

## PPVT and CRCT Analysis for RCSS Rhymes and Stories DVD

*Analysis by Dr. Sankara Sethuraman*

*Augusta University*

In 2010-2011 the Richmond County School System and Augusta State University (now Georgia Regents University) collaborated on combining innovative technology with traditional children's literature to improve pre-literacy skills. An Improving Teacher Quality grant from the U.S. Department of Education funded the study which trained teachers to adapt their teaching methods to incorporate DVDs of classic rhymes and stories with other tools that promote early literacy, and to administer the Peabody Picture Vocabulary Test (PPVT-III). The study was conducted in 33 kindergarten classrooms in 31 Title I schools, each of which was considered disadvantaged and produced below average test scores in areas of reading. The goal of the study was to incorporate classic rhymes and stories at home and in the classroom in order to promote better listening, reading, and overall literacy comprehension skills. As a result of the study's success, thousands of DVDs have been distributed and the DVD's ten hours of audio, text, and pictures are now freely available online at [www.hearatalel.com](http://www.hearatalel.com). The researchers plan to expand this study which, as documented in the tables, shows 459 kindergarten students' mean improvement from the 27<sup>th</sup> to the 47<sup>th</sup> percentile on the PPVT.

In spring 2014, of the original 459 students, 30 had been retained in first or second grade and did not take the 3<sup>rd</sup> grade state administered Criterion Referenced Competency Test (CRCT) in Reading. As the second set of data below reveal, even three years later these 303 children did extraordinarily well. We're still seeking data on retention and on typical CRCT scores for students who had been retained, but even if we assume none of the 30 retained students would ever pass the CRCT, our results are still quite strong, showing that compared to RCSS who did

not participate in the 2010-2011 rhymes and stories intervention, our students were 33% more likely to exceed the state reading standard than students who did not.

### **Summary of Analysis of Students' PPVT Scores**

Fall 2010 and again in Spring 2011, 33 Kindergarten teachers from 31 schools gave the PPVT-III (a nationally normed receptive vocabulary test) to 459 students. The first analysis below demonstrates that their scores showed a mean improvement of 7.82 raw points (from standard mean scores of 91.47 [*a score of 91 is equivalent to the 27<sup>th</sup> percentile*] to 99.48 [*99 = 47<sup>th</sup> percentile*]). We compared these scores to the only comparable PPVT scores available from 5 RCSS schools (with scores for 283 students) from the previous school year; these students showed a mean improvement of 2.74 points (from standard mean scores of 91.66 [*92 = 30<sup>th</sup> percentile*] to 94.21 [*94 = 34<sup>th</sup> percentile*]). Compared to the control group, the mean advantage gained by our students as a result of workshop trained teachers and the DVDs is 5.08 points (7.82 - 2.74).

The second analysis below (a 4-page report prepared by a different statistician) charts the only three teachers who gave the PPVT to one class in 2009-10 and then to a second class in 2010-11 (after benefit of the workshop and DVDs). In this much smaller sample of students who took both exams, the 45 students in 2009-10 began fall 2009 with mean scores of 95.69 points [*96 = 39<sup>th</sup> percentile*] and in spring 2010 achieved mean scores of 95.82 [*96 = 39<sup>th</sup> percentile*], an almost invisible gain of only .13 points. We have only 36 scores for these teachers the following year, after the workshop and DVDs, and this second set of students began with much weaker scores in Fall 2010, mean scores of 78.81 points [*79 = 8<sup>th</sup> percentile*], but for these students the effect of their teachers' workshop training and the DVDs seems to have been

remarkable; their mean scores in Spring 2011 jumped 11.47 points to 90.28 [90 = 25<sup>th</sup> percentile]. Data indicate that the teachers' workshop training and DVDs had an especially positive effect on students who tended to begin the year with lower scores.

**Comparison of standard PPVT scores for the students of 33 teachers who participated in the training/DVD intervention scores of students from 5 teachers who did not have the training/DVDs.**

**Objective 1: To investigate whether the training/DVD intervention program improves the standard PPVT scores of students.**

Thirty-three Kindergarten teachers from 31 schools in Richmond County participated in the training program in the Summer of 2010 and received DVDs for their students. The standard PPVT scores of their students at the beginning of the school year (Fall 2010) and at the end of the school year (Spring 2011) were then recorded of which only the scores of a total of 459 students are available to us for analysis. These students were given the DVD. Prior to getting trained, the same teachers taught another set of students in the year 2009-2010. However, standard PPVT scores at the beginning of the school year (Fall 2009) and at the end of the school year (Spring 2010) were available to us only for 283 of these students.

