Improved Reading and Math Achievement by Students in the Lake Wales Charter Schools who used Fast ForWord® Products: 2009 - 2010

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ABSTRACT

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

Results: After Fast ForWord participation, the group made significant gains in reading and math achievement with 35% of the students improving one or more levels on the Reading component of the FCAT, and 33% of the students improving one or more levels on the Math component of the FCAT; 70% of the students made their Annual Learning Gains in Reading while 80% made their Annual Learning Gains in Math. Improvements were evident for students in all classifications evaluated: special education, Title I, and English language learners. Students evaluated for fluency showed statistically significant improvements on the FAIR-Maze, a test of reading fluency, improving their scores from 79 to 85 which corresponds to an improvement from the 8th percentile to the 16th percentile.

Study Design & Participants: The design of this study was a single school case study using nationally-normed and high stakes assessments. Study participants were middle school students in the Lake Wales Charter Schools in Lake Wales, Florida.

Materials & Implementation: Following staff training on the Fast ForWord products, the students used the Fast ForWord products during the 2009-2010 school year and had their reading and math abilities evaluated before and after Fast ForWord participation with the Math and Reading components of the Florida Comprehensive Assessment Test (FCAT), the Florida Assessments for Instruction in Reading (FAIR): Maze subtest, and/or Reading Progress Indicator (RPI).

Keywords: Florida, middle school, charter school, urban district, observational study, Special Education, Title I, English Language Learners, Fast ForWord Literacy, Fast ForWord Literacy Advanced, Fast ForWord Reading Levels 1 - 5, Florida Comprehensive Achievement Test (FCAT), Florida Assessments for Instruction in Reading (FAIR): Maze subtest, 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).

Further research has demonstrated that the use of an optimal learning environment with a focus on reading and cognitive skills not only benefits the auditory processing and language skills of school children who have specific language impairments, but can benefit the reading achievement of a wide range of students.

The Lake Wales Charter Schools were 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 and math achievement of their students. In this study, commercially available computer-based products (Fast ForWord Literacy, Fast ForWord Literacy Advanced, and Fast ForWord Reading Levels 1 - 5) were used to evaluate the effectiveness of this approach for improving the reading and math achievement of middle school students.

METHODS

Participants

Five schools in the Polk County School District applied for charter status in 2003. They were approved and the Lake Wales Charter Schools opened their doors to students in August of 2004. In 2008, the system developed its own middle school, Edward W. Bok Academy, creating a kindergarten through 12th grade system that serves nearly 4,000 students. Edward W. Bok Academy has 370 students: 63% are White, 16% are Hispanic, and 16% are Black; 57% of the students are eligible for free or reduced-price lunches.

During the 2009-2010 school year, Bok Academy added new supplemental reading and math products. For their supplemental reading product, students used the Fast ForWord products.

This study focuses on 199 students attending Edward W. Bok Academy who used the Fast ForWord products between the 2009 and 2010 administrations of the FCAT. Study participants were in grades 6-9 at the time of the 2010 administration of the FCAT. Before and after Fast ForWord participation, students were assessed with a variety of tests: the Reading and Math components of the Florida Comprehensive Achievement Test (FCAT), the Maze subtest of the Florida Assessments for Instruction in Reading (FAIR), and/or Reading Progress Indicator (RPI). 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. Each product includes several exercises designed to build cognitive skills critical for all learning, such as attention and memory. These exercises simultaneously develop academic skills critical for reading, such as English language conventions, phonemic awareness, vocabulary, and comprehension.

Some of the primary skills developed by these products are outlined below in Table 1. More detailed descriptions of the exercises and learning modes within each product can be found online at http://www.scientificlearning.com/exercises .

