-test data available for analysis each year. As can be seen from the table, the OAT was not administered to 4<sup>th</sup> graders during the 2004 – 2005 school year. A year-over-year comparison was available for 3rd and 4th graders. Data was also available for a more longitudinal study with a comparison of performance in 3rd and 5th grade (note: most of the students participated in the *Fast ForWord* products while in the 4th grade.)*

#### Analysis:

Reading Edge scores were reported as composite scores. Ohio Achievement Test scores were reported as scaled scores. All scores were analyzed using paired t-tests with 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). Between 2003 and 2006, the Washington Local School System primarily used the 48- and 50-minute protocols for the *Fast ForWord Language* and *Fast ForWord to Reading* products. These protocols call for students to use the products for 48 or 50 minutes a day, five days per week for eight to twelve weeks. Detailed product use is shown in Table 2. Note that most students used multiple products.

	Number of Students	Days Participated	Number of Calendar Days	Percent Complete	Attendance Level	Participation Level
Fast ForWord Language Basics	123	12	22	98%	70%	88%
Fast ForWord to Reading Prep	57	21	38	94%	76%	99%
Fast ForWord Language	417	32	94	77%	64%	96%
Fast ForWord Language to Reading	301	43	132	72%	53%	95%
Fast ForWord to Reading 1	109	17	59	88%	68%	97%
Fast ForWord to Reading 2	128	21	64	72%	61%	97%
Fast ForWord to Reading 3	87	43	152	68%	53%	95%
Fast ForWord to Reading 4	45	36	100	58%	58%	97%
Total Fast ForWord Product Use	610	64	190			

Table 2. Usage data showing the number of students who used each Fast ForWord product 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. Total values reflect the average total number of days that students used products. Note: Students often use multiple products.

**Assessment Results**

**Reading Edge:** Three hundred-eighty students used Fast ForWord products during the 2005-2006 school year and had Reading Edge scores available from the fall and spring of that year. On average, students received a composite score of 65 before Fast ForWord participation. After using the products, students

significantly improved their performance, with average scores increasing to 79 (Table 3, Figure 1). Twenty-two students used the products in 2004-2005 and had additional follow-up scores available from 2005-2006. These students continued to show significant improvement in reading skills (Figure 2).

	n	Before		After		t statistic
		Mean	SE	Mean	SE	
2005-2006	380	64.9	1.7	79.2	1.4	-11.5*

Table 3. Reading Edge scores improved significantly following Fast ForWord participation. \* $p > .05$

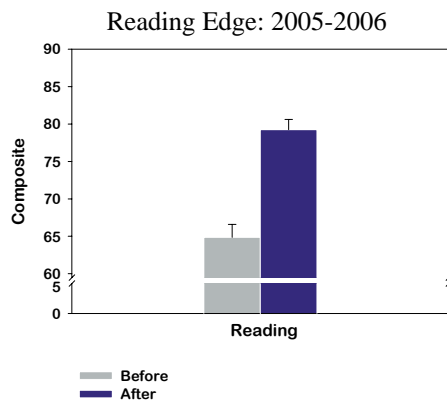


Figure 1. Students made significant gains in reading skills following Fast ForWord participation during the 2005-2006 school year. Results from 380 students are shown.

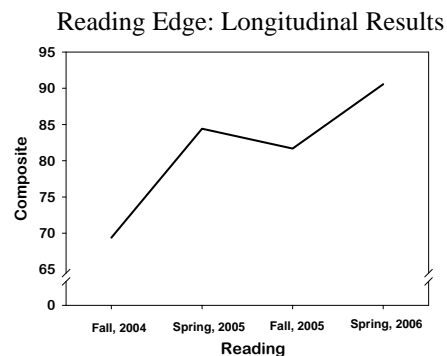


Figure 2. Students continued to make gains on Reading Edge in 2005-2006, after completing Fast ForWord participation in 2004-2005. Results from 22 students are shown.

**Ohio Achievement Tests:**

During the 2005 – 2006 school year, the OAT was given to students in third through fifth grade. Prior to the 2005-2006 school year, the Ohio Achievement Test was not given to fourth graders. Therefore, the performance of students who were in the 3<sup>rd</sup> grade during the 2004 – 2005 school year could be compared to their performance as 4<sup>th</sup> graders during the 2005 – 2006 school year. In addition, the performance of students who were in the 3<sup>rd</sup> grade during the 2003 – 2004 school year could be compared to their performance as 5<sup>th</sup> graders during the 2005 – 2006 school year.