A **two-factor ANOVA** (Analysis of Variance) procedure was conducted to analyze the effect of training/DVDs on standard PPVT scores. The two factors are (1) training status/DVDs (had training/DVDs or not) and (2) semester in which scores were recorded (Fall or Spring). Training status/DVDs is an independent factor because the students on whom standard PPVT scores were collected before the teachers received training/DVDs (2009-10 batch) are completely different from those on whom standard PPVT scores were collected after the teachers (2010-11 batch) received training/DVDs. Semester is a repeated factor because standard PPVT

scores were collected on the same set of students at the beginning of Fall and at the end of Spring in each school year. Interaction between the training/DVD status factor and the semester factor was also included in the analysis. The level of significance for the procedure was kept at the customary 5% or 0.05. The results of the ANOVA procedure are given below:

#### Tests of Within-Subjects (semester) Effects

Measure: Standard PPVT scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Semester	9752.672	1	9752.672	115.339	.000
Interaction between Semester and Training/DVD Status	2257.524	1	2257.524	26.698	.000
Error (Semester)	62571.639	740	84.556		

#### Tests of Between-Subjects (Training status) Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	12429203.158	1	12429203.158	33722.938	.000
Training/DVD Status	2616.656	1	2616.656	7.100	.008
Error	272740.479	740	368.568		

1. The p-value of the interaction effect = 0.000 is less than the level of significance of 0.05 which means that the interaction between semester and training/DVD status is statistically significant. This means that the improvement from Fall to Spring in the standard PPVT scores is different for students of the school year 2009-10 (teachers had not received training/DVDs) compared to the standard PPVT scores of students of the school year 2010-2011 (teachers had received training DVDs).

2. We then conducted further investigation of improvement in standard PPVT scores of 2009-10 and 2010-11 **using a two-sample independent t-test unequal variance**. The results of the t-test are given below:

### Descriptive Statistics

	Training/ DVD status	N	Mean	Std. Deviation
Improvement in PPVT scores	With	45	7.82	13.480
	Without	28	2.74	12.192

### Independent Samples Test for the comparison of improvement in 2009-10 to that of 2010-11.

Levene's Test for Equality of Variances		t-test for Equality of Means						
F	Sig.	t	df	Sig. (1- tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
8.091	.005	5.291	642.574	.000	5.078	.960	3.194	6.963

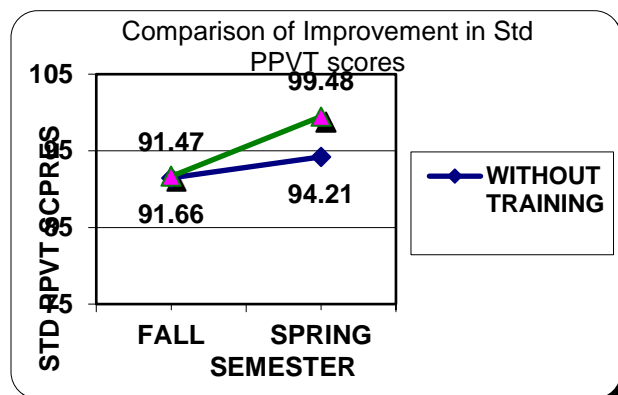
The P-value of **the t-test for the equality of means** is 0.0000 and it is less than the level of significance of 0.05. **Therefore, we conclude that improvement from Fall to Spring is much higher in 2010-11 than in 2009-10.** Recall that teachers had not received training/DVDs in the year 2009-10 but had received training/DVDs in 2010-11. **We can therefore conclude that the training/DVD intervention might have played a significant role in bringing about the higher improvement in the standard PPVT scores of**

