[2005 AERO "Best Paper" award winner]

Effects of All-day K and Reading First on Kindergarten Performance: 2004-2005 Cohort

Cynthia S. McCahon, PhD
Senior Research Analyst
Department of Research and Evaluation
Mesa Public Schools

Executive Summary

Six hundred kindergarten students, 300 in all-day kindergarten (all-day K) classes, 300 in half-day classes (half-day K) were evaluated for reading and mathematics proficiency to determine whether all-day K significantly improves the academic performance of kindergarten students. The students included in the study were students at Eisenhower, Guerrero, Hawthorne, Holmes, Lincoln, Lindbergh, Longfellow, Lowell, Redbird, Webster, Roosevelt, Whitman, and Whittier elementary schools (all containing mainly Hispanic, free and reduced lunch-eligible students).

Reading readiness was assessed in early January using the DIBELS assessment methods and benchmarks. Analysis of variance showed that all-day K students performed significantly better than half-day K students. All-day K brings the performance of English-language-learner (ELL) students up to the level of non-ELL half-day students for all benchmarks except word use fluency. Students in the Reading First program performed significantly better than students not in Reading First, but this may be biased due to the use of benchmarks specifically designed to measure the core outcomes of the Reading first program. Students in both all-day K and Reading First performed the best. Stepwise regression showed the Reading First independent variable providing more variance explanation than the all-day K factor.

Mathematics ability was assessed in mid-March by measuring the attainment of 137 benchmark/level combinations found on the Kindergarten Student Profile ("yellow card"). Chi-square analysis showed that all-day K students showed significantly *higher* attainment frequencies than half-day K students for 42.3% of the combinations, *about the same* for 53.3% of combinations and significantly *lower* attainment for 4.4% of the combinations. While ELL students perform at a significantly lower level than non-ELL students for seven out of the nine mathematics benchmarks, the all-day K ELL students show significantly higher attainment percentages than the half-day K ELL students for 45.1% of the benchmark/level combinations, statistically equivalent attainment for 47.5% of the combinations, and significantly lower attainment for 7.4% of the combinations. Like the previous reading readiness assessment, all-day K brings ELL students up to or beyond the mathematics attainment percentages of non-ELL half-day students in a full one-third of the mathematics benchmark/level combinations. Reading First students showed significantly *higher* attainments than not-Reading First students for 37.2% of the combinations, *about the same* for 62.1% of combinations and significantly *lower* attainment for 0.7% of the combinations.

Lastly, reading readiness was reassessed in early May by using the *MPS- First Grade Reading Inventory, Part 1*. Analysis of variance showed, like the earlier DIBELS assessment, that all-day K students performed significantly better than half-day K students. Still noted is the phenomenon of all-day K bringing ELL students up to or slightly above the level of non-ELL half-day students. Reading First students also performed significantly better than non-Reading First students for each of the five MPS-FGRI benchmarks. As in the January reading assessment, Reading First brings ELL students up to the level of non-Reading First non-ELL students. However, unlike the earlier DIBELS assessment, all-day K proved to be the more

powerful independent variable over Reading First in explaining the student's reading readiness performance.

In summary, the all-day K students performed better on the selected reading readiness and mathematics ability assessments than half-day K students attending the schools included in this study. Furthermore, students in all-day K **and** Reading First performed the best in nearly one-half (45%) of the reading assessment benchmarks and in 25% of the mathematics assessment benchmarks. All-day K or Reading First helps ELL students reach the attainment levels of half-day or non-Reading First non-ELL students. However, to more definitively assess the Reading First variable, more half-day K students at schools other than Roosevelt would need to be evaluated. Lastly, it is recommended that this study be repeated with a 2005/06 cohort of students at these schools, along with tracking the 2004/05 cohort's academic performance over the next few years.

Introduction

The purpose of this study is to determine if a full day of kindergarten accelerates and/or enhances the attainment of the State of Arizona Academic Standards (reading and mathematics) for the Kindergarten grade level.

Data Collection

Procedure:

A random sample of 300 kindergarten students attending all-day kindergarten classes (both state funded and district funded) was selected from the following schools: Guerrero, Hawthorne, Holmes, Lindbergh, Longfellow, Lowell, Roosevelt, Whittier and Whitman. Fifty-nine percent (N=177) of these students participated in the "Reading First" program. The comparison group was composed of 300 kindergarten students randomly selected from six schools not offering all-day kindergarten, but with similar demographic mixes of ethnicities and free/reduced lunch percentages to attempt to statistically control for these demographic variables: Eisenhower, Lincoln, Lindbergh, Redbird, Roosevelt, and Webster. Fourteen percent (N=41) of these students participated in the "Reading First" program. Tables 1a - 1c show the development of the sampling structure and resultant number of observations in each category.

Three sets of assessment measures were taken for each student in the sample over the course of the spring semester: a DIBELS reading assessment (with five benchmarks) in early January of 2005, a mathematics assessment (with nine benchmarks each with eight to 21 levels) in mid-March and a pre-reading inventory assessment (with five benchmarks) in early May.

Analysis of variance was used to determine if the means of the benchmarks in the two sets of reading assessments exhibited by the all-day kindergarten students were significantly higher than the corresponding means of the half-day kindergarten students, controlling for English-language-learner (ELL) status, free/reduced lunch status, gender, and age. Also analyzed were any effects due to the use of the Reading First curriculum, due to its wide usage at the schools in this study. Chi-square analysis was used to assess if the attainment frequencies of the mathematics assessment benchmarks were significantly higher for the all-day kindergarten students over the half-day kindergarten students, again checking for ELL, free/reduced lunch status, gender, age and Reading First effects.

Table 1a: Planned Research Design (N=600)

All-Day Kindergarten (N=300)				**Half-Day Kindergarten (N=300)**	
State Funded (first year of program) **(N=150)**		**District Funded** (more than one year of program) **(N=150)**			
Reading First (N=75)	**not Reading First (N=75)**	**Reading First (N=75)**	**not Reading First (N=75)**	**Reading First (N=150)**	**not Reading First (N=150)**
113: Lowell	112: Longfellow 155: Guerrero	106: Hawthorne 107: Holmes 116: Whittier 117: Whitman 121: Roosevelt *(Wallerich)* *(Wood)*	122: Lindbergh *(Smith)* *(Wagner)*	121 : Roosevelt *(Armistead)* *(D'Amico)*	111: Lincoln 115: Webster 120: Eisenhower 122: Lindbergh *(Foglia)* 123: Redbird

Table 1b: Actual Population Breakout (N=1420)

All-Day Kindergarten (N=903)				**Half-Day Kindergarten (N=517)**	
State Funded (first year of program) **(N=361)**		**District Funded** (more than one year of program) **(N=542)**			
Reading First (N=110)	**not Reading First (N=251)**	**Reading First (N=494)**	**not Reading First (N=48)**	**Reading First (N=41)**	**not Reading First (N=476)**
113: Lowell	112: Longfellow 155: Guerrero	106: Hawthorne 107: Holmes 116: Whittier 117: Whitman 121: Roosevelt *(Wallerich)* *(Wood)*	122: Lindbergh *(Smith)* *(Wagner)*	121 : Roosevelt *(Armistead)* *(D'Amico)*	111: Lincoln 115: Webster 120: Eisenhower 122: Lindbergh *(Foglia)* 123: Redbird

Table 1c: Sampling Plan Used (N=600)

All-Day Kindergarten (N=300)				**Half-Day Kindergarten (N=300)**	
State Funded (first year of program) **(N=150)**		**District Funded** (more than one year of program) **(N=150)**			
Reading First (N=75)	**not Reading First (N=75)**	**Reading First (N=102)**	**not Reading First (N=48)**	**Reading First (N=41)**	**not Reading First (N=259)**
113: Lowell	112: Longfellow (38) 155: Guerrero (37)	106: Hawthorne (21) 107: Holmes (21) 116: Whittier (20) 117: Whitman (20) 121: Roosevelt (20) *(Wallerich)* *(Wood)*	122: Lindbergh *(Smith)* *(Wagner)*	121 : Roosevelt *(Armistead)* *(D'Amico)*	111: Lincoln (69) 115: Webster (70) 120: Eisenhower (70) 122: Lindbergh (11) *(Foglia)* 123: Redbird (39)

Analysis

Part 1: Results of the January Reading Assessment Using DIBELS Benchmarks

Five benchmarks were evaluated in the DIBELS assessment: initial sound fluency (ISF), letter naming fluency (LNF), phoneme segmentation fluency (PSF), nonsense word fluency (NWF) and word use fluency (WUF). Ten separate analyses of variance (two models for each dependent variable) were conducted. The general model structure was:

dependent variable = set of main independent variables (ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE) with or without two-way interaction effects with all-day/half-day K variable

Specifically, all the models can be found in Appendix A.

