

Improved Reading Achievement by Students in the Everett Public Schools who used Scientific Learning Products: 2009 - 2010

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ABSTRACT

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

Results: After participation, there was a net increase in MCAS ELA level by 27% of the students. The improvement continued after initial use. Of the students who first used the products during the 2007-2008 school year, by 2010, there was a net increase in MCAS ELA level by 44% of the students. Students in a variety of subgroups made statistically significant improvements in their MCAS ELA scaled scores including students receiving special education services, students with limited English proficiency, and economically disadvantaged students.

Study Design & Participants: The design of this study was a multi-school observational study using high stakes and nationally-normed assessments. Study participants were elementary and middle school students in the Everett Public Schools of Everett, Massachusetts.

Materials & Implementation: The Everett Public Schools first used the Scientific Learning Fast ForWord products during the 2006-2007 school year; since then, more than 4,000 students have used the products. During the 2009-2010 school year, some students started using the products for the first time while others continued their previous years' work. Also during the 2009-2010 school year, the district started using the Scientific Learning Reading Assistant Expanded Edition software with some students. Massachusetts students in 3rd – 8th grade have their reading achievement evaluated each spring with the Massachusetts Comprehensive Assessment System (MCAS); students with limited English proficiency (LEP) also have their English proficiency evaluated with the Massachusetts English Proficiency Assessment (MEPA). Students who used the Fast ForWord products had their reading skills evaluated before using the Fast ForWord products, and then again after each product, with Reading Progress Indicator (RPI).

Keywords: Massachusetts, elementary school, middle school, urban district, observational study, special education, limited English proficiency, African-American, Hispanic, Fast ForWord Language Basics, Fast ForWord Language, Fast ForWord Language to Reading, 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, Scientific Learning Reading Assistant Expanded Edition, Massachusetts Comprehensive Assessment System (MCAS), Massachusetts English Proficiency Assessment (MEPA), Reading Progress Indicator (RPI).

INTRODUCTION

Numerous research studies have shown that cognitive and oral language skills are underdeveloped 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.

Using the commercially available Fast ForWord products to establish an optimal learning environment, the Everett Public Schools found that each year between 2006 and 2009, there was a net increase in achievement level by 20% to 26% of the Fast ForWord participants (Scientific Learning, 2010). The district was interested in continuing the study to determine whether the combined use of the Fast ForWord and Reading Assistant products would also effectively improve the achievement of the students. The district was also interested in evaluating the longitudinal impacts of Fast ForWord product use.

METHODS

Participants

The Everett Public Schools serve more than 6,000 students. Approximately 47% of the students in the district are Caucasian, 17% are African American, and 26% are Hispanic. Nearly 69% of the students are eligible for free or reduced-price lunches, 41% are not native English speakers, and 17% receive services for special education. The district is further challenged by a very high mobility rate; during the first half of the 2009-2010 school year, 20% of the students enrolled, withdrew, or transferred to a different school within the district. During the 2009-2010 school year, all seven schools in the district used Scientific Learning products.

The first part of this study focuses on students at the five schools that have students in 4th – 8th grades. The MCAS is first administered to 3rd graders, and therefore students in 4th – 8th grades had MCAS Achievement Levels available from before and after participation. Since MCAS scaled scores are first given for 4th graders, the analysis using MCAS scaled scores addresses the

products' impact on students in 5th through 8th grades (with the 4th grade scores used as the pre-test scores.)

Many of the students in the district are limited English proficient (LEP). To evaluate the impact of the products on LEP students, changes on the Massachusetts English Proficiency Assessment (MEPA) were calculated. This analysis included LEP students in kindergarten through 8th grade.

Finally, Reading Progress Indicator was used to determine the impact of product use on reading skills. The RPI analysis included 470 students in 1st – 8th grade who were assessed with Reading Progress Indicator before using the Fast ForWord products, and then again after using each product.

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 Scientific Learning 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.

The Reading Assistant Expanded Edition software is a computer-based tutor for guided oral reading. Reading Assistant combines advanced speech recognition technology with scientifically-based interventions to help elementary and secondary students strengthen their reading fluency, 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>.

