Improved Academic Skills by Students in Westfield Washington Schools who used Fast ForWord® Products

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ABSTRACT

Purpose: This study investigated the effects of the Fast ForWord products on the academic skills of intermediate and middle school students who used the products within the curriculum in a school setting.

Results: On average, the Fast ForWord participants had significantly greater gains than expected in Language Arts, Math, and Reading, showing statistically significant improvements in all three areas.

Study Design: The design of this study was a case study using a nationally-normed assessment.

Participants: Study participants were 98 fifth- through eighth-grade intermediate and middle school students in Westfield, Indiana.

Materials & Implementation: Following staff training on the Fast ForWord products, the students used the products during the 2007-2008 school year. Students had their language arts, math, and reading skills evaluated with the Northwest Evaluation Association (NWEA) online assessment before and after Fast ForWord participation.

Keywords: Indiana, intermediate school, middle school, suburban district, case study, Fast ForWord Literacy, Fast ForWord Literacy Advanced, Fast ForWord Reading Level 2, Fast ForWord Reading Level 3, Fast ForWord Reading Level 4, Measures of Academic Progress (MAP).

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). Westfield Washington Schools was interested in evaluating the effectiveness of an optimal learning environment with a focus on early reading and cognitive skills as a way to improve the reading achievement of students in a school setting. In this study, commercially-available, computer-based products (Fast ForWord Literacy, Fast ForWord Literacy Advanced, Fast ForWord Reading Level 2, Fast ForWord Reading Level 3, and Fast ForWord Reading Level 4) were used to evaluate the effectiveness of this approach for improving the academic skills of intermediate school students.

METHODS

Participants

Westfield Washington Schools serves seven schools and is located in Westfield, Indiana, a growing community located at the crossroads of U. S. 31 and St. Rd. 32 just north of Indianapolis. The mission of Westfield Washington Schools is to provide engaging educational opportunities that will prepare all students to become life-long learners and help them to become respectful, responsible, honest, compassionate, and hard-working citizens. Westfield Intermediate School serves more than 850 fifth and sixth graders and

Westfield Middle School serves nearly 800 seventh and eighth graders.

Westfield Washington Schools used the Fast ForWord products during the 2007-2008 school year and took part in the study reported here. The schools selected students for the study based on their fall and winter RIT scores on the Northwest Evaluation Association (NWEA) online assessment, the Measures of Academic Progress (MAP). To provide a performance comparison, participants' gains were compared to the expected growth norms on the MAP. One hundred and twenty students from Westfield Washington Schools used the Fast ForWord products and had MAP scores from Fall, 2007 and Spring, 2008. School personnel administered the assessment and reported scores to Scientific Learning for analysis.

Implementation

Educators were trained in current and established neuroscience findings regarding the development of critical cognitive skills that are necessary for reading and learning success. Further training introduced the scientific background validating the efficacy of the Fast ForWord products; methods for assessment of potential candidates for participation; effective implementation techniques; as well as the selection of appropriate measures for testing and evaluation 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 students in this study (Fast ForWord Literacy, Fast ForWord Literacy Advanced, Fast ForWord Reading Level 2, Fast ForWord Reading Level 3, and Fast ForWord Reading Level 4) include five to six 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.

Space Racer[1]*, and Sky Rider*[2]*:* Students hear a series of short, non-verbal tones. Each tone represents a different fragment of the frequency spectrum used in spoken language. Students are asked to differentiate between these tones. The exercises improve working memory, sound processing speed, and sequencing skills.

Galaxy Goal[1]*:* 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.

Spin Master[1]*, Meteor Ball*[2]*, and Lunar Leap*[2]*:* 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.

Lunar Tunes[1]*, and Laser Match*[2]*:* Students choose a square on a grid and hear a sound or word. Each sound or word has a match somewhere within the grid. The goal is to find each square's match and clear the grid.

Star Pics[1]*:* Students see two pictures representing words that differ only by the initial or final consonant (e.g., "face" versus "vase", or "tack" versus "tag"). When students hear one of the words, they must click the picture that matches the word. This exercise increases sound processing speed, improves auditory recognition of phonemes and words, and helps students gain an understanding of word meaning.

Stellar Stories[1]*, and Galaxy Theater*[2]*:* Students follow increasingly complex commands, match pictures to sentences, and answer multiple-choice questions about stories that are presented aurally.

Bear Bags: More Lunch[3]*:* In this exercise, the participant is asked to help Mama Bear sort words (on pieces of toast) into phoneme-based categories (in lunch bags). It develops phonemic awareness and decoding of single- syllable words. It also develops grapheme/phoneme associations.

Magic Bird[3]*:* This exercise combines spelling and word-building practice with spelling patterns and word families commonly studied in 2nd grade. 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

[1] Exercise from the Fast ForWord Literacy product.
[2] Exercise from the Fast ForWord Literacy Advanced product.
[3] Exercise from the Fast ForWord Reading Level 2 product.

participant must either select the missing letter to complete a partially spelled word or rearrange scrambled letter tiles to spell a word. This exercise develops spelling and sensitivity to letter-sound correspondences.