Table 2 summarizes the results of these ten model runs. Note that the mean performance of all-day kindergarten students is significantly higher than half-day kindergarten students in **seven of the ten** analyses. It was also found that students in the Reading First curriculum scored significantly higher than the non-Reading First students in **all ten** of the analyses.

The mean performances of all-day versus half-day kindergarten students by DIBELS benchmark are illustrated in Figures 1a to 1e. Note that for each reading benchmark, all-day K students scored higher than half-day K students. Figures 2a-2e contain the results of Reading First versus non-Reading First students for each of the five DIBELS benchmarks, with Reading First students scoring higher than not-Reading First students for every benchmark. Appendix B contains the graphs of the means of the other factors (age, freelunch and gender) found to be significant. The ELL factor is discussed later.

Table 2
Significant Factors Using Analysis of Variance of DIBELS Scores (α=0.05)

Dependent Variable	Main and Interaction Effects Models (significance)	Main Effects Only Models (significance)
Initial Sound Fluency	ELL (0.000) READFIRST (0.000) AGE (0.025)	ELL (0.000) READFIRST (0.000) ALLDAY (0.006) AGE (0.024)
Letter Naming Fluency	ALLDAY (0.000) ELL (0.000) READFIRST (0.000) FREELUNCH (0.017)	ALLDAY (0.000) ELL (0.000) READFIRST (0.000) FREELUNCH (0.009)
Phoneme Segmentation Fluency	ALLDAY (0.000) ELL (0.000) READFIRST (0.000) AGE (0.001)	ALLDAY (0.000) ELL (0.000) READFIRST (0.000) AGE (0.001) GENDER (0.034)
Nonsense Word Fluency	ALLDAY (0.000) READFIRST (0.000) ELL (0.004) FREELUNCH (0.015) GENDER (0.024)	ALLDAY (0.000) READFIRST (0.000) FREELUNCH (0.005) ELL (0.010) GENDER (0.025)
Word Use Fluency	READFIRST (0.000) ELL (0.001)	ELL (0.000) READFIRST (0.000)

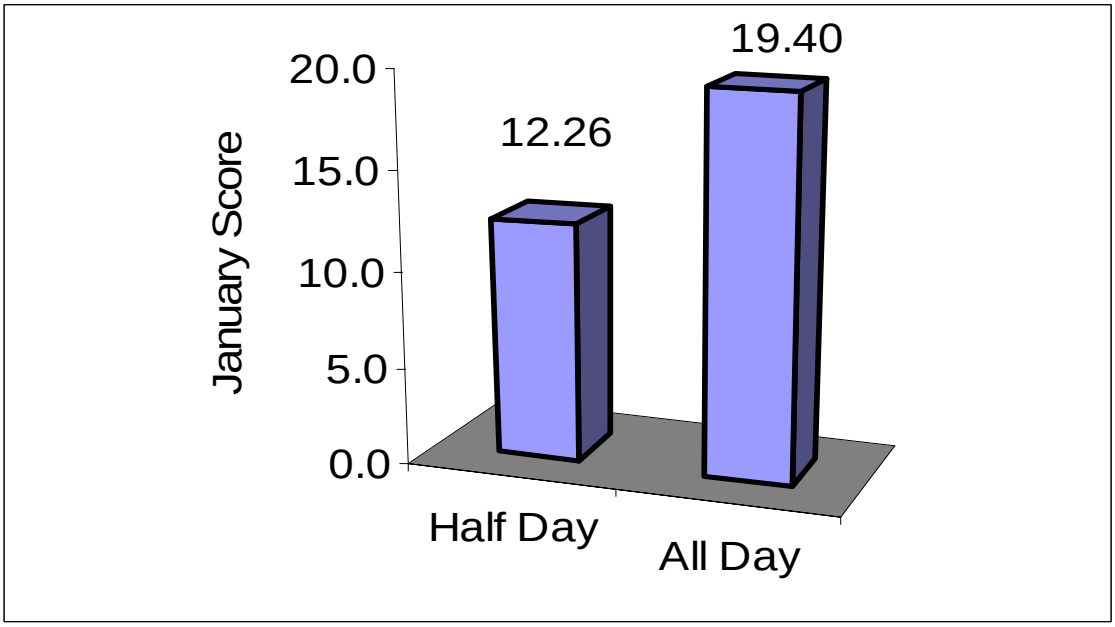

Figure 1a: Initial Sound Fluency for All-Day Versus Half-Day Kindergarteners

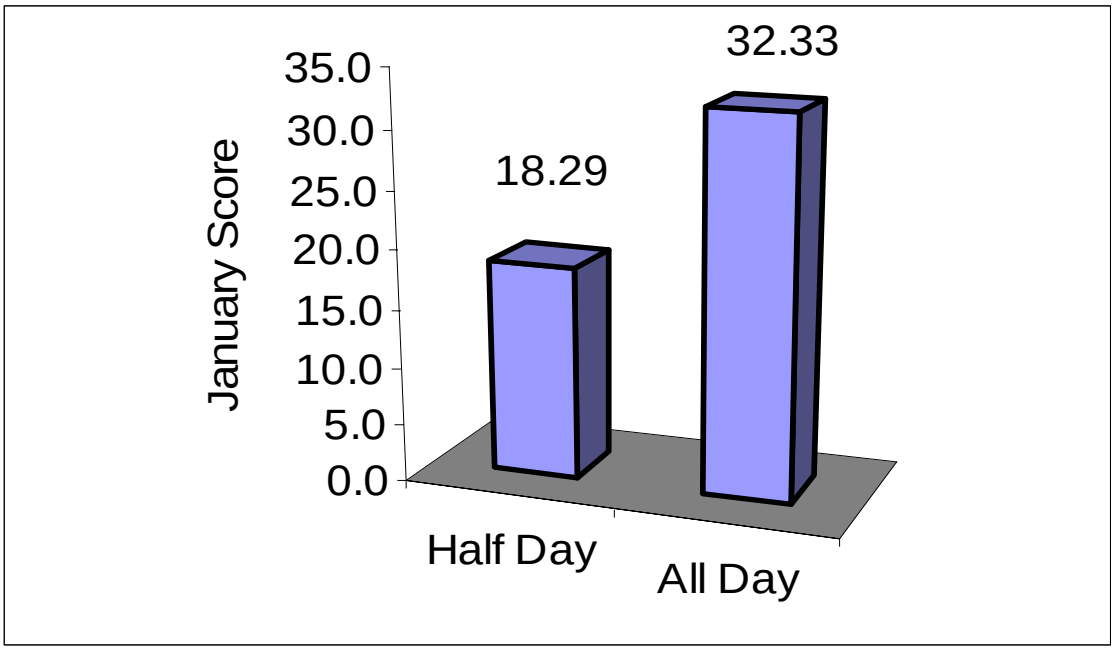

Figure 1b: Letter Naming Fluency for All-Day Versus Half-Day Kindergarteners

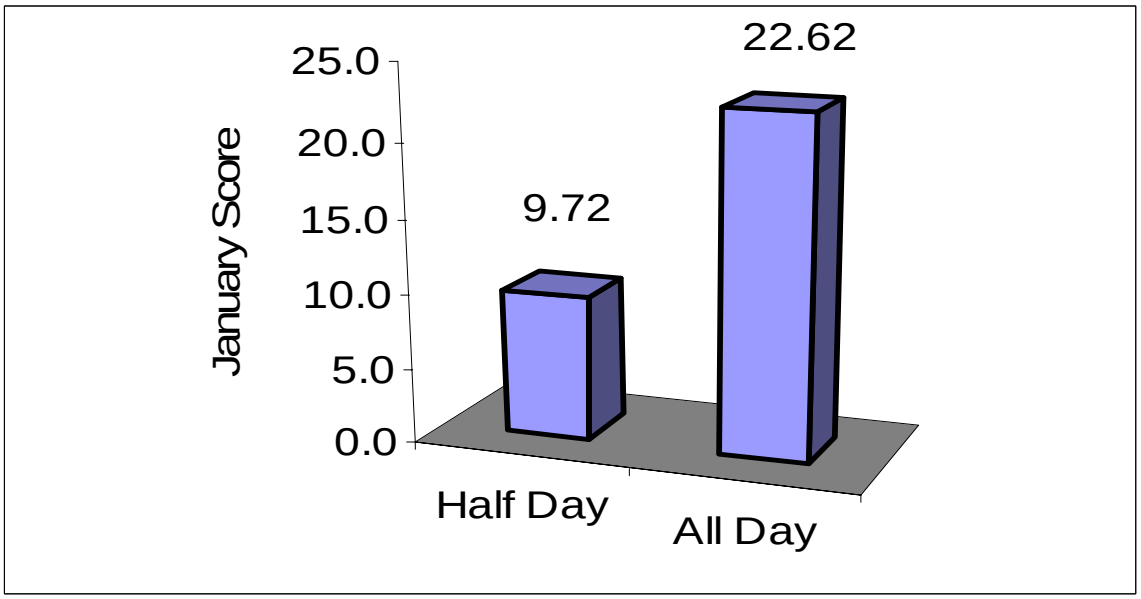

Figure 1c: Phoneme Segmentation Fluency for All-Day Versus Half-Day Kindergarteners