Product Name	Primary Skills									
	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 Language Basics	•									
Fast ForWord Language v2	•	•	•	•		•			•	
Fast ForWord Language to Reading v2	•		•	•	•	•	•		•	
Fast ForWord Literacy	•	•	•	•	•	•			•	
Fast ForWord Literacy Advanced	•		•	•	•	•	•		•	
Fast ForWord Middle & High School	•	•	•	•	•	•			•	
Fast ForWord Reading Prep				•		•	•			
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						•	•	•	•	•
Reading Assistant								•	•	•

Table 1: The Scientific Learning 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 achievement and reading skills were assessed with the Massachusetts Comprehensive Assessment System (MCAS), the Massachusetts English Proficiency Assessment (MEPA), and/or Reading Progress Indicator (RPI).

Massachusetts Comprehensive Assessment System (MCAS): The MCAS is used to evaluate all public school students in Massachusetts, including students with disabilities and limited English skills. It is designed to measure students' performance based on the Massachusetts Curriculum Framework learning standards. All students in Grades 3 – 10 take the MCAS in the spring of each year. As a condition for graduation, students must pass the 10th grade MCAS in English/Language Arts and in Math.

Achievement Levels are reported for students in 3rd – 10th grades, and scaled scores for students in 4th – 10th grade. At all grade levels, a scaled score of 240 is required to demonstrate Proficiency.

Only scores from the English/Language Arts portion of the MCAS were analyzed for this study.

Massachusetts English Proficiency Assessment (MEPA): The MEPA is used to evaluate English skills of students in kindergarten through 12th grade who have limited English proficiency. It consists

of two parts: the MEPA-R/W evaluates students' reading and writing skills while the MEPA-O evaluates students' listening and speaking skills. The tests are generally administered each spring. Fall tests are administered to students who did not participate in the spring testing. There are five different testing levels: K-2, 3-4, 5-6, 7-8, and 9-12.

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.

Analysis

MCAS scores were reported in terms of both achievement levels (for students in 3rd – 10th grade) and scaled scores (for students in 4th – 10th grade). To analyze the initial impact of the products, the 2009 test scores were compared to the 2010 test scores for students who first used the products during the 2009-2010 school year. Results were then aggregated across students who first used the products between the 2007 and 2010 school years, and changes in proficiency levels were calculated. Since the MCAS-ELA is administered each year in March, throughout the report, 2009-2010 product use refers to products

that were started between March, 2009 and March, 2010.

The longitudinal impact analysis investigated the impact on MCAS ELA achievement level for students who first used the products during the 2007-2008 school year – evaluating the students’ achievement level two years later, in 2010.

English proficiency results were available for all students who were classified as LEP. The analyses used the overall 2009 and 2010 MEPA scores for students who first used the products during the 2009-2010 school year.

Scaled scores and normal curve equivalents were used in the Reading Progress Indicator analyses. After calculating average skill level before and after participation, and determining statistical significance, the scores were converted to grade equivalent score and percentiles for reporting purposes.

In all cases, data were analyzed using paired t-tests and 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 products. 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 years, the Everett Public Schools used the 30-Minute protocols for most students in 3rd grade and below, and the 50-Minute protocols for most students in 4th grade and above. These protocols call for students to use the product for 30 or 50 minutes a day, five days per week for six to sixteen weeks. Details are shown in Tables 2 and 3.

2009 – 2010 Fast ForWord Use						
	Number of Students	Days Participated	Calendar Days	Percent Complete	Participation Level	Attendance Level
Fast ForWord Language Basics	248	6	10	99	98	79
Fast ForWord Language v2	630	39	100	71	97	69
Fast ForWord Language to Reading v2	557	45	128	68	95	69
Fast ForWord Middle & High	25	13	38	41	86	51
Fast ForWord Literacy	196	30	81	87	97	67
Fast ForWord Literacy Advanced	196	38	107	76	95	63
Fast ForWord Reading Level 1	96	21	63	90	98	69
Fast ForWord Reading Level 2	174	31	91	90	97	66
Fast ForWord Reading Level 3	315	42	125	76	96	65
Fast ForWord Reading Level 4	334	43	126	82	96	65
Fast ForWord Reading Level 5	298	67	211	51	97	63
Total Fast ForWord Use	1515	79	225	--	96	67

Table 2. Usage data showing the number of students who used the Fast ForWord products during the 2009 – 2010 school year, 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. Students often used multiple products. Total Fast ForWord Use reflects the average total number of days that students used Fast ForWord products and their average participation and attendance across products. Usage data for Fast ForWord Reading Prep is not shown, because only one student used that product. Due to scheduling challenges, students were only scheduled to attend the Fast ForWord lab five days out of every six. Therefore, a student who attended every possible session would have had an Attendance Level of 83%.