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Primary Skills / Product Name	Listening Accuracy & Auditory Sequencing	Auditory Word Recognition	English Language Conventions	Following Directions	Listening Comprehension	Phonological Skills / Phonemic Awareness	Phonics / Word Analysis	Fluency	Vocabulary	Reading Comprehension
Fast ForWord Literacy	●	●	●	●	●	●			●	
Fast ForWord Literacy Advanced	●		●	●	●	●	●		●	
Fast ForWord Reading Level 1					●	●	●	●	●	●
Fast ForWord Reading Level 2					●	●	●	●	●	●
Fast ForWord Reading Level 3						●	●	●	●	●
Fast ForWord Reading Level 4						●	●	●	●	●
Fast ForWord Reading Level 5						●	●	●	●	●

Table 1: The Fast ForWord and Reading Assistant products work on numerous cognitive and early reading skills. The primary skills focused on by each product are noted in the table.

Assessments

Before and after Fast ForWord participation, student reading and math achievement and skills were assessed with a variety of tests including the Florida Comprehensive Achievement Test (FCAT), the FAIR-Maze, and/or Reading Progress Indicator (RPI).

Florida Comprehensive Assessment Test (FCAT): The Reading and Mathematics portions of the FCAT are designed to assess student achievement of the high-order cognitive skills represented in the Sunshine State Standards (SSS). This is a criterion-referenced test. All students in Grades 3-10 take the FCAT in Reading and Mathematics in the spring of each year. The primary metrics for reporting student performance on the FCAT are the Scale Score and the Developmental Scale Score. The Developmental Scale Score is designed to increase from year to year as students increase their level of achievement.

Florida Assessments for Instruction in Reading (FAIR) – Maze subtest: Part of the FAIR's Targeted Diagnostic Inventory, the Maze is used to assess the reading fluency, comprehension, and vocabulary skills of students who struggle to demonstrate reading proficiency on the FCAT. The Maze presents passages in which every sentence after the first is missing one word, and the student must choose the correct word from three choices (cloze task). Scores are reported in terms of standard scores which are normalized scores with a mean of 100 and a standard deviation of 15.

Reading Progress Indicator (RPI): Reading Progress Indicator is a computerized assessment designed to rapidly measure the impact of the Fast ForWord products. It assesses a student's early reading skills including phonemic awareness, decoding, vocabulary, and comprehension. Scores are reported in terms of normal curve equivalents, scaled scores, grade equivalent scores, and percentiles.

Analysis

Scores were reported in terms of developmental scaled scores and achievement levels for the FCAT, standard scores for the FAIR-Maze, and normal curve equivalents, scaled scores, grade equivalent scores, and percentile scores for Reading Progress Indicator.

The FCAT analysis evaluated both student improvement on the developmental scaled score, and whether students met their Annual Learning Gains (ALG). In order to meet Annual Learning Gains, the Florida Department of Education requires students to meet one of the following three criteria:

1) Increase Achievement Level by one or more categories; or
2) If initial FCAT Achievement Level is 3, 4, or 5, maintain Achievement Level; or
3) If initial FCAT Achievement Level is 1 or 2, increase DSS score by an amount greater than the state-required threshold for their grade as shown in Table 2.

Grade	Expected Change in Reading DSS Score	Expected Change in Math DSS Score
6	133	95
7	110	78
8	92	64
9	77	54

Table 2: Expected change in Developmental Scale Score (DSS) varies by grade. Students who are Level 1 or Level 2 can make Annual Learning Gain by improving their DSS by more than the expected change.

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The FAIR-Maze analysis was conducted using standard scores. The RPI analysis was conducted using scaled scores and normal curve equivalents, however average scaled scores and NCE scores were converted to grade equivalents and percentiles for reporting purposes. Data were analyzed using paired t-tests. All analyses used a p-value of less than 0.05 as the criterion for identifying statistical significance.

RESULTS

Participation Level

Research conducted by Scientific Learning shows a relationship between product use and the benefits of the product. Product use is composed of content completed, days of use, and adherence to the chosen protocol (participation and attendance levels). During the 2009 - 2010 school year, students at Bok Academy used a variety of protocols with most using 40-Minute protocols. These protocols call for students to use the products for 40 minute a day, five days per week for nine to thirteen weeks. Detailed product use is shown in Table 3.