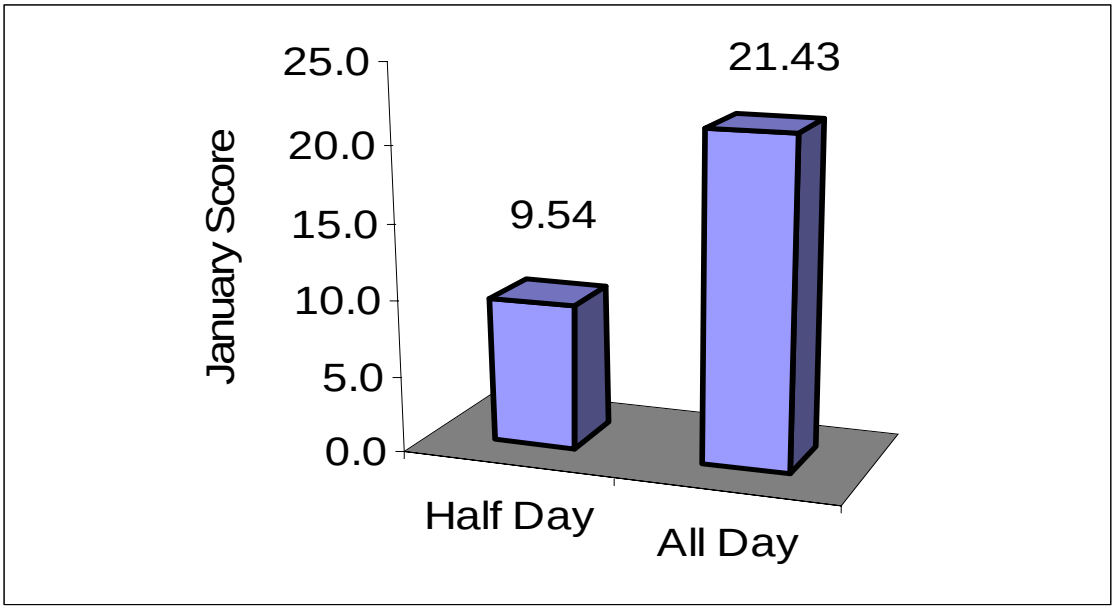

Figure 1d: Nonsense Word Fluency for All-Day Versus Half-Day Kindergarteners

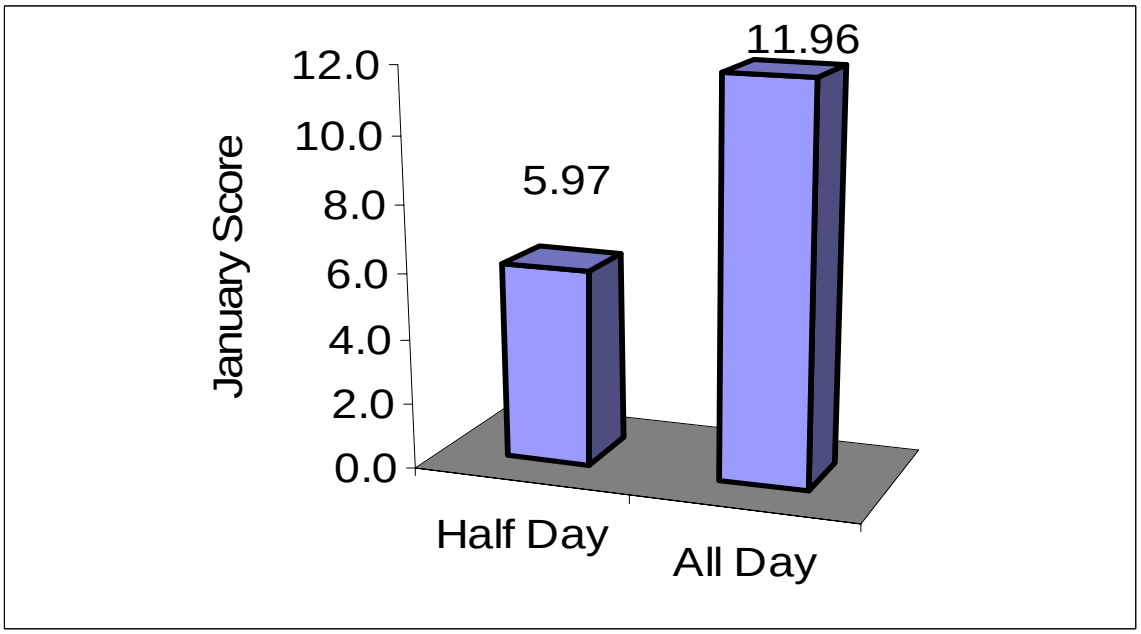

Figure 1e: Word Use Fluency for All-Day Versus Half-Day Kindergarteners

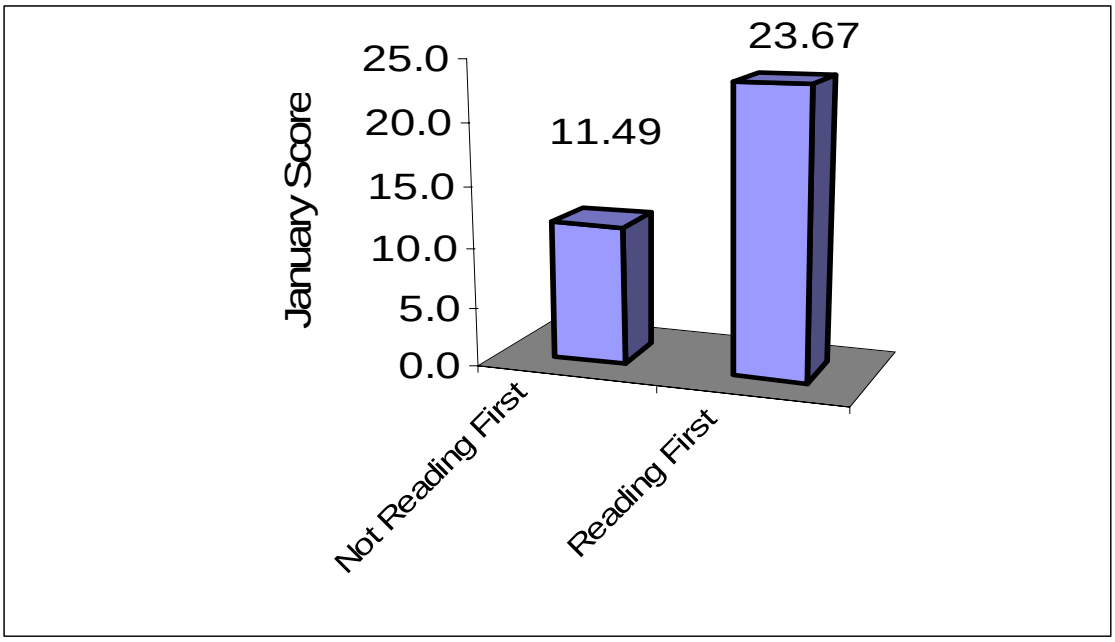

Figure 2a: Initial Sound Fluency for Reading First Versus Not Reading First Kindergarteners