2009 – 2010 Reading Assistant Use					
	Number of Students	Days Participated	Calendar Days	Participation Level	Attendance Level
Reading Assistant	647	74.3	213.3	72.3	73.9

Table 3. Usage data showing the number of students who used the Reading Assistant software during the 2009 – 2010 school year, along with group averages for the number of days participated, the number of calendar days between start and finish, the participation level, and the attendance level. Of the students who used Reading Assistant, 532 also used Fast ForWord products.

Assessment Results

Massachusetts Comprehensive Assessment System (MCAS): One hundred twenty-two students in 5th through 8th grades who first used Scientific Learning

products during the 2009-2010 school year had MCAS scaled scores available from spring 2009 and spring 2010. Before using Scientific Learning products, the students’ average MCAS score was 231.4. After using

the products, the students made statistically significant improvements, with their average MCAS score increasing to 236.1. A histogram shows the general improvement of the students from 2009 to 2010 (Figure 1).

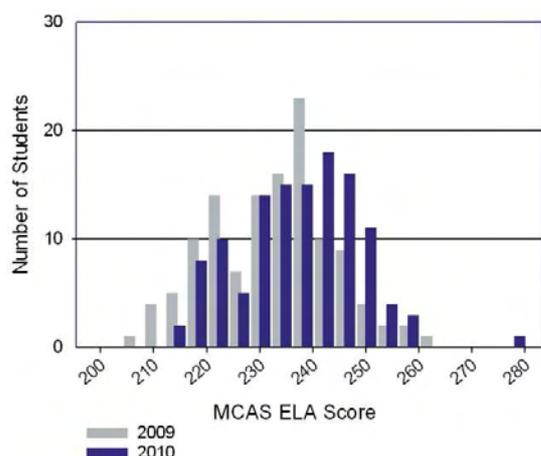


Figure 1. The distribution of scores before and after initial participation. A score of 240 demonstrates Proficiency. The 122 students were in 5th – 10th grade in 2010.

Students were divided by their 2009 Reading Achievement Level and average improvements for each level were calculated. Students who were initially at the Warning or Needs Improvement Level achieved statistically significant improvements, increasing their scores by 10.6 and 6.0 points, respectively, while the scores of students who were initially at the Proficient Level decreased by 2.8 points (Table 3; Figure 2).

Dividing the results by demographic group showed that statistically significant improvements were seen across non-proficient students from a variety of demographic groups including students receiving

services for special education, students eligible for free or reduced-price lunches, students with limited English proficiency, and students from a variety of races and ethnicities (Table 4).

	N	2009		2010		t-
Initial Level		Mean	SE	Mean	SE	statistic
Warning	20	213.9	0.9	224.5	1.5	7.3*
Needs Improvement	74	230.5	0.7	236.5	1.1	6.6*
Proficient	27	245.6	1.0	242.8	2.2	-1.4

Table 3. On average, students in the lower two achievement levels on the MCAS Reading test made statistically significant improvements on their MCAS Reading Scores following initial use of the Scientific Learning products. There were no statistically significant changes in the students who were initially “Proficient.”