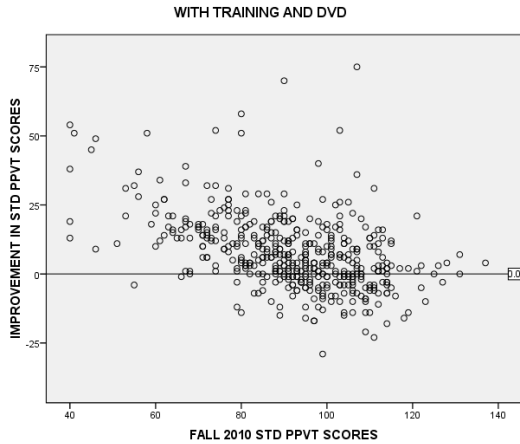
students. The 95% confidence interval for the difference in improvement of std PPVT scores due to teacher training/DVDs is between 3.194 and 6.9863.

3. The average standard PPVT score (91.66) of the students in Fall 2010 (with a standard deviation of 16.672) was ALMOST THE SAME AS the average standard PPVT score (91.47) of the students in Fall 2009 (with a standard deviation of 13.982), their improvement from Fall to Spring was significantly higher ( $99.48 - 91.66 = 7.82$ ) than that of 2009-10 ( $94.21 - 91.47 = 2.74$ ). Hence, we conclude that training/DVD intervention has indeed brought about a substantial improvement in students. See the table below for detailed descriptive statistics.

**Descriptive Statistics for standard PPVT scores**

	Training/ DVD Status	Minimum	Maximum	Mean	Std. Deviation	N = # of students
FALL 2009	Without	40	128	91.47	13.982	283
FALL 2010	With	40	137	91.66	16.672	459
SPRING 2010	Without	64	140	94.21	11.862	283
SPRING 2011	With	51	182	99.48	15.722	459





**Comparison of PPVT scores for the students who used DVDs and whose teachers gave the PPVT in 2009 and received training in 2010**

**Objective 1: To investigate whether the NR/FT training program improves the PPVT scores of students.**

Kindergarten teachers from Collins, Terrace Manor, and Wilkinson Gardens schools in Richmond County participated in the training program in the Fall of 2010. The PPVT scores of their students at the beginning of the school year (Fall 2010) and at the end of the school year

(Spring 2011) were then recorded of which only the scores of a total of 36 students are available to us for analysis. These students were given the DVD. Prior to the study, the same teachers taught another set of students in the year 2009-2010. But, PPVT scores at the beginning of the school year (Fall 2009) and at the end of the school year (Spring 2010) were available to us only for 171 of these students.

### Tests of Within-Subjects (semester) Effects

Measure: **PPVT scores**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Semester	<b>2819.653</b>	<b>1</b>	<b>2819.653</b>	<b>44.251</b>	<b>.000</b>
Interaction between Semester and Training Status	<b>1251.450</b>	<b>1</b>	<b>1251.450</b>	<b>19.640</b>	<b>.000</b>
Error(Semester)	<b>13062.381</b>	<b>205</b>	<b>63.719</b>		

### Tests of Between-Subjects (Training status) Effects

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Intercept	1855783.527	<b>1</b>	<b>1855783.527</b>	<b>6291.864</b>	<b>.000</b>
Training Status	3394.744	<b>1</b>	<b>3394.744</b>	<b>11.510</b>	<b>.001</b>
Error	60464.691	<b>205</b>	<b>294.950</b>		

1. The p-value of the interaction effect = 0.000 is less than the level of significance of 0.05 which means that the interaction between semester and training status is statistically significant. This means that the improvement from Fall to Spring in the PPVT scores is different for students of the school year 2009-10 (teachers/students had not received training/DVDs) compared to the PPVT scores of students of the school year 2010-2011 (teachers/students had received training).



2. We then conducted further investigation of improvement in PPVT scores of 2009-10 and 2010-11 using a two-sample independent t-test. The results of the t-test are given below:

### Descriptive Statistics

	Training Status	N	Mean	Std. Deviation
Improvement in PPVT Scores	Without	171	2.30	10.294
	With	36	11.47	15.221

### Independent Samples Test for the comparison of improvement in 2009-10 to that of 2010-11.

Levene's Test for Equality of Variances		t-test for Equality of Means						
F	Sig.	t	df	Sig. (1-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
8.347	0.004	3.454	41.985	.0005	9.17	2.656	3.813	14.534

The P-value of the t-test for the equality of means is 0.0005 and it is less than the level of significance of 0.05. Therefore, we conclude that improvement from Fall to Spring is much higher in 2010-11 than in 2009-10. Recall that teachers/students had not received training/DVDs in the year 2009-10 but had received training/DVDs in 2010-11. We can therefore conclude that the training program and DVDs might have played a significant role in bringing about the higher improvement in the PPVT scores of students.