Fish Frenzy[3]*:* In this exercise, 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. This exercise develops decoding skills, identification of sight words, and auditory memory.

Leaping Lizards[3]*:* This exercise uses 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 this exercise.

Dog Bone[3]*:* In this exercise, 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. This exercise develops listening comprehension and working memory skills as measured by performance on multiple choice questions.

Ant Antics[3]*:* 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[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 develops 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 develops 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 develops 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] *and Book Monkeys: Book Two*[5]*:* 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] *and Lulu's Laundry Line*[5] *:* 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. In *Lulu's Laundry Line*, short passages are presented with occasional gaps where punctuation is missing. These exercises develop paragraph comprehension, complex morphology, flexible reading, and vocabulary, as well as automaticity for decoding and sentence comprehension.

Hoof Beat[5]*:* 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 cognitive flexibility during reading and automatic access to the various dimensions of vocabulary. The exercise is designed to build vocabulary by showing the participant how words function.

Jitterbug Jukebox[5]*:* The participant hears a word spoken aloud and letters appear on the keys of a jukebox. The participant must spell the word by

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

[5] Exercise from the Fast ForWord Reading Level 4 product.

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[5]*:* 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.

Assessments

Before and after the participants used the Fast ForWord products, students' reading skills were assessed with the Northwest Evaluation Association (NWEA) online assessment, the Measures of Academic Progress (MAP). The Language Arts, Math, and Reading tests were used in this study. The study participants were pre-tested on the three subtests in late August or early September, 2007. The tests were administered again in late April or early May of 2008, at the end of the study.

Measures of Academic Progress (MAP): Developed by the Northwest Evaluation Association, the MAP are state-aligned computerized adaptive tests that accurately reflect the instructional level of each student and measure growth over time. The MAP is appropriate for students in grades 2 through 10.

Analysis

Scores were reported in terms of RIT scale scores. The RIT scale is infinite, but most student scores fall between the values of 140 and 300. Like meters or pounds, the scale is equal-interval. 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 and attendance levels). During the 2007-2008 school year, Westfield Washington Schools chose to use the 30-, 40-, and 50-Minute protocols. These protocols called for students to use the product for 30, 40, or 50 minutes a day, five days per week for several weeks, with the shorter daily protocols requiring more weeks. Table 1 shows detailed product use for students in Westfield Washington Schools who used Fast ForWord products during the 2007-2008 school year. As can be seen in the table, all participants started on the Fast ForWord Literacy product, with the majority progressing onto at least one additional Fast ForWord product.

Figure 1 shows the average daily progress through the Fast ForWord Literacy exercises. This graph represents the learning curve of the students as they progress through the product. 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.

Fast ForWord Product:	Number of Students	Days Participated	Calendar Days	Percent Completion	Percent Attendance	Percent Participation
Literacy	120	27.7	59.9	90.7%	79.8%	97.7%
Literacy Advanced	113	34.1	69.9	74.3%	79.0%	97.2%
Reading Level 2	10	23.3	55.3	67.7%	87.4%	99.1%
Reading Level 3	80	22.4	48.5	65.6%	82.2%	99.1%
Reading Level 4	35	19.3	35.1	65.2%	81.7%	99.0%
Total	120	83.4	177.6			

Table 1. Usage data showing the number of students who used the Fast ForWord products, 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.

Learning Curve: Fast ForWord Literacy

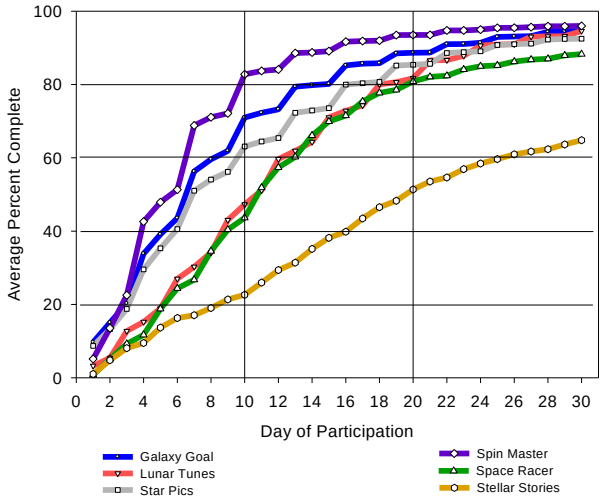

Figure 1. Average daily progress through the Fast ForWord Literacy exercises.

On average, the students made statistically significant improvements on the Language Arts, Math, and Reading tests (see Table 2, Figure 2).