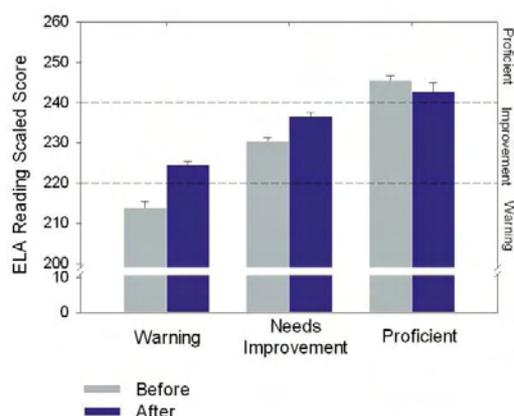


Figure 2. On average, students in the lower two achievement levels on the MCAS Reading test made statistically significant improvements on their MCAS Reading Scores following initial use of the Scientific Learning products. Data from 121 students are included in this figure.

			2009		2010			
	Initial Level	n	Mean	SE	Mean	SE	Change	t-statistic
Special Education	Warning	5	213.6	2.9	218.0	1.4	4.4	NA
	Needs Improvement	14	225.3	1.4	229.1	2.1	3.8	1.9
Low SES	Warning	19	214.2	0.86	224.9	1.5	10.7	7.1*
	Needs Improvement	57	229.4	0.86	234.4	1.2	5	4.7*
Limited English	Warning	11	212.9	0.9	223.6	2.15	10.7	4.9*
	Needs Improvement	7	225.4	2.6	233.7	3.8	8.3	NA
African-American	Warning	6	213.7	2.0	225.3	3.6	11.6	NA
	Needs Improvement	14	228.9	1.6	233.4	2.2	4.5	3.6*
Hispanic	Warning	10	213.4	1.1	223.2	2.1	9.8	4.6*
	Needs Improvement	25	230.0	1.2	235.3	1.8	5.3	2.6*
Caucasian	Warning	4	NA	NA	NA	NA	NA	NA
	Needs Improvement	30	231.3	1.2	238.4	1.9	7.1	5.3*

Table 4. Average MCAS ELA scores were calculated for 2009 and 2010 for students in 5th – 8th grade in various demographic groups who were at the “Warning” or “Needs Improvement” level and first used the Fast ForWord products during the 2009-2010 school year. Averages are only shown for groups containing at least five students, and statistical significance is only calculated for groups containing at least 10 students. * Statistically significant ($p < 0.05$).

The MCAS is administered to students in 3rd – 8th grades. However, the scores of 3rd graders are only reported in terms of a proficiency level (not a scaled score), so they were excluded from the previous analysis. This next analysis considers changes in achievement level, and includes all 145 students in 4th – 8th grades (the 4th graders would have taken the 2009 MCAS as 3rd graders). The analysis showed that of the 145 students who first used the products during the 2009-2010 school year, 57 students (39%) increased their MCAS ELA achievement by one or more levels while 18 students (12%) had a decrease resulting in a net increase by 27% of the students (Figure 3).

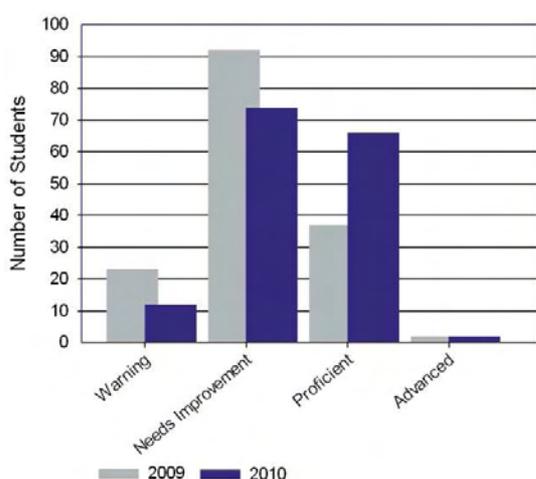


Figure 3. The MCAS ELA Achievement Level is shown for the 145 students in 3rd – 8th grade who first used the products during the 2009-2010 school year.

In order to evaluate typical impact in the first year of use, an analysis was done using results from all students who first used Scientific Learning products between 2007 and 2010 and had MCAS scores available. Results from the 388 participants with assessment data from the first year of product use showed that 142 of the 388 students (37%) achieved an increase in achievement level while 45 students (12%) had a decrease, yielding a net increase by 25% of the students (Figure 4).

A subset of 187 participants also had assessment data from two years prior to product use. The results these students had prior to participation show the changes that could be expected without the use of Scientific Learning products. Over the school year prior to participation, 33 of the 187 students (18%) achieved an increase of one or more levels while 36 students (19%) had a decrease.