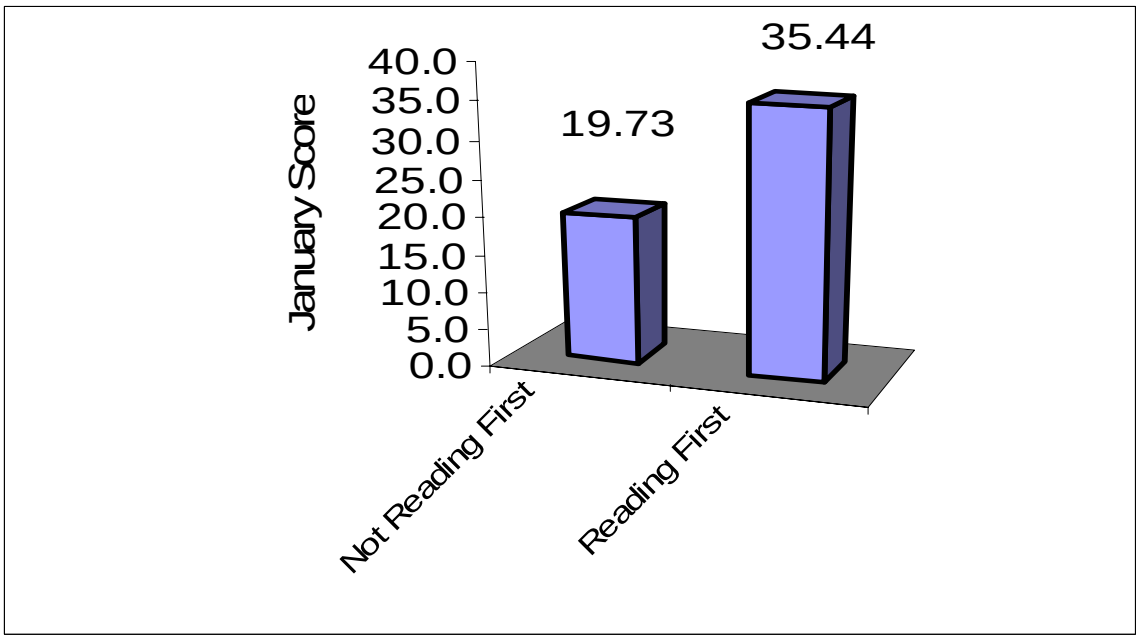

Figure 2b: Letter Naming Fluency for Reading First Versus Not Reading First Kindergarteners

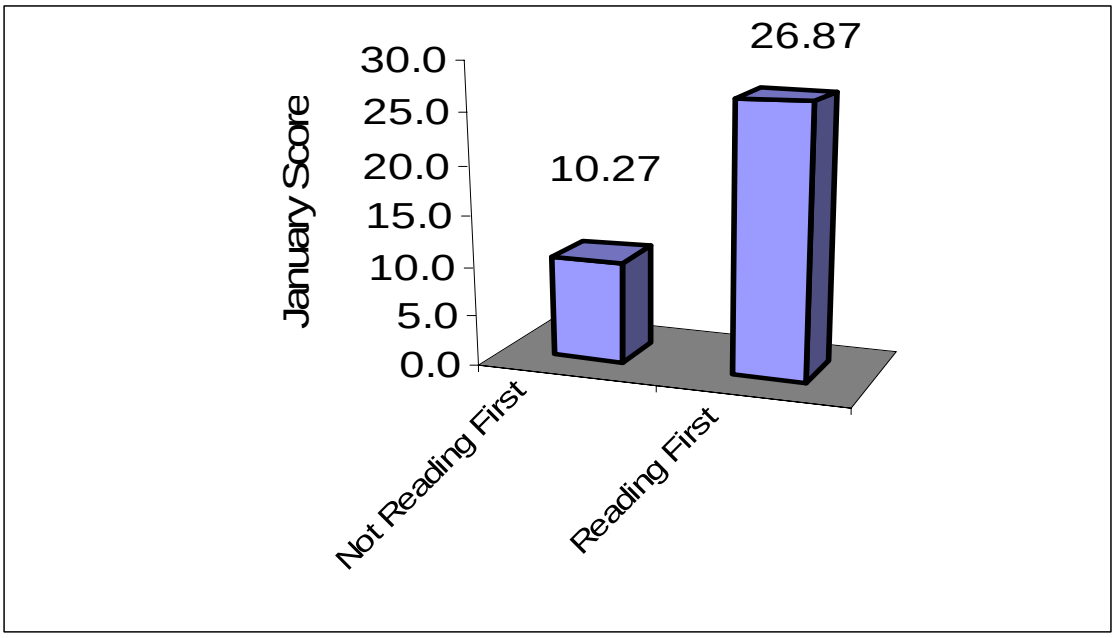

Figure 2c: Phoneme Segmentation Fluency for Reading First Versus Not Reading First Kindergarteners

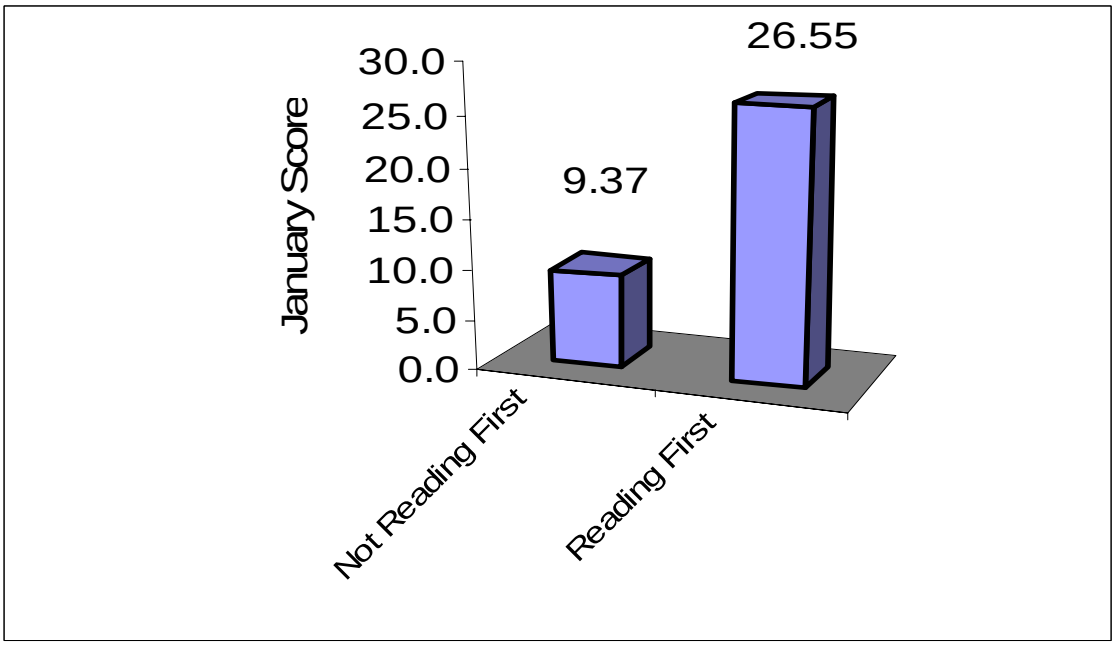

Figure 2d: Nonsense Word Fluency for Reading First Versus Not Reading First Kindergarteners

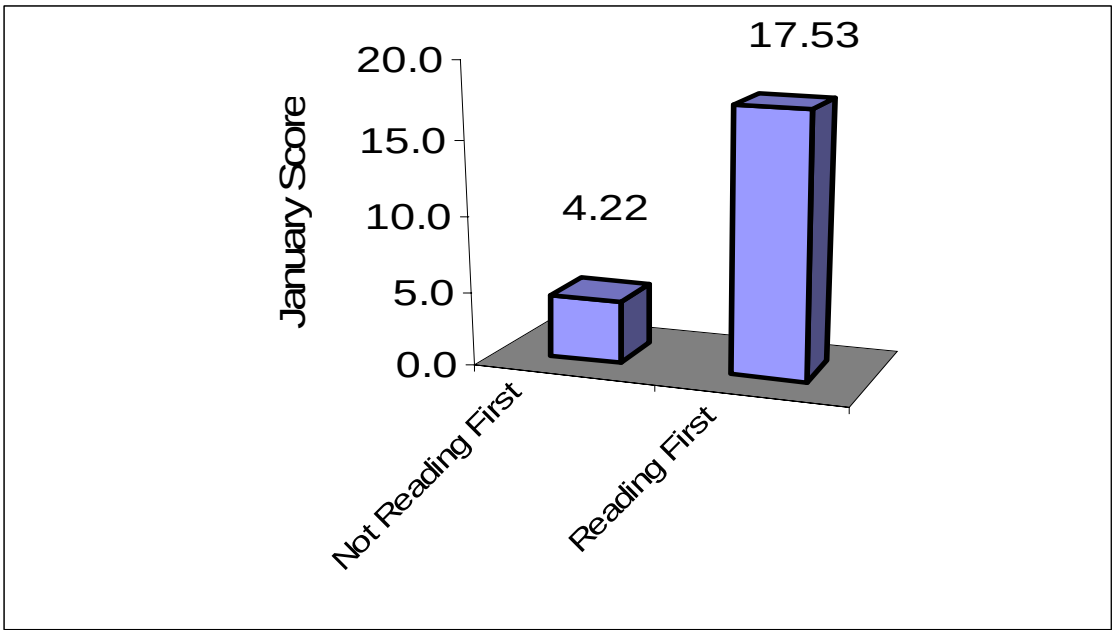

Figure 2e: Word Use Fluency for Reading First Versus Not Reading First Kindergarteners

In order to assess their joint effects, Figures 3a-3e show the results of all-day versus half-day kindergarteners split out by reading program (Reading First and not-Reading First). Notice that all-day K students not in Reading First show a higher degree of improvement in initial sound fluency, letter naming fluency, and nonsense word fluency over half-day K students not in Reading First than the improvement shown by all-day Reading First students over half-day Reading First students. Word use fluency seems unaffected by all-day K regardless of enrollment in Reading First or not. Note that for **all** benchmarks, performance of half-day and all-day K students in Reading First exceeds that of half-day and all-day K students not in Reading First. It should be noted, however, that the Reading First half-day group consists of only two classes at a single school. Therefore, no conclusions about the impact of half-day K with the Reading First program can be made.

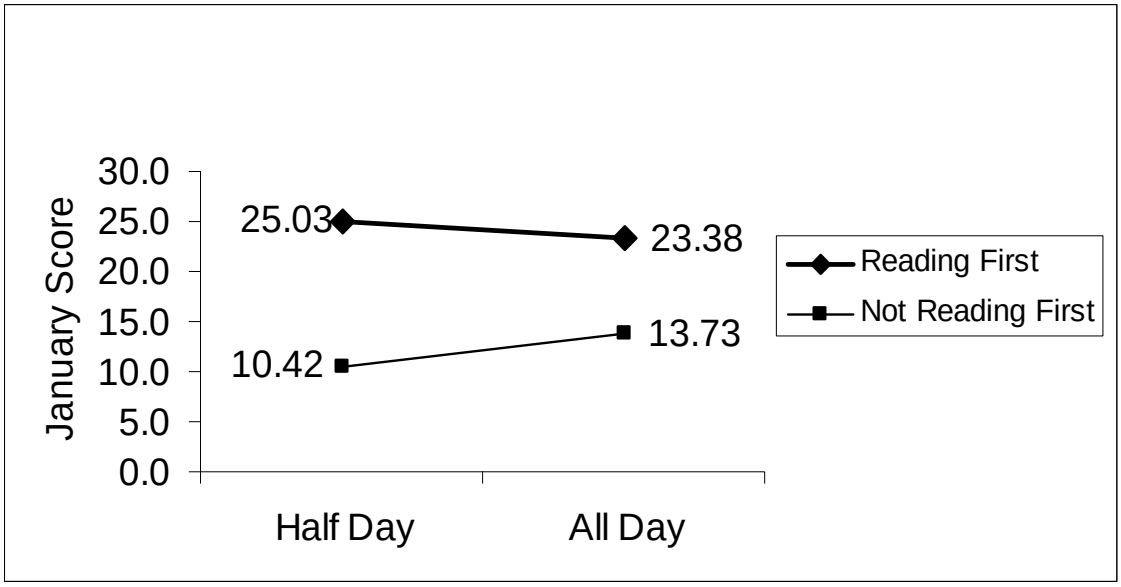

Figure 3a: Initial Sound Fluency for All-Day Versus Half-Day Kindergarteners by Reading First Program

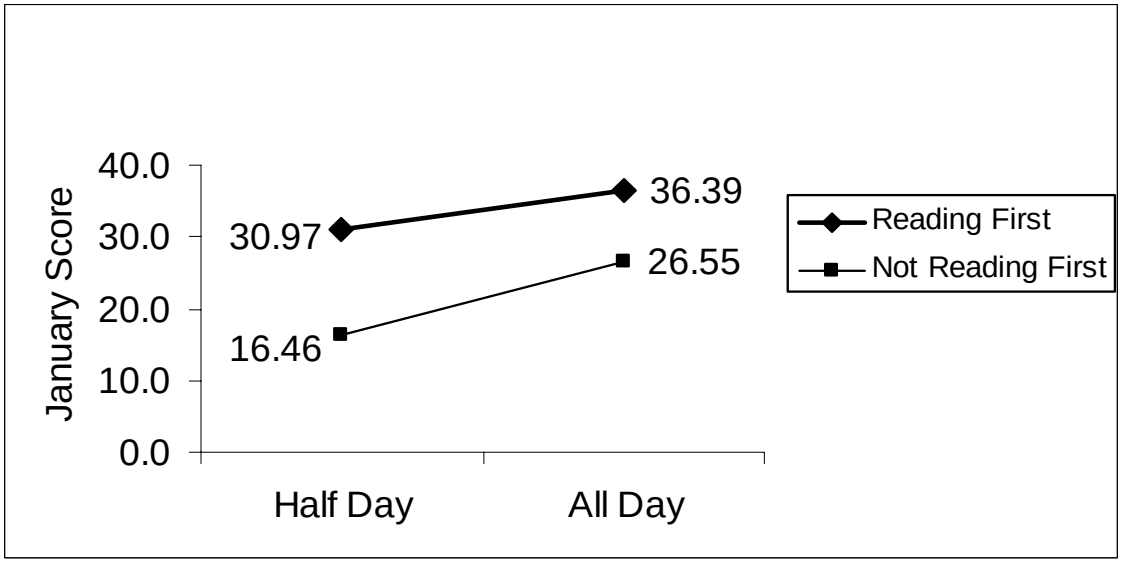

Figure 3b: Letter Naming Fluency for All-Day Versus Half-Day Kindergarteners by Reading First Program

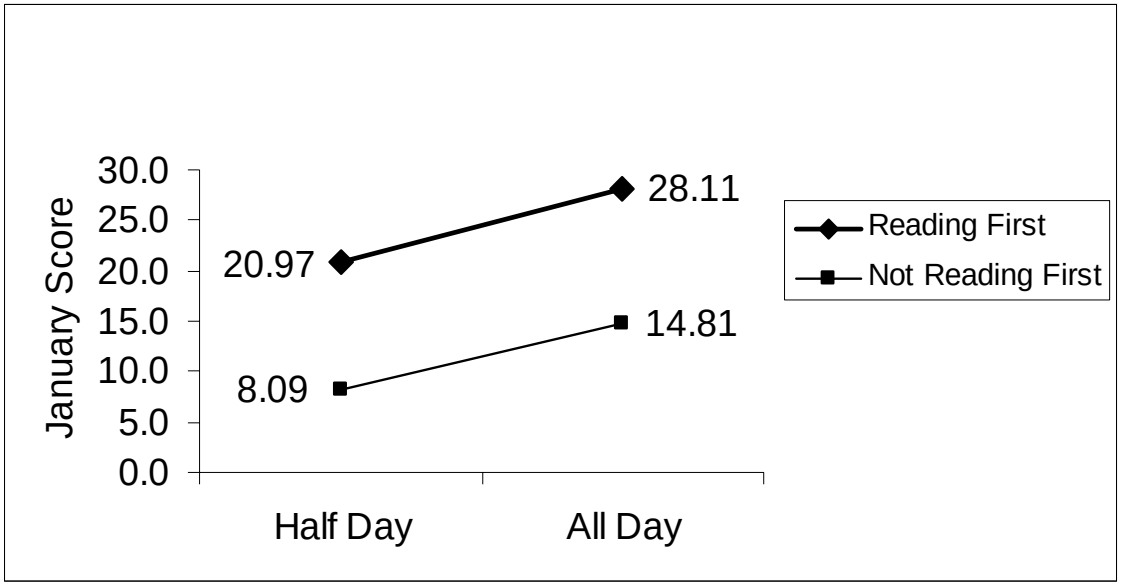

Figure 3c: Phoneme Segmentation Fluency for All-Day Versus Half-Day Kindergarteners by Reading First Program

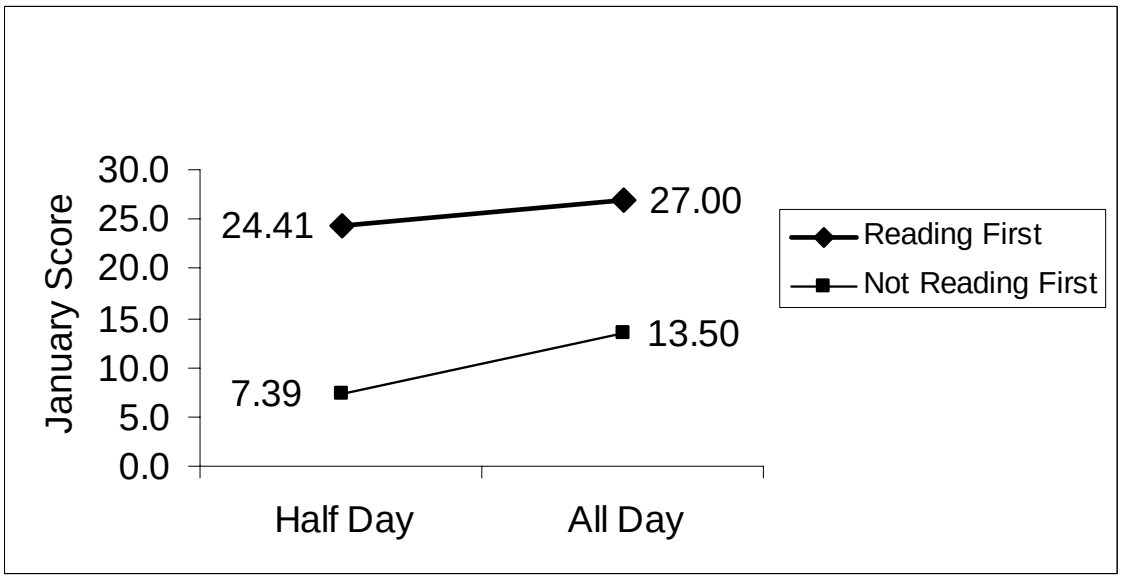

Figure 3d: Nonsense Word Fluency for All-Day Versus Half-Day Kindergarteners by Reading First Program

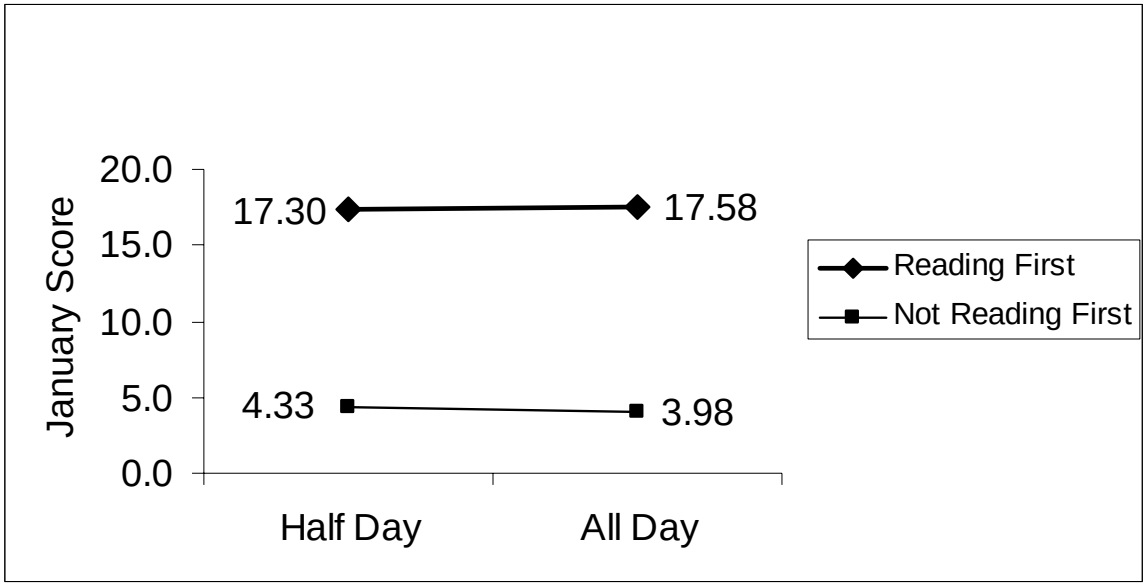

Figure 3e: Word Use Fluency for All-Day Versus Half-Day Kindergarteners by Reading First Program

Stepwise regression was performed for each of the five DIBELS dependent variables to determine which of the main effects contributed the most toward explaining the variance seen in the dependent variable value. Table 3 lists the results of the stepwise regression analyses. Note that Reading First explained more of the variance in performance of kindergarten students for all of the DIBELS benchmarks.

Table 3
Percent of Variance Explained by Predictor Variables

DIBELS Reading Benchmark	All-Day Contribution	Reading First Contribution
Initial Sound Fluency	0.081	0.220
Letter Naming Fluency	0.166	0.193
Phoneme Segmentation Fluency	0.145	0.222
Nonsense Word Fluency	0.135	0.258
Word Use Fluency	0.043	0.200

Lastly, due to the significant ELL effect present in both sets of models, Figures 4a-4e illustrate the effects of all-day K on ELL students. Note that all-day K brings the performance of ELL students up to or above the level of half-day non-ELL students for all five benchmarks except word use fluency (at only 90% of the half-day non-ELL student performance).

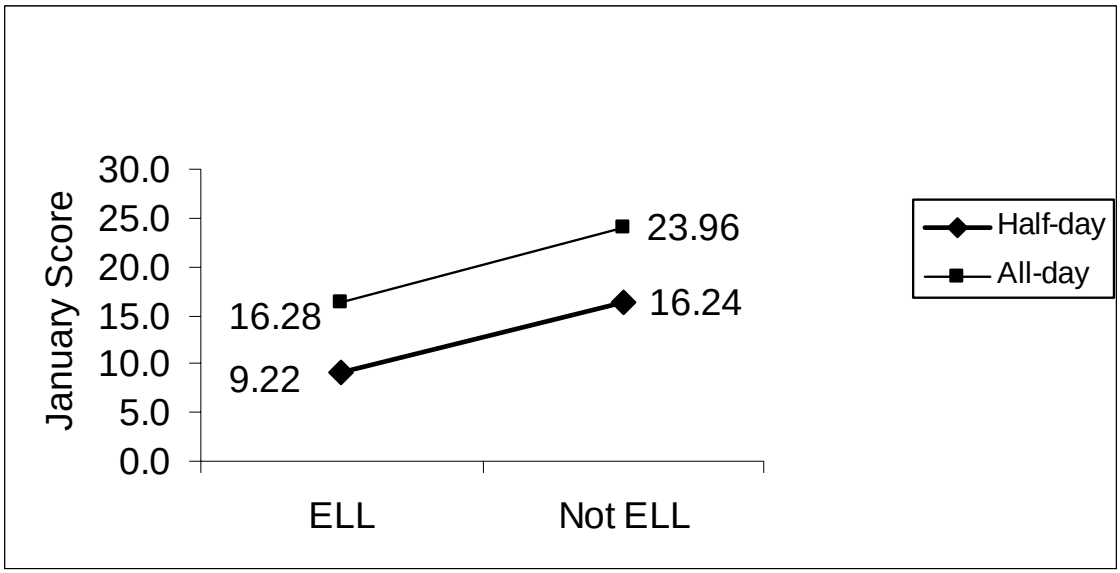

Figure 4a: Initial Sound Fluency for All-Day Versus Half-Day ELL and Non-ELL Kindergarteners

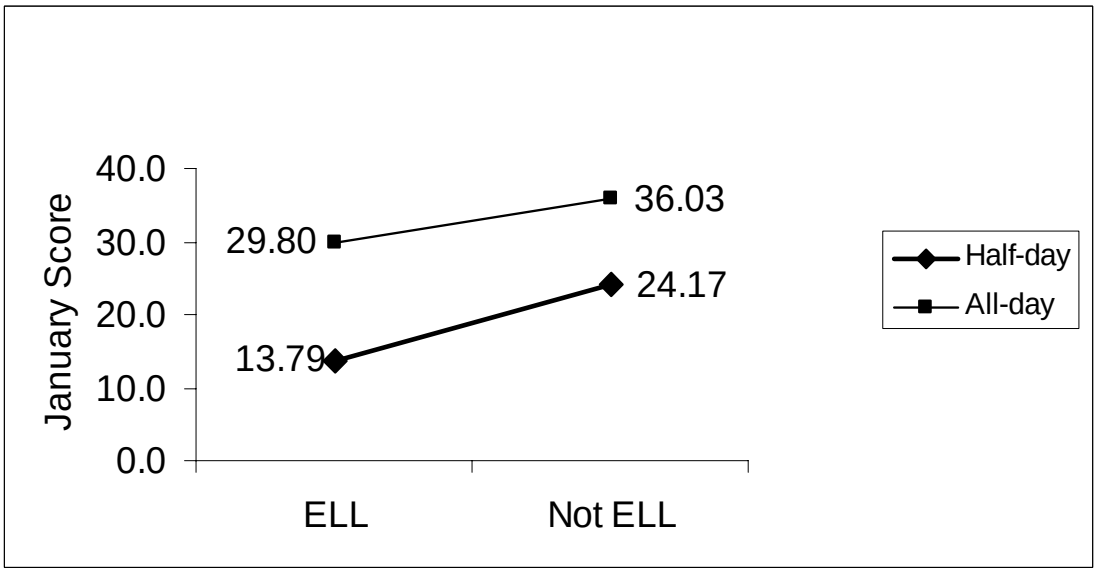

Figure 4b: Letter Naming Fluency for All-Day Versus Half-Day ELL and Non-ELL Kindergarteners

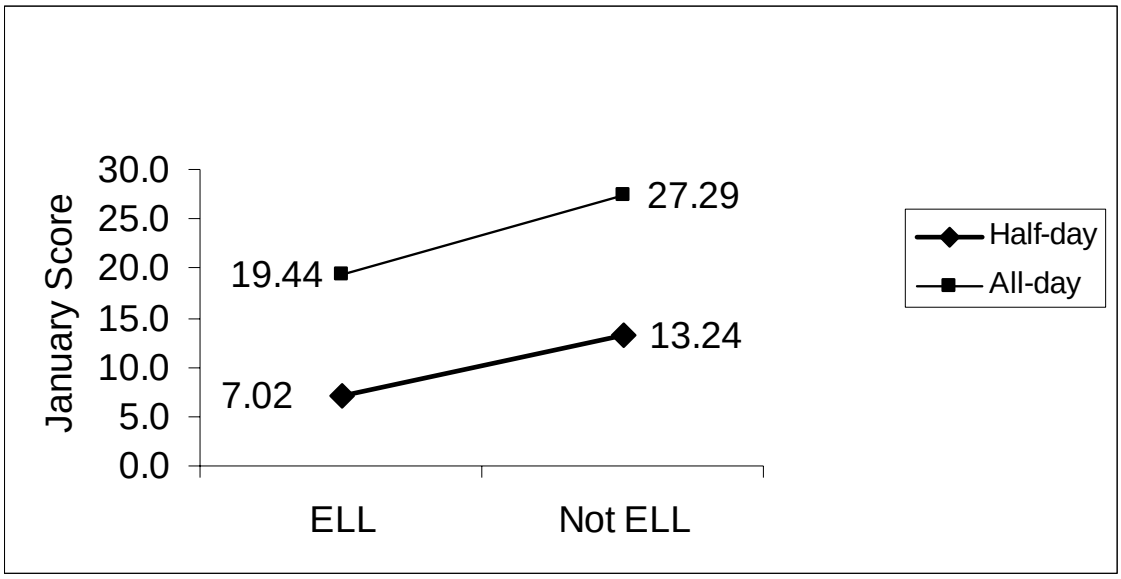

Figure 4c: Phoneme Segmentation Fluency for All-Day Versus Half-Day ELL and Non-ELL Kindergarteners

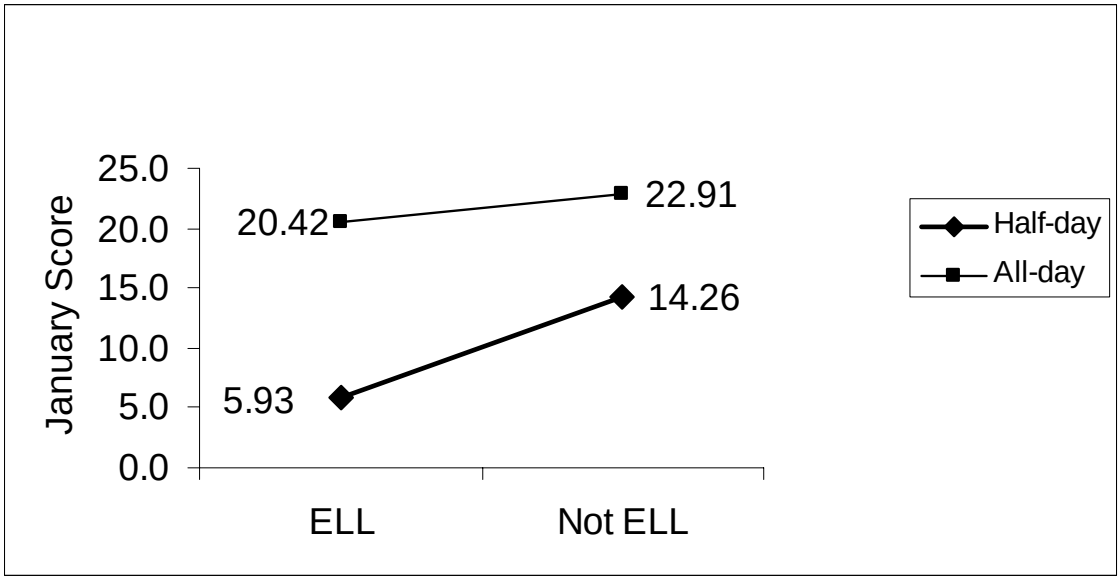

Figure 4d: Nonsense Word Fluency for All-Day Versus Half-Day ELL and Non-ELL Kindergarteners

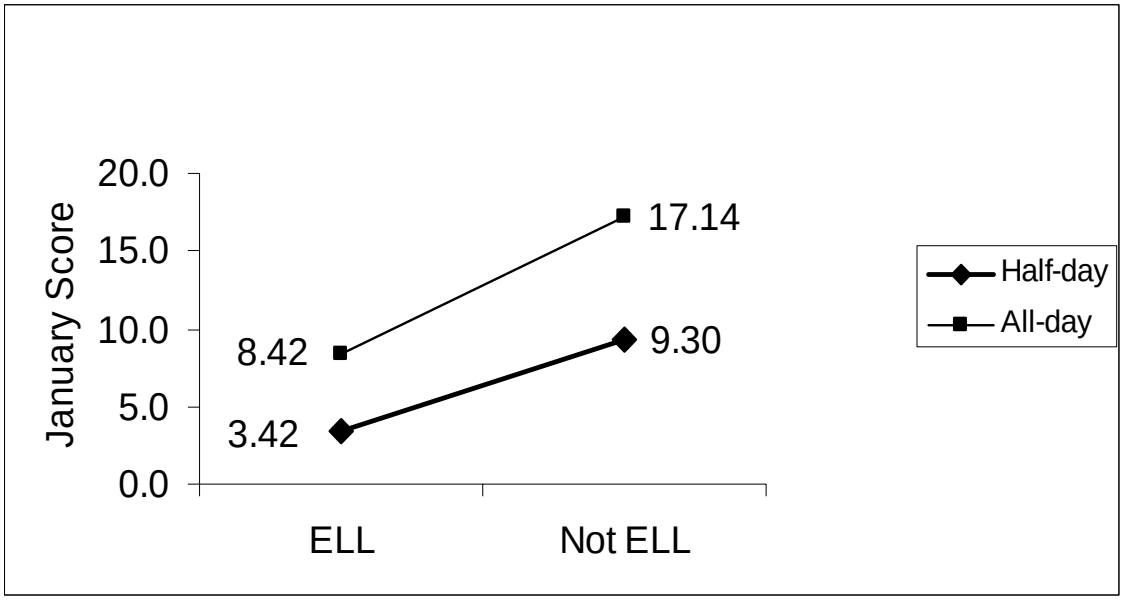

Figure 4e: Word Use Fluency for All-Day Versus Half-Day ELL and Non-ELL Kindergarteners

Likewise, Figures 5a-5e show the effects of the Reading First program on ELL students, bringing their performance to well beyond that of half-day non-ELL students for each benchmark, including word use fluency..

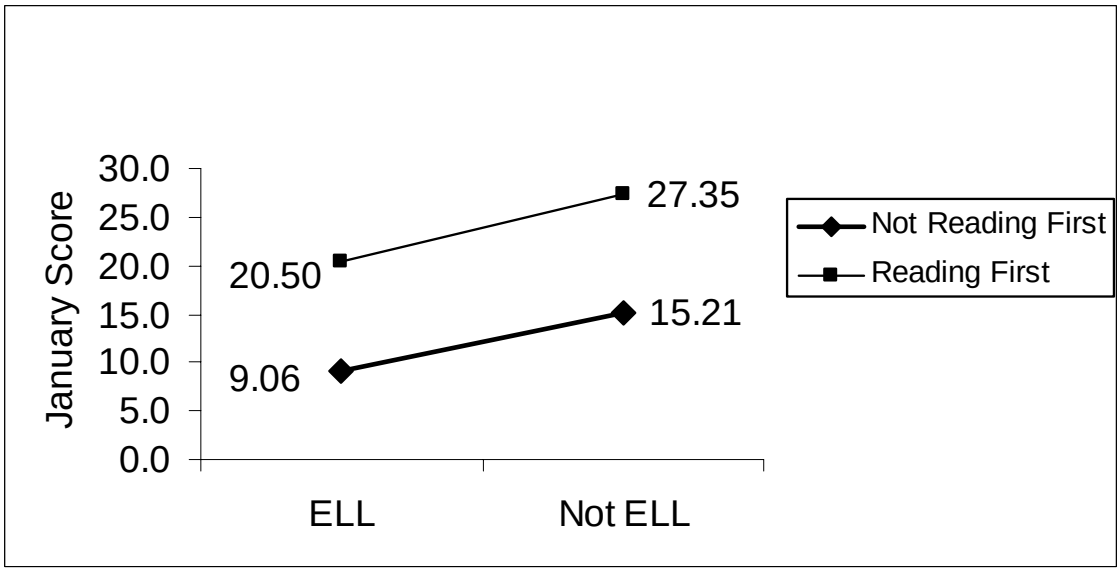

Figure 5a: Initial Sound Fluency for Reading First Versus Not Reading First ELL and Non-ELL Kindergarteners

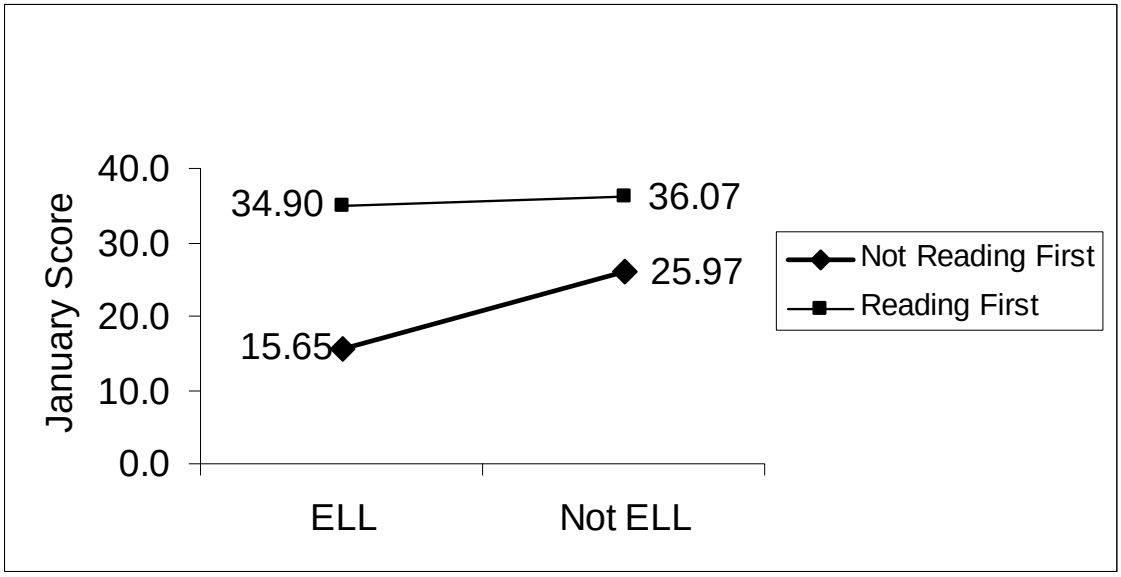

Figure 5b: Letter Naming Fluency for Reading First Versus Not Reading First ELL and Non-ELL Kindergarteners

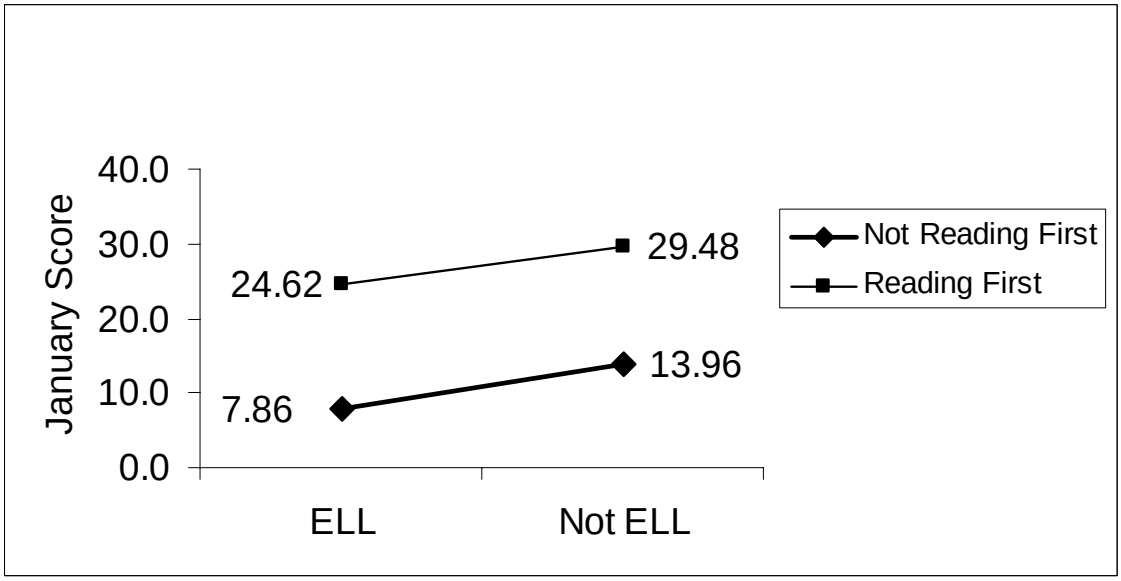

Figure 5c: Phoneme Segmentation Fluency for Reading First Versus Not Reading First ELL and Non-ELL Kindergarteners

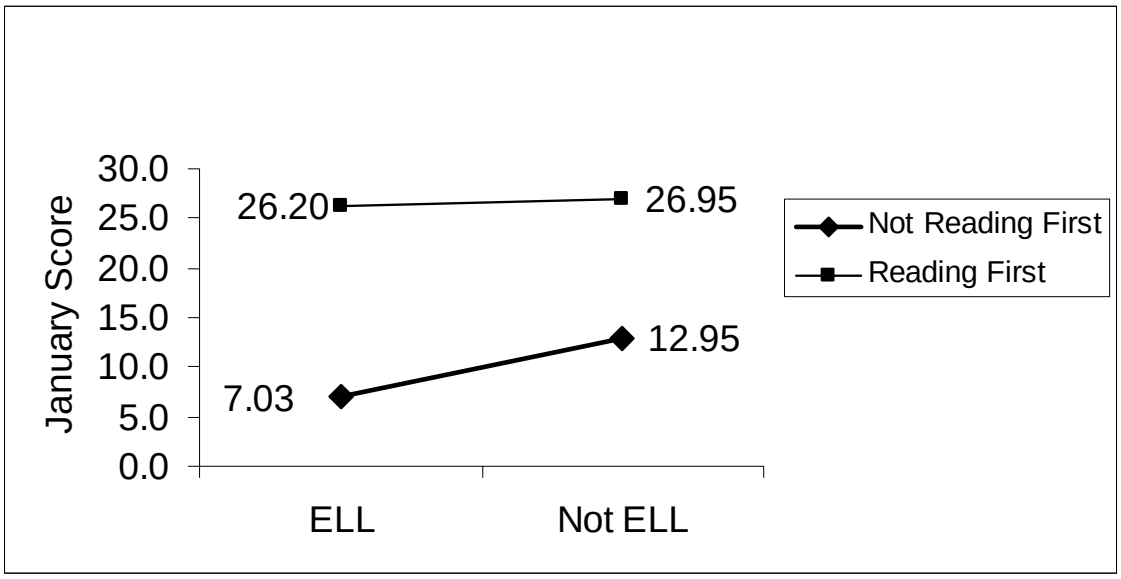

Figure 5d: Nonsense Word Fluency for Reading First Versus Not Reading First ELL and Non-ELL Kindergarteners