Forty-one students used Fast ForWord products between the fall, 2004 and the spring, 2006 test dates. The group achieved significant gains. Average scaled scores increased from 403 to 416 (Table 4, Figure 3). At the time of the pre-test, 46 percent of the students were performing at or above the Proficient level.

Following Fast ForWord participation, this percentage increased to 70 percent (Table 5).

Fifth graders took the OAT in the spring of 2006; they had also taken it as third graders in the fall of 2003. Twenty-one students had both scores available and used Fast ForWord between the two administrations. The majority of the students used the products during the 2004-2005 school year, which means that the post-test was administered more than one year after completion of the Fast ForWord products, and helps show whether the effects of participation endure. Scores improved significantly, from an average scaled score of 386 to an average scaled score of 406 (Table 4, Figure 4). Prior to Fast ForWord participation, only 19 percent of students were performing at or above the Proficient level. At the time of the follow-up test, 76 percent of students had reached the Proficient level or above (Table 5).

OAT Results: 3<sup>rd</sup> Grade - 4<sup>th</sup> Grade

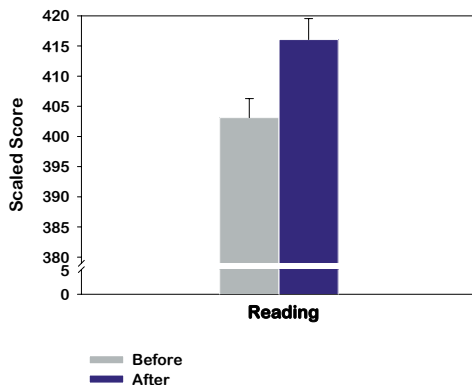


Figure 3. Students who used Fast ForWord during the 2005 – 2006 school year significantly improved their reading performance following Fast ForWord participation. Results from 41 students are shown.

OAT Results: Longitudinal 3<sup>rd</sup> Grade – 5<sup>th</sup> Grade

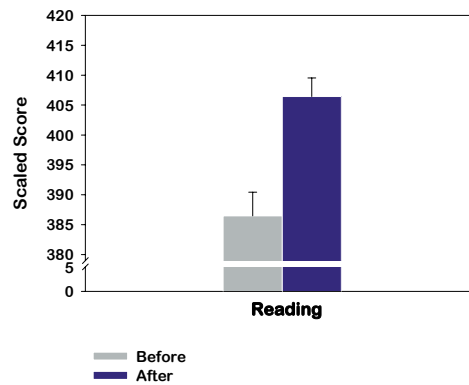


Figure 4. Students who were evaluated in the fall of 2003 and the spring of 2006 achieved significant gains in reading skills. Twenty-one students are included in this graph, and most used the products during the 2004 – 2005 school year.

	n	Before		After		t statistic
		Mean	SE	Mean	SE	
2003-2006	21	386.3	4.0	406.4	3.1	-5.0*
2004-2006	41	403.1	3.2	416.1	3.5	-3.7*

Table 4. Significant gains were made on the OAT following Fast ForWord participation. \* $p > .05$

	Proficient or Above	
	Before	After
2003-2006	19%	76%
2004-2006	46%	70%

Table 5. Percentage of students achieving the Proficient level of performance or higher on the OAT.

**DISCUSSION**

Elementary school students in the Washington Local School System made significant improvements in

their reading skills following Fast ForWord participation. Students made significant gains in early reading skills as measured by Reading Edge.

The average gain on Reading Edge was 14 points, with composite scores improving from 65 to 79. Performance on the Ohio Achievement Test also improved significantly. Students improved between the 2005 and 2006 administration of the OAT. They also demonstrated enduring benefit with longitudinal improvements between the 2003 and 2006 administrations. Between 2005 and 2006, the percentage of students reaching the Proficient level of performance or above increased from 46 percent to 70 percent. The longitudinal results reflect significant gains by students who took a follow-up test more than a year after most had completed Fast ForWord participation. Seventy-six percent of these students reached the Proficient level of performance or higher, up from 19 percent prior to Fast ForWord participation.

## 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. The current study, combined with earlier studies in the district, reflects significant improvements in reading achievement. This suggests that using the Fast ForWord products strengthened the students' foundational skills and helped them benefit more from the classroom curriculum.

### Notes:

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