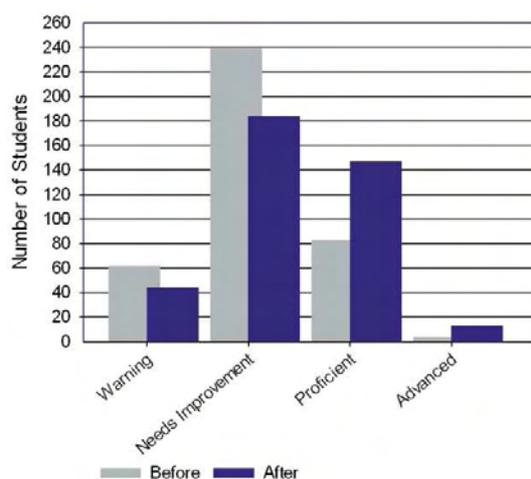


Figure 4. Scores for first-time participants between 2007 and 2010 were aggregated. The 388 students were in 4th – 8th grade at the time of first participation and 37% improved their MCAS ELA achievement level the year they first used the products.

A longitudinal analysis evaluated the performance of 118 students who first used the Fast ForWord products during the 2007-2008 school year and had MCAS ELA Achievement Levels from 2007 (before participation) and 2010 (two years later) available for analysis. Of the 118 students, 58 students (49%) increased their achievement level while 6 students (5%) had a decrease for a net increase by 44% of the students (Figure 5).

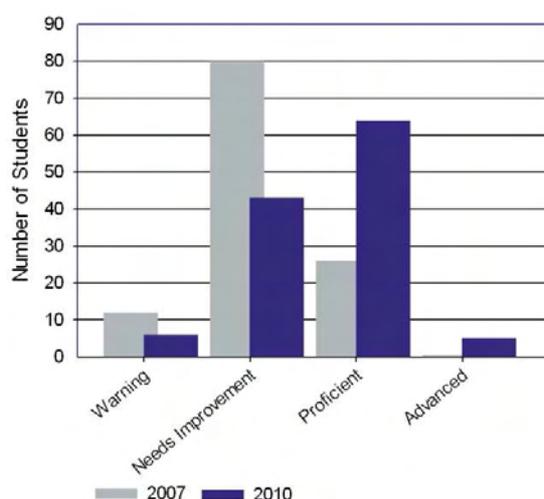


Figure 5. Longitudinal results show that between 2007 and 2010, 44% of the 118 students improved one or more achievement levels on the MCAS ELA assessment.

Previous studies have suggested that there is a relationship between the number of products a student completes and the student’s improvement (Scientific Learning, 2008a, 2008b). In order to replicate those studies, student achievement was evaluated for the 138 students who used the Fast ForWord products at some point between 2007 and 2010 and whose MCAS ELA Achievement Level at pre-test was at the “Needs Improvement” level in 2007. Students who completed more products were more likely to become “Proficient” by 2010 (Table 5).

Number of Products Completed	# of “Needs Improvement” Students in 2007	# of Proficient Students in 2010	Percent that Reached Proficient
1	15	4	27%
2	24	11	46%
3	46	21	46%
4	38	23	61%
5	15	9	60%
Total	138	68	49%

Table 5. Students at the “Needs Improvement” level who completed more products were more likely to reach “Proficient”.

Massachusetts English Proficiency Assessment (MEPA):

Eighty-eight students who first used Scientific Learning products during the 2009-2010 school year were classified as Limited English Proficient (LEP) and had MEPA scores available from 2009 and 2010. Sixty-one of the participants (69%) improved their English language proficiency by one or more levels (Figure 6).

