

# Improved Reading Achievement by Students in Thailand who used Fast ForWord® Products: 2007 - 2008

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### ABSTRACT

**Purpose:** This study investigated the effects of the Fast ForWord products on the reading achievement of International students who used the products within the curriculum in a school setting.

**Results:** On average, after Fast ForWord participation, students showed significant improvement in their reading skills and academic achievement with improvements of 5 months to 1 year in Reading, Language, Math, Social Studies, Science, and Sources of Information, during the 4 months between assessments.

**Study Design:** The design of this study was a single school study using tests of reading skills and achievement that were normed in the United States.

**Participants:** Study participants were 5<sup>th</sup> graders attending the Ekamai International School in the Thailand during the 2007 - 2008 school year.

**Materials & Implementation:** Before and after participation on the Fast ForWord products, students were evaluated with the Iowa Test of Basic Skills (ITBS) and Reading Progress Indicator (RPI), tests that were developed and normed in the United States.

**Keywords:** Thailand, private school, middle school, observational study, Fast ForWord Literacy, Fast ForWord Literacy Advanced, Fast ForWord Reading Level 2, Fast ForWord Reading Level 3, Iowa Test of Basic Skills (ITBS), Reading Progress Indicator (RPI).

### INTRODUCTION

Numerous research studies have shown that cognitive and oral language skills are under-developed in struggling readers, limiting their academic progress (Lyon, 1996). University-based research studies reported the development of a computer software product that focused on learning and cognitive skills, and provided an optimal learning environment for building the memory, attention, processing and sequencing skills critical for reading success (Merzenich et al., 1996; Tallal et al., 1996). This prototype of the Fast ForWord Language software showed that an optimal learning environment and focus on early reading and cognitive skills resulted in dramatic improvements in the auditory processing and language skills of school children who had specific language impairments (Merzenich et al., 1996; Tallal et al., 1996) or were experiencing academic reading failure (Miller et al., 1999).

The Ekamai International School is a private non-profit school in Thailand. The children are bilingual

and the language of instruction in English. School administrators were interested in evaluating the effectiveness of an optimal learning environment for developing English reading skills and achievement as well as the cognitive skills necessary for learning. Under the guidance of staff at the Ekamai International School, commercially available computer-based products (Fast ForWord Literacy, Fast ForWord Literacy Advanced, and Fast ForWord Reading Levels 2 & 3) were used to evaluate the effectiveness of using an optimal learning environment focused on cognitive and linguistic skills for improving the cognitive skills and English language and reading skills of bilingual English speaking students.

### METHODS

#### Participants

The Ekamai International School is located in Bangkok, Thailand. It is a private, non-profit school operated by the Seventh-Day Adventist Mission in Thailand. It caters to students of all races,

nationalities, and religions who are in kindergarten through twelfth grade. The medium of instruction is English and the curriculum follows the American system with additional classes on Thai language and culture.

The students in this study were 76 fifth graders between the ages of 10 and 14, and reflect the international nature of the school. Eighty-two percent of the students were Thai nationals. The other 18% came from a variety of countries including China, Bangladesh, the Philippines, India, and South Korea. Approximately half the students had attended the school their entire academic career (seven years). The rest were fairly evenly spread between two and six years of attendance at Ekamai.

Seventy-six students used the Fast ForWord products in the spring of 2008 and took part in this study. The students were assessed with the Iowa Test of Basic Skills (ITBS) and Reading Progress Indicator (RPI) to evaluate the impact of the Fast ForWord products: The pre-test was the school's annual administration of the ITBS at the end of January. The post-test was a second administration in late May. The students were also tested at the beginning and end of the study with Reading Progress Indicator (RPI).

### Implementation

Advanced Ed in Bangkok, Thailand, provided support for the Ekamai International School. Educators at Ekamai 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 students in this study (Fast ForWord Literacy, Fast ForWord Literacy Advanced, Fast ForWord Reading Levels 2 & 3) 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

the products, all help develop certain critical skills as detailed in the following exercise descriptions.

*Space Racer<sup>1</sup> and Sky Rider<sup>2</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.

*Galaxy Goal<sup>1</sup>*: Students hear a single syllable that is repeated several times, and then interrupted by a different syllable. Students must respond when they hear the change in the syllable. This exercise improves auditory processing, develops phoneme discrimination, and increases sustained and focused attention.

*Spin Master<sup>1</sup>, Meteor Ball<sup>2</sup>, and Lunar Leap<sup>2</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. *Meteor Ball* also develops sound-letter correspondence skills. *Lunar Leap* also develops grapheme recognition.