2009 – 2010 Product Use						
	Number of Students	Days Participated	Number of Calendar Days	Percent Complete	Participation Level	Attendance Level
Fast ForWord Literacy	51	25	118	51%	67%	59%
Fast ForWord Literacy Advanced	41	29	165	37%	57%	45%
Fast ForWord Reading Level 1	3	--	--	--	--	--
Fast ForWord Reading Level 2	25	22	65	67%	72%	61%
Fast ForWord Reading Level 3	81	22	62	58%	82%	64%
Fast ForWord Reading Level 4	57	20	59	60%	87%	62%
Fast ForWord Reading Level 5	6	27	176	26%	79%	52%
Total	199	30.8	120.6	-	77.1%	58.4%

Table 3. Usage data showing the number of students who used the Fast ForWord products between the 2009 and 2010 FCAT assessments, 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. Detailed data is not provided for groups containing fewer than five students. Note:Most of the students used one Fast ForWord product, but some used multiple products.

Assessment Results

Florida Comprehensive Achievement Test (FCAT):

An analysis comparing Developmental Scale Scores from before and after Fast ForWord use revealed that, on average, the students made statistically significant gains on both the Reading and Math measures in 2010 (Reading: $t(178) = 9.2$; $p < 0.001$); Math: $t(177) = 4.0$; $p < 0.001$)). Furthermore, the students' average 2010 scores exceeded their target scores in both reading and math. In general, the same trend of actual scores exceeding target scores is seen in the grade by grade breakdown shown in Table 4, with the exception of the 6th grade group in math.

			2009		2010			
	Grade	n	Mean	SE	Mean	SE	t-statistic	Target
Reading	6th	22	1392.8	36.2	1602.5	59.6	4.2*	1525.8
	7th	85	1704.0	33.2	1843.4	25.1	6.0*	1814.0
	8th	59	1833.2	34.7	1931.3	25.8	5.2*	1925.2
	9th	13	1987.5	41.6	2095.0	42.4	--	2064.5
Math	6th	22	1594.7	33.9	1614.7	36.8	2.8	1689.7
	7th	85	1745.5	21.8	1883.6	21.1	10.9*	1823.4
	8th	58	1845.7	27.8	1967.8	18.8	7.9*	1909.7
	9th	13	1980.8	19.4	2012.8	19.3	--	2034.8

*Table 4. FCAT Reading and Math scores for students at each grade-level. Students in 6th – 8th grades made statistically significant improvements in their FCAT Reading scores; students in 7th and 8th grades also made statistically significant improvements in their FCAT Math scores. Due to the small number of students, 9th grade data were not tested for statistical significance. * $p < 0.05$.*

Students who have an FCAT Achievement Level of 3 or higher are considered proficient. In 2009, before Fast ForWord participation, 51% of the participants were proficient in Reading, and 62% were proficient

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in Math. In 2010, following Fast ForWord participation, those numbers increased to 68% in Reading (Figure 1) and 70% in Math (Figure 2), with 35% of the students improving one or more levels in Reading and 33% improving by one or more levels in Math.

Across all grades, 70% of the students made Annual Learning Gains in Reading, and 80% made Annual Learning Gains in Math. An analysis by grade level showed that at each grade level (6^{th} – 9^{th}) the majority of the Fast ForWord participants made Annual Learning Gains in Reading; the majority also made Annual Learning Gains in Math in 7^{th}, 8^{th}, and 9^{th} grades.

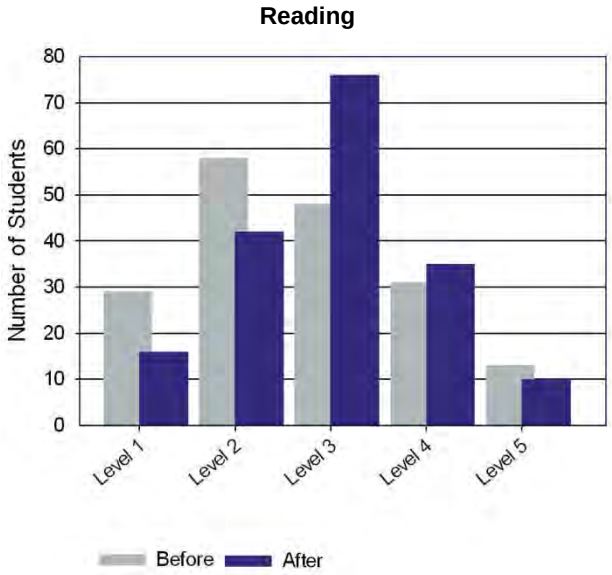

Figure 1. A histogram showing the number of students at each Achievement Level on the reading component of the 2009 and 2010 administrations of the FCAT.

