Improved Reading Skills by Students in Ireland who used Fast ForWord® Products

ABSTRACT

Purpose: This study investigated the effects of the Fast ForWord products on the reading skills of English-speaking students in Ireland. **Study Design:** The design of this study was a case study using a normed assessment of reading ability. **Participants:** Study participants were students ages 7 through 14 years who were attending the SMART Education Learning Centre in Castleknock, Dublin, Ireland. **Materials & Implementation:** The Fast ForWord product was implemented at the Castleknock Learning Centre as part of the educational curriculum. Before and after Fast ForWord participation, students had their reading skills evaluated with the Neale Analysis of Reading Ability: Second Revised British Edition (NARA II). **Results:** On average, students who completed the Fast ForWord program at the Learning Centre significantly improved in reading accuracy and reading comprehension. Average gain in reading accuracy was 14 months, and average improvement in reading comprehension was two years.

Keywords: Ireland, observational study, 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, Neale Analysis of Reading Ability: Second Revised British Edition (NARA II).

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).

Neuron Learning Ltd. provides the Fast ForWord products in the United Kingdom and Ireland. In June of 2006, Neuron Learning announced that the SMART Education Learning Centre in Castleknock, Dublin had become a certified provider of Fast ForWord products. SMART Education believes every student is unique and works together with each student and his or her parents to create an IEP (Individualized Education Plan). The Fast ForWord products were implemented at the Castleknock Learning Centre as part of the educational curriculum offered to its students.

METHODS

Participants

The study reported here includes results from 10 students who were attending the SMART Education Learning Centre of Castleknock, Dublin, Ireland. Study participants were 6 boys and 4 girls who were ages 7 through 14 years at the beginning of the study. Students used the Fast ForWord products at the Learning Centre or at their homes and had their reading ability assessed with the Neale Analysis of Reading Ability: Second Revised British Edition before and after Fast ForWord participation. Staff at the Castleknock Learning Centre administered the assessment and reported scores for analysis.

Implementation

All professionals involved in this study 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 students in this study, Fast ForWord Language, Fast ForWord Language to Reading, and Fast ForWord to Reading 1 through 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 differences between these products, all help develop certain critical skills as detailed in the following exercise descriptions.

Circus Sequence[1] and Trog Walkers[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.

Old MacDonald's Flying Farm[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.

Phoneme Identification[1], Polar Cop[2], and Treasure in the Tomb[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. *Polar Cop* also develops sound-letter correspondence skills. *Treasure in the Tomb* also develops grapheme recognition.

Phonic Match[1] and Bug Out[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. 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[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.

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.

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

Bear Bags[3] and Bear Bags: More Lunch[4]: 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[3] and Magic Bird[4]: 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.

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

[3] Exercise from the Fast ForWord to Reading 1 product.
[4] Exercise from the Fast ForWord to Reading 2 product.

Flying Fish[3] and Fish Frenzy[4]: 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 Mail[3]: 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[3] and Leaping Lizards[4]: 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[3] and Dog Bone[4]: 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[4]: 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[5]: 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[5]: 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[5]: 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[5]: 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[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[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. 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[6]: 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[6]: The participant hears a word spoken aloud and letters appear on the keys of a

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

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

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[6]: 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[6]: 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[6]: 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[6]: 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' reading skills were evaluated with the Neale Analysis of Reading Ability: Second Revised British Edition. The tests were administered before and after Fast ForWord participation. The time between pre- and post-test was, on average, approximately four months.

Neale Analysis of Reading Ability: Second Revised British Edition (NARA II): The NARA II is an individually administered test of reading skills designed to measure rate, comprehension, and accuracy of reading. It contains a series of short passages which the student reads aloud, followed by the student orally answering comprehension questions read by the test administrator. The assessment is appropriate for students ages 6-13.

Analysis
Scores for the Neale Analysis of Reading Ability were reported in terms of reading ages which were converted to age equivalents. Data were analyzed using paired t-tests and 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). Students at the Castleknock Learning Centre used the 48- and 50-Minute protocols for the Fast ForWord products. This protocol called for students to use the product for 48 or 50 minutes a day, five days per week for eight to twelve weeks. Students used the products over a period of two to six months. Detailed product use is shown in Table 1.