*Lunar Tunes<sup>1</sup> and Laser Match<sup>2</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 *Lunar Tunes* exercise develops auditory word recognition and phoneme discrimination, improves working memory, and increases sound processing speed. The *Laser Match* exercise develops skill with sound-letter correspondences as well as working memory.

*Star Pics<sup>1</sup>*: Students see 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<sup>1</sup> and Galaxy Theater<sup>2</sup>*: Students listen to stories, then answer multiple-choice questions about them, match pictures to sentences, and follow commands of increasing complexity. As participants

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

<sup>2</sup> Exercise from the Fast ForWord to Literacy Advanced product.

integrate information across the sentences of a paragraph, and across the paragraphs of a story, they build listening comprehension skills. These exercises create a foundation for reading by developing basic language skills such as auditory word recognition and auditory memory, while simultaneously building more complex grammatical skills.

*Bear Bags: More Lunch*<sup>3</sup>: 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. *Bear Bags: More Lunch* also develops grapheme/phoneme associations.

*Magic Bird*<sup>3</sup>: This exercise combines spelling and word-building practice with spelling patterns and word families commonly studied in 2<sup>nd</sup> 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 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*<sup>3</sup>: 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*<sup>3</sup>: 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*<sup>3</sup>: 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 words or short phrases. This exercise develops listening comprehension and working memory skills as measured by performance on multiple choice questions.

*Ant Antics*<sup>3</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>4</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>4</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>4</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>4</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>4</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>4</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

<sup>3</sup> Exercise from the Fast ForWord to Reading 2 product.

<sup>4</sup> Exercise from the Fast ForWord to Reading 3 product.

suffixes and prefixes. This task develops paragraph comprehension, complex morphology, flexible reading, and vocabulary.

### Assessments

Each winter, the students' reading skills are evaluated with the Iowa Test of Basic Skills (ITBS). For the purposes of this study, the students were re-evaluated four months later in late spring. At the beginning and end of the study, the students' reading skills were assessed with Reading Progress Indicator. School personnel administered the assessments.

**Iowa Test of Basic Skills (ITBS):** The Iowa Test of Basic Skills, or ITBS, was developed by the University of Iowa's College of Education to provide an assessment of students in kindergarten through 8<sup>th</sup> grade. The emphasis of the test is to be able to use the results to guide instruction. The multiple-choice test evaluates students in the core areas (Reading, Language, and Math) as well as in subject areas (Science, Social Studies, and Sources of Information).

**Reading Progress Indicator:** Reading Progress Indicator is a computer-based assessment designed to rapidly measure the effects of the Fast ForWord products. There are four levels of the assessment, each designed for a specific grade range. Each test level measures phonological awareness, decoding, vocabulary and comprehension. Scores are reported as grade equivalents and percentiles.

### Analysis:

ITBS scores were reported in terms of both Normal Curve Equivalents (NCE's) and Grade-Equivalents

with the Grade Equivalents based on a 10-month school year. Reading Progress Indicator (RPI) scores were reported in terms scales scores and normal curve equivalents. After analyses, RPI scores were converted to percentiles and grade equivalents for reporting purposes. Changes in the three core areas of the ITBS (Reading, Language, and Math) were analyzed using a multivariate analysis of variance (MANOVA). The subject areas were evaluated using paired t-tests. RPI scores were analyzed using t-tests. A p-value of less than 0.05 was 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). During the 2007-2008 school year, the Ekamai International School used primarily the 40-Minute protocols for the Fast ForWord Literacy and Fast ForWord Literacy Advanced products. A variety of protocols (40-, 50-, and 90-Minutes) were used for the Reading products. These protocols call for students to use the products for 40, 50, or 90 minutes a day, five days per week for four to sixteen weeks. Detailed product use is shown in Table 1.

	Number of Students	Days Participated	Number of Calendar Days	Percent Complete	Participation Level	Attendance Level
Fast ForWord Literacy	76	24	48	90%	94%	76%
Fast ForWord Literacy Advanced	71	8	31	28%	92%	81%
Fast ForWord Reading Level 2	17	20	50	63%	90%	79%
Fast ForWord Reading Level 3	50	19	39	63%	88%	76%
Total Fast ForWord Product Use	76	49	114	--	--	--

*Table 1. Usage data for students in the study. This table shows 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: Most students used multiple products.*

### Assessment Results

**Iowa Test of Basic Skills (ITBS):** The ITBS is administered each year at the end of January. An additional administration was made in late May to evaluate the impact of the Fast ForWord products on the students.