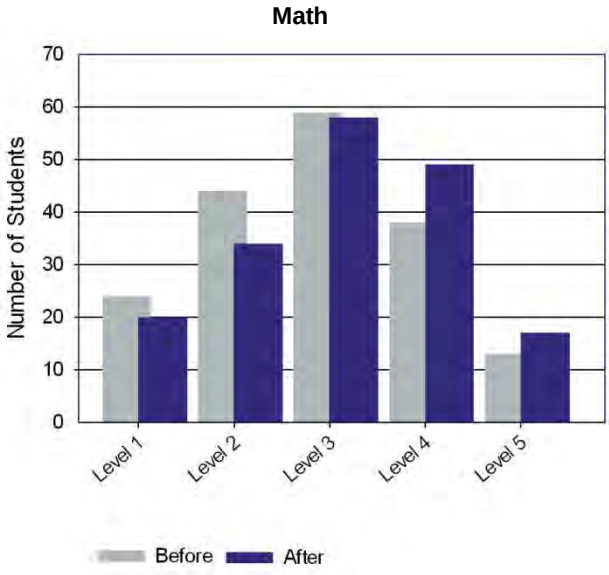

Figure 2. A histogram showing the number of students at each Achievement Level on the math component of the 2009 and 2010 administrations of the FCAT.

FCAT Analyses by Classification: These results were consistent across student classifications (Special Education, Title I, English Language Learners) with between 35% and 87% of the students improving one or more levels in reading (Figures 3 – 5).

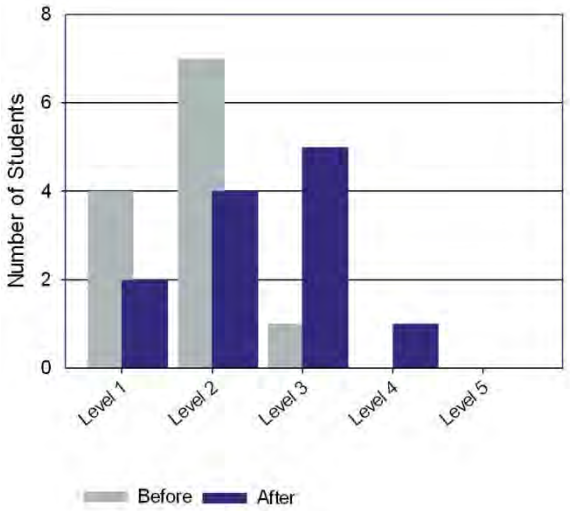

Figure 3. A histogram showing the 2009 and 2010 Achievement Level on the FCAT Reading for 12 students receiving services for special education.

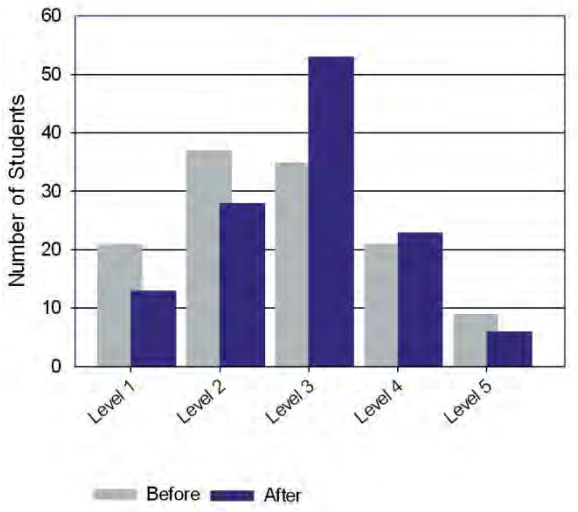

Figure 4. A histogram showing the 2009 and 2010 Achievement Level on the FCAT Reading for 123 students eligible for Title I services.

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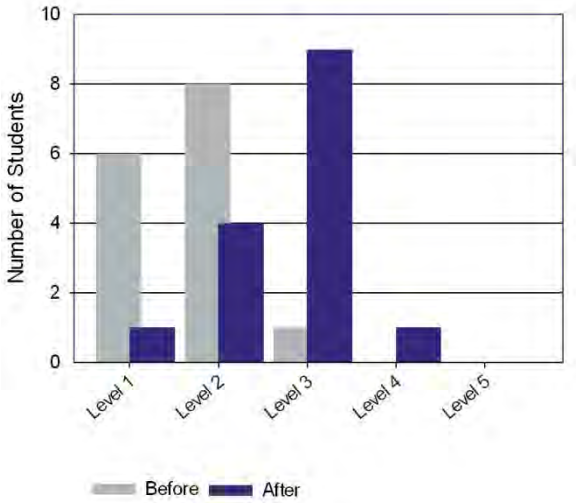

Figure 5. A histogram showing the 2009 and 2010 Achievement Level on the FCAT Reading for 15 students eligible for ELL services.

Students who are in FCAT Achievement Level 1 or Level 2 can meet their Annual Learning Gains by exceeding expected gains in their FCAT scores. Comparisons of actual FCAT scores to expected FCAT scores showed that in both Reading and Math, all classifications exceeded expectations (Figure 6; Figure 7). The difference between the actual and expected scores of students eligible for Title I services was statistically significant; significance was not determined for the other groups due to small group size.

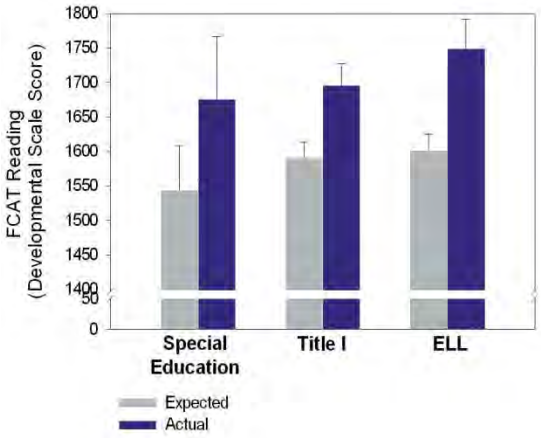

Figure 6. Expected gains (based on grade level) and actual gain on the Reading component of the FCAT for students who started at Level 1 or Level 2. The difference between the expected and actual gains of the Title I students was statistically significant ($t(57) = 3.72$; $p < 0.05$). The other two groups were not tested for significance due to the small number of students. The graph includes 11 students receiving special education services, 58 identified as Title I, and 14 English Language Learners.

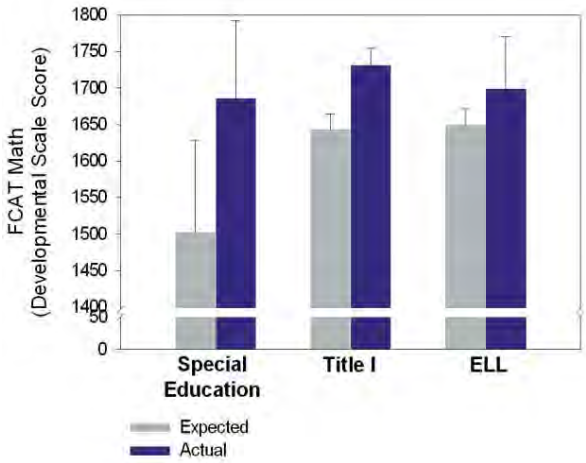

Figure 7. Expected gains (based on grade level) and actual gain on the Math component of the FCAT for students who started at Level 1 or Level 2. The difference between the expected and actual gains of the Title I students was statistically significant ($t(51) = 4.7$; $p < 0.05$). The other two groups were not tested for significance due to the small number of students. The graph includes 6 students receiving special education services, 52 identified as Title I, and 9 English Language Learners.

FAIR-Maze: Seventy-eight students had FAIR-Maze scores available from the fall, winter, and spring of the 2009-2010 school year. During that time, the students made statistically significant improvements in their reading fluency, improving from a standard score of 79 in the fall to 85 in the spring ($F(2,76) = 5.92$; $p < 0.01$) (Figure 5). A standard score of 79 corresponds to the 8th percentile while a standard score of 85 corresponds to the 16th percentile.

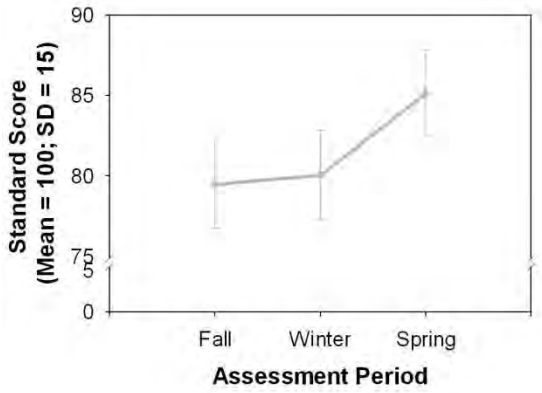

Figure 8. On average, 78 students achieved statistically significant improvements on their FAIR-Maze scores following the use of Fast ForWord products.

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Reading Progress Indicator (RPI): RPI was administered before using the Fast ForWord products and again upon completion of each product. Sixty middle school students had pre- and post-participation scores and are included in the RPI evaluation. Of the students, 54 (90%) showed improvement. Their initial average grade level was the beginning of seventh grade (7.0) slightly higher than their skill-level of mid sixth-grade (6-4). Three and one-half months later, following Fast ForWord participation, students had improved their skills by one year, to the mid seventh-grade level (7-4) (Figure 6). This corresponds to improving from the 27th percentile to the 48th percentile. Many of the students (57%) were initially in the Struggling category (below the 30th percentile). After Fast ForWord participation, the number of students in the Struggling category dropped by 59%, from 34 students to 14.

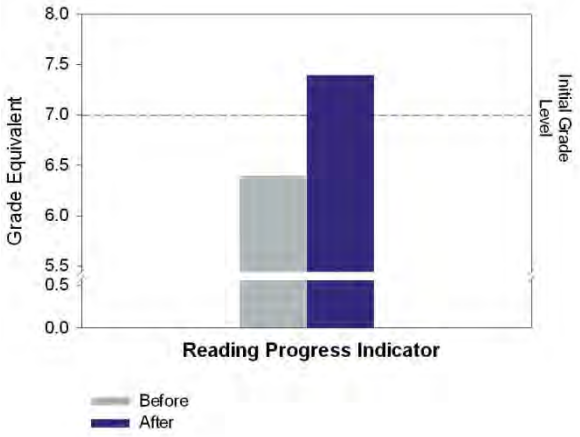

Figure 9. Sixty middle school students, with an average grade level of early seventh grade, made statistically significant improvements on their early reading skills, improving 1 year in the 3 ½ months between assessments.

DISCUSSION

During the 2009-10 school year, Bok Academy added new supplemental reading and math products with many students using both. The supplemental reading products, the Fast ForWord family of programs, provided an optimal learning environment focused on improving learning and cognitive skills in a language and reading-oriented environment. On average, during the 2009 – 2010 school year, Fast ForWord participants at Bok Academy significantly improved their reading and math achievement. Students were evaluated on a variety of assessments including the FCAT, FAIR, and RPI. Results showed that the students made statistically significant improvements on both the Reading and Math components of the FCAT, with 35% improving one or more levels on the Reading component and 33% improving one or more levels on the Math component. In addition, students who used Fast ForWord products made statistically significant improvements on a measure of reading fluency (FAIR-Maze) and another measure of reading skills (RPI).

These findings demonstrate that, within Bok Academy, an optimal learning environment coupled with a focus on cognitive and early reading skills can help middle school students improve their reading skills and attain a higher level of reading and math 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, writing, and other academic skills. After Fast ForWord use, students at Bok Academy made significant gains in their reading and math achievement. These results replicate other studies and suggest 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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