Almost all students started with the Fast ForWord Language product and continued participation with a Fast ForWord to Reading product. Figure 1 shows the average daily progress through the Fast ForWord Language product exercises. This graph shows the learning curve of the students as they progress through the product. Similar learning curves are available for the other products used in this study, Fast ForWord Language to Reading and Fast ForWord to Reading 1 through Fast ForWord to Reading 4. 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 products 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	9	23	55	79%	99%	89%
Fast ForWord Language to Reading	1	-	-	-	-	-
Fast ForWord to Reading 1	7	14	21	93%	99%	92%
Fast ForWord to Reading 2	9	22	37	92%	100%	90%
Fast ForWord to Reading 3	5	21	48	79%	100%	84%
Fast ForWord to Reading 4	1	-	-	-	-	-
Total	10	65	128	-	-	-

Table 1. 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. Product use information is not shown for products with fewer than five students.
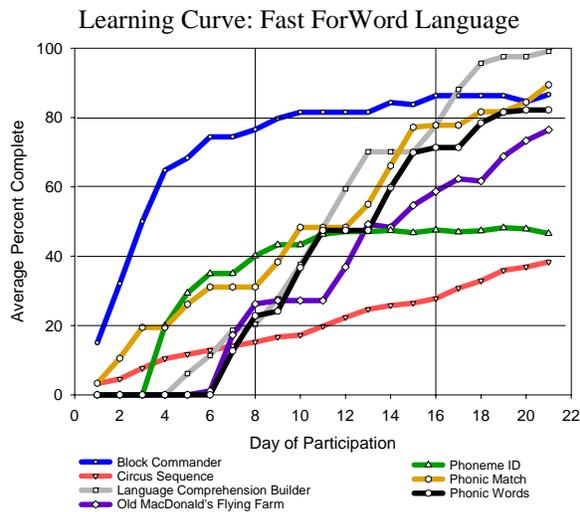

Figure 1. Average daily progress through the Fast ForWord Language product exercises. Results from 9 students are shown.
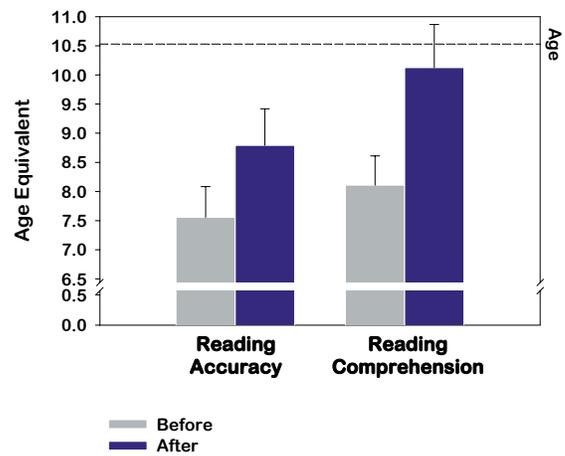

Figure 2. On average, after Fast ForWord participation, students had significant gains in reading ability with reading comprehension improving 2 years. Results from 10 students are shown.

Assessment Results

<u>Neale Analysis of Reading Ability: Second Revised British Edition (NARA II)</u>: Reading ages for ten students who completed the Fast ForWord program at the Castleknock Learning Centre were available for analysis. The reading ages, which were reported in terms of years and months. Data were analyzed using paired t-tests that showed a significant improvement in reading ability following Fast ForWord participation (Table 2). Average gain in Reading Accuracy was 14 months and the average improvement in Reading Comprehension was two years (Figure 2).

	n	Before		After		t-statistic
		Mean	SE	Mean	SE	
Reading Accuracy	10	7.55	0.52	8.79	0.62	5.75*
Reading Comprehension	10	8.10	0.50	10.10	0.74	4.49*

*Table 2. Students improved significantly in reading ability following Fast ForWord use. *p<0.05.*

DISCUSSION

Students attending the Castleknock Learning Centre in Dublin, Ireland during the 2005-2006 year made significant gains in reading skills following Fast ForWord participation.

The average reading accuracy age equivalent of the students at pre-test was 7.5 years and the average reading comprehension age equivalent was 8.1 years. In both reading skills, students were not performing at their actual age level of 10.2 years. After approximately four months of Fast ForWord product use, student reading accuracy increased by 14 months and reading comprehension improved by more than 2 years. These gains are substantial improvements for students who were previously reading as much as two and one-half years below their reading age level.

These findings demonstrate that 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. After Fast ForWord use, students who were attending Castleknock Learning Centre in Ireland made significant gains in reading skills. This suggests that using the Fast ForWord products strengthened the students' foundational skills, allowing them to benefit more from the classroom curriculum.

Notes:
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