3. Even though the average PPVT score (78.81) of the students in Fall 2010 (with a standard deviation of 19.073) was significantly less than the average PPVT score (90.95) of the students in Fall 2009 (with a standard deviation of 13.772), their improvement from Fall to Spring was significantly higher ( $90.28 - 78.81 = 11.47$ ) than that of 2009-10 ( $93.25 - 90.95 = 2.30$ ). **Hence, we conclude that training and DVDs have indeed brought about a substantial improvement in students who had lower scores to start with.** See the table below for detailed descriptive statistics.

**Descriptive Statistics for PPVT scores**

	TRAINING/DVDs	Mean	Std. Deviation	N = # of students
Fall 2009	Without	<b>90.95</b>	<b>13.772</b>	<b>171</b>
Fall 2010	With	<b>78.81</b>	<b>19.073</b>	<b>36</b>
Spring 2010	Without	<b>93.25</b>	<b>11.347</b>	<b>171</b>
Spring 2011	With	<b>90.28</b>	<b>13.800</b>	<b>36</b>

.....

### **3<sup>rd</sup> Grade Reading Scores on the 2014 Statewide Criterion Referenced Competency Test**

In 2014, 2268 third graders from the Richmond Country took the CRCT. The mean CRCT score in reading was 830. Out of the 2268 students who took the CRCT exam, 303 students were in the DVD intervention program in 2011 in their kindergarten years. The mean and standard deviation of reading scores in CRCT exam for these 303 students were 837.23 and 29.92 respectively. Our hypothesis is that the average CRCT score in reading for the students in the DVD intervention program will be higher than the system-wide average for the Richmond County. Using the one-sample Ttest, we computed the probability that, for any random sample of 303 students from the Richmond County, the average CRCT score in reading will be 837.23 or more is 0.000017. That is, it is very rare that the average CRCT score for a sample of 303 students will be 837.23 or more. That means, there is very little chance that it (the average being 837.23 or more) can happen by chance when the system-wide average is 830. Since the average score of 303 students in the DVD intervention group was indeed 837.23, we have sufficient evidence to conclude that this superior performance of 303 students is due to the DVD intervention. Even if we include as “below CRCT standard” 30 students who had been retained and did not take the 2014 test, our results are still quite positive.

Sample	Below CRCT standard	Met CRCT standard	Exceeded CRCT standard
303	23	160	120
	7.6%	52.8%	39.6 %

30 students had been retained in first or second grade; even though these students did not take the 2014 test, if we include these students in the test results as below the CRCT standard, the results are still quite positive.

333	53	160	120
303+30	<b>15.9%</b>	<b>45.0%</b>	<b>36.0%</b>

2014 RCSS CRCT in Reading system-wide (excluding the 303 students who were in the DVD intervention group)

1,965	317	1117	531
	<b>16.13%</b>	<b>56.84%</b>	<b>27.02%</b>

2014 RCSS CRCT in Reading system-wide

2,268	340	1277	651
	14.9%	56.3%	28.7%

We can test the hypothesis that the distribution of rankings in CRCT scores of students belonging to the DVD intervention group is different from that of the students in the NON\_DVD group, Richmond County –wide.

Group	Sample	Below CRCT std	Met CRCT std	Exceeded CRCT std
DVD	303	23	160	120
NON-DVD	1,965	317	1117	531

The Chi-square test is applied to the above contingency table to test the hypothesis of homogeneity. The P-value is obtained to be less than 0.0001. This means that there is a

significant difference in the distribution of rankings of CRCT scores between the DVD and Non-DVD group.

Further analysis indicates that the proportion of students who met or exceed CRCT standard in the DVD group is higher than that of students in the Non-DVD group.

Similarly, analysis indicates that the proportion of students who were below the CRCT standard in the DVD group is lower than that of students in the Non-DVD group.