Schools typically use the Growth Norms, published by NWEA, to determine if students met their academic goals for the school year. Tables 3 through 5 show the results of the Fast ForWord participants compared to the Growth Norms. Results are presented for groups of students with 20 or more students, namely fifth through eighth graders combined (n=98), fifth graders separately (n=45), and sixth graders separately (n=27).

Assessment Results

Measures of Academic Progress (MAP): Westfield Washington Schools used the Language Arts, Math, and Reading tests of the MAP. The tests were administered three times during the 2007-2008 school year, in the Fall, Winter, and Spring. These results look at the improvements between Fall and Spring. One hundred and twenty students had RIT scale scores from these two time points and used Fast ForWord products Ninety-eight of these 120 students had scores that could be considered true pre- and post-tests, where the pre-test was administered prior to starting the Fast ForWord product and the post-test was administered after the student completed participation.

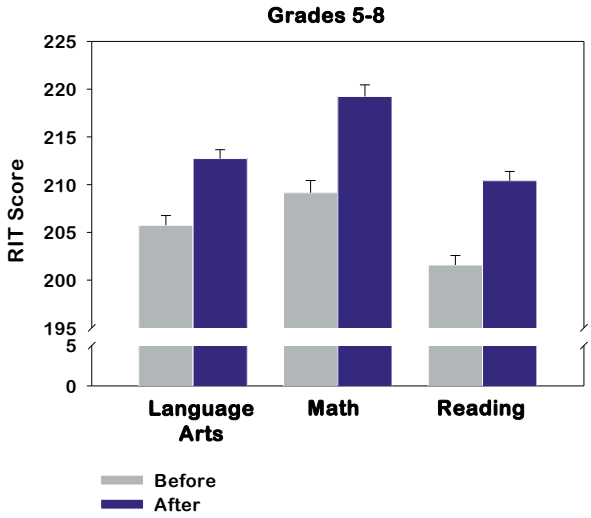

Figure 2. Students in intermediate and middle school who used Fast ForWord products showed statistically significant improvements in Language Arts, Math, and Reading. Results from 98 students are shown.

Test	n	MAP: Before		MAP: After		t-statistic
		Mean	SE	Mean	SE	
Language Arts	98	205.7	1.0	212.7	0.9	9.3*
Math	98	209.2	1.3	219.2	1.2	12.6*
Reading	98	201.6	1.0	210.4	1.0	10.5*

*Table 2. On average, students improved in academic skills after Fast ForWord use, with students significantly improving in Language Arts, Math, and Reading tests. * $p < 0.05$*

LANGUAGE ARTS			
Grade	**Total Number of Participants**	**Average Growth (FFW)**	**Typical Growth (Norm)**
5th – 8th	**98**	**+ 7.0**	**+ 4.2***
5th	**45**	**+ 8.3**	**+ 5.2**
6th	**27**	**+ 5.6**	**+ 4.0**

*Table 3. Students who used the Fast ForWord products significantly exceeded the NWEA Growth Norm in Language Arts. * Based on a weighted average of 5th through 8th graders.*

MATH			
Grade	**Total Number of Participants**	**Average Growth (FFW)**	**Typical Growth (Norm)**
5th – 8th	**98**	**+ 10.1**	**+ 7.5***
5th	**45**	**+ 12.0**	**+ 8.7**
6th	**27**	**+ 10.3**	**+ 7.2**

*Table 4. Students who used the Fast ForWord products significantly exceeded the NWEA Growth Norm in Math. * Based on a weighted average of 5th through 8th graders.*

READING			
Grade	**Total Number of Participants**	**Average Growth (FFW)**	**Typical Growth (Norm)**
5th – 8th	**98**	**+ 8.8**	**+ 4.5***
5th	**45**	**+ 11.1**	**+ 5.4**
6th	**27**	**+ 9.4**	**+ 4.3**

*Table 5. Students who used the Fast ForWord products significantly exceeded the NWEA Growth Norm in Reading. * Based on a weighted average of 5th through 8th graders.*

DISCUSSION

During the 2007 – 2008 school year, a group of 120 students from Westfield Washington Schools used the Fast ForWord products. Overall, students made statistically significant improvements in their language arts, math, and reading skills, as measured by the MAP. The gains of the students significantly exceeded the expected Growth Norms, demonstrating that an optimal learning environment coupled with a focus on cognitive and early reading skills can help students attain a higher level of academic achievement.

CONCLUSION

Language and reading skills are critical for all students, affecting 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. After Fast ForWord use, students in Westfield Washington Schools made significant gains in their language arts, math, and reading abilities, significantly exceeding their expected gains. This suggests that using the Fast ForWord products strengthened the students' foundational skills and better positioned them to benefit from the classroom curriculum.

Notes:

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REFERENCES

Lyon, G.R. (1996). Learning Disabilities. *The future of children: Special education for students with disabilities.* 6:54-76.

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

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

Northwest Evaluation Association. *Measures of Academic Progress (MAP)*. Lake Oswego, OR: Northwest Evaluation Association.

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