Results from the ITBS were analyzed using a multivariate analysis of variance (MANOVA) to compare scores from before participation to scores from after participation. All 76 participants had ITBS scores available from both January and May.

The MANOVA was performed using the normal curve equivalent (NCE) scores from the three core areas: Reading, Language, and Math. The NCE's are seasonally corrected so expected learning is taken into account and the scores of students who improve at the expected rate will remain constant. The MANOVA indicated that there was a main effect of Time as well as a main effect of Test, but no Time by Test interaction (Table 2). Visual inspection showed that the impact was positive with post-test scores significantly higher than pre-test scores and that the students were strongest on the Math test (Table 3). This meant the students achievement improved at a rate that was higher than the typical rate.

Multivariate Analysis of Variance (MANOVA)		
	df	F-Statistic
Time	1, 75	14.1*
Test	2, 74	157.7*
Time x Test	2, 74	0.08

Table 2: There was a main effect of time and test with students showing significantly greater achievement on the post-test than the pre-test. These improvements were evident in all three areas: Reading, Language, and Math. \*:  $p < 0.05$ .

	n	Before		After		t-statistic
		Mean	SE	Mean	SE	
Reading	76	40.1	1.5	42.4	1.9	2.31*
Language	76	59.3	1.5	61.2	1.8	2.29*
Math	76	65.9	2.1	68.1	2.1	2.32*

Table 3: Average normal curve equivalent scores from January and May for 76 students. Scores are seasonally corrected for the amount students are expected to grow. Increases in scores are above those that are expected. \*  $p < 0.05$ .

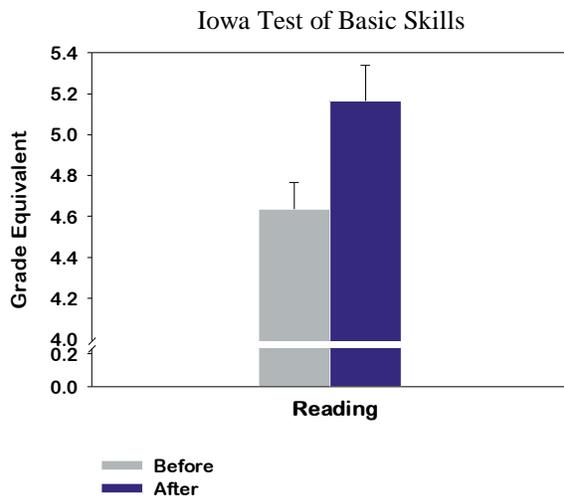


Figure 1: A group of 76 fifth graders showed significant improvements on their ITBS Reading grade equivalent.

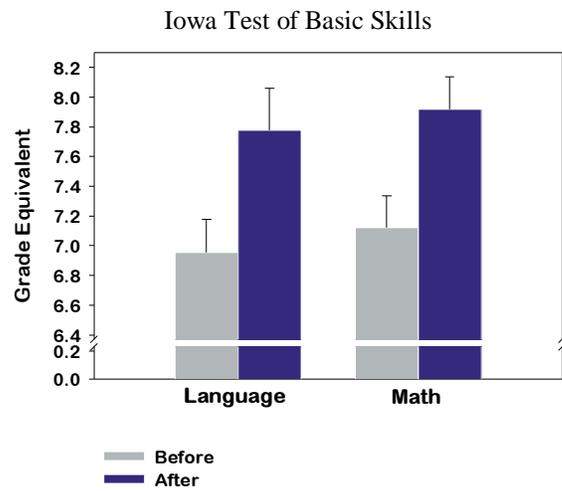


Figure 2: A group of 76 fifth graders showed significant improvements on their ITBS Language and Math grade equivalents.

All subjects require strong learning skills including attention, memory, and information processing. Therefore, it is not surprising that students also achieved statistically significant improvements on the Social Studies and Science sections as well as the section on Sources of Information which includes the ability to read maps and diagrams as well as reference material (Table 4; Figure 3).

It is important to note that the NCE scores on the ITBS are season-corrected with mid-year norms used for the January assessment and spring-norms used for the May assessment. This means that the growth that was expected to have occurred between January and May was already accounted for, and improvements were above those which were expected.

Grade equivalent results were evaluated for descriptive purposes. The grade equivalents are based upon a 10 month school year and indicate that average improvements were five months to one year during the four months between assessments. Students gained, on average, 8 months or more in Language, Math, Sources of Information, Social Studies, and Science, and more than 5 months in reading.

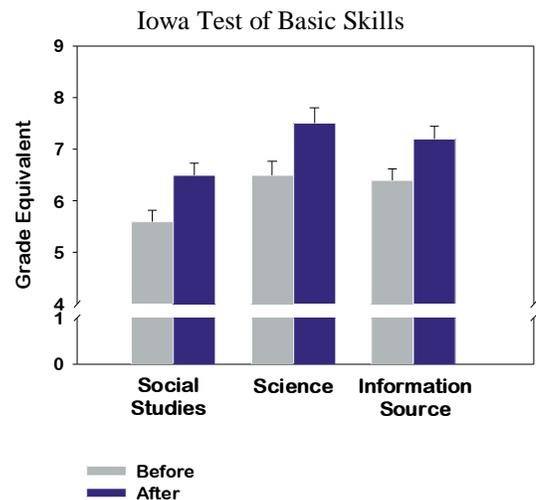


Figure 3: Fifth graders improved their Social Studies, Science, and Source of Information skills. Data from 76 students are included in this graph.

	n	Before		After		t-statistic
		Mean	SE	Mean	SE	
Social Studies	76	48.5	1.9	52.8	1.8	1.8*
Science	76	54.7	1.9	58.9	2.0	2.0*
Sources of Information	76	55.5	1.8	58.1	1.8	1.8*

Table 4: Average normal curve equivalent scores from January and May for 76 students. Scores are seasonally corrected for the amount students are expected to grow and show that students made statistically significant improvements in their Social Studies, Science, and Sources of Information tests. \*  $p < 0.05$ .

**Reading Progress Indicator:** Reading Progress Indicator was used to evaluate students before and after participation on each Fast ForWord product. Scores from before and after participation were available for all 76 students. Across the 76 students, the students made significant improvements, improving by 7 months from the 5<sup>th</sup> grade level to a level of 5.7 – very similar to the improvements seen on the ITBS (Figure 4). Normal curve equivalent scores improved from 43 to 51 corresponding to an improvement from the 37<sup>th</sup> percentile to the 52<sup>nd</sup>.

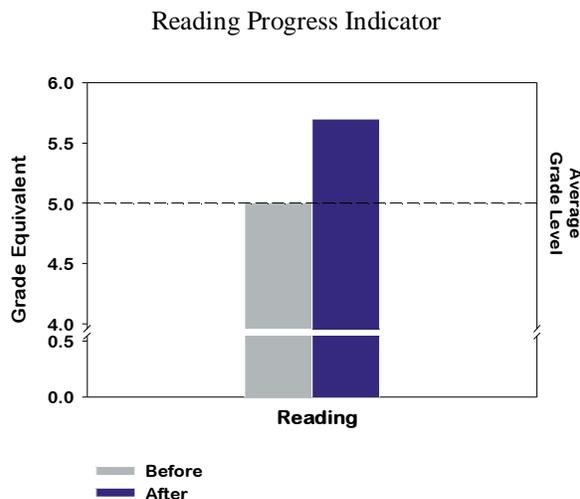


Figure 4: Fifth graders improved their reading skills by an average of 7 months in the 4 months between the pre- and post-test. Results from 76 students are shown here.

Reading Progress Indicator evaluates students in four different skill areas: Phonological Awareness, Vocabulary, Decoding, and Comprehension. The percentage of items correct in each skill area was available for the students. The largest change was in phonological awareness where students improved from 57 percent of the items correct to 72 percent.

## DISCUSSION

Fifth graders at the Ekamai International School made significant gains in their academic achievement following Fast ForWord participation. These improvements were apparent in the analysis of the students' ITBS scores with significant improvements in seasonally-corrected scores. The students also made significant improvements in their reading skills as demonstrated by their increased RPI scores.

The students who covered a range of nationalities, religions, and races, had attended English medium schools for several years (mean = 4.7 years) but were still challenged by phonological awareness, a critical early reading skill. Following use of the Fast ForWord products, the bilingual students dramatically improved their English phonological awareness, and also improved their academic achievement with average improvements of 5 – 8 months during the four months between tests.

## CONCLUSION

Language and reading skills are critical for all students, impacting their ability to benefit from instruction, follow directions and participate in class discussions. For students who are not native English speakers, challenges distinguishing between the different phonemes in the English language make learning the English language particularly difficult.

The students in this study achieved dramatic improvements in their phonological awareness skills which resulted in significant improvements on achievement tests administered in English. This study supports other studies demonstrating that using the Fast ForWord products strengthens students' foundational skills allowing them to benefit more from the classroom curriculum, and extends results to a group of non-native English speakers in Thailand.

**Notes:**

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