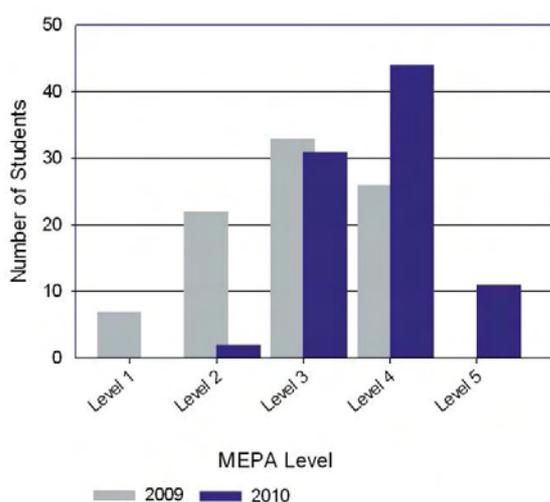


Figure 6. Improved English proficiency levels were seen for 69% of the 88 Limited English Proficient students who started using Scientific Learning products in the 2009-2010 school year, and who had 2009 and 2010 MEPA scores available for analysis.

Reading Progress Indicator (RPI): Reading Progress Indicator was administered before students first used the Fast ForWord products, and then again upon completion of each product. Four hundred ten students in first through eighth grade first used RPI during the 2009-2010 school year and took the assessment two or more times. The students’ average grade level was 3.6 and at the time of the first administration of RPI, they were performing at the 3.0 level – the beginning of the third grade. At the time of their final administration of RPI, an average of 5 ½ months later, the students were performing at the 4.1 level – early fourth grade. On average, the students had improved 1 year and 1 month (Figure 7). This improvement corresponds to an improvement from the 30th percentile to the 48th percentile.

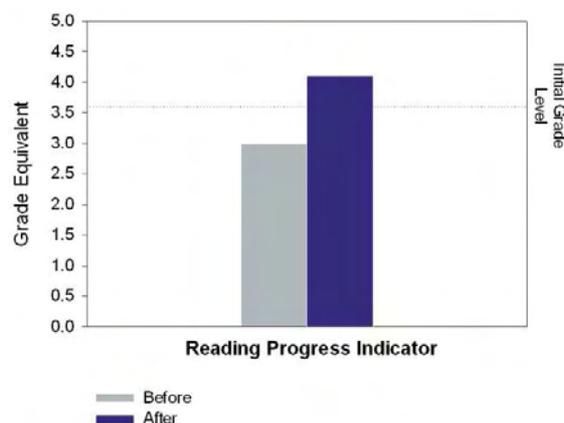


Figure 7. RPI was used to evaluate the improvements in reading skills of 410 students who were new to Fast ForWord products during the 2009-2010 school year. The students’ made statistically significant improvements in their reading skills, with their skill level improving by one year and one month in the 5 ½ months between tests.

DISCUSSION

During the 2009-2010 school year, there was a net increase in MCAS achievement level by 27% of the students who used Fast ForWord and/or Reading Assistant. In contrast, an analysis of achievement levels from a prior year, when these students did not have access to the Scientific Learning products, found no net increase.

An analysis by demographic group showed that the Scientific Learning products provided an effective intervention for students with a wide range of special needs and backgrounds. Across students at the “Warning” and “Needs Improvement” levels all subgroups with enough students for analysis made statistically significant improvements in their MCAS scores. An evaluation of MEPA scores showed that 61% of the students with limited English proficiency

scored at a higher MEPA level after using Scientific Learning products.

Consistent with prior research, the improvements in the Everett Public Schools appear to be related to the number of products completed, with 27% of the “Needs Improvement” students reaching “Proficient” after one product, and more than 60% of them reaching “Proficient” after four or more products.

Finally, longitudinal results showed that students continued to gain ground in the years after first participation: among the Fast ForWord participants who used the products in 2007-2008 and were followed until 2010, there was a net increase in MCAS level by 44% of the students.

These findings demonstrate that, within the Everett Public Schools, an optimal learning environment coupled with a focus on cognitive and early reading skills can help students attain a higher level of reading and language achievement.

CONCLUSION

Language and reading skills are critical for all students, impacting their ability to benefit from instruction, follow directions, participate in class discussions, read to learn, and complete written work. After Fast ForWord and Reading Assistant use, students in the Everett Public Schools made significant gains on measures of reading achievement, reading skills, and English proficiency. These results replicate other studies and suggest that using the Scientific Learning products strengthened the students’ foundational skills and better positioned them to benefit from the classroom curriculum.

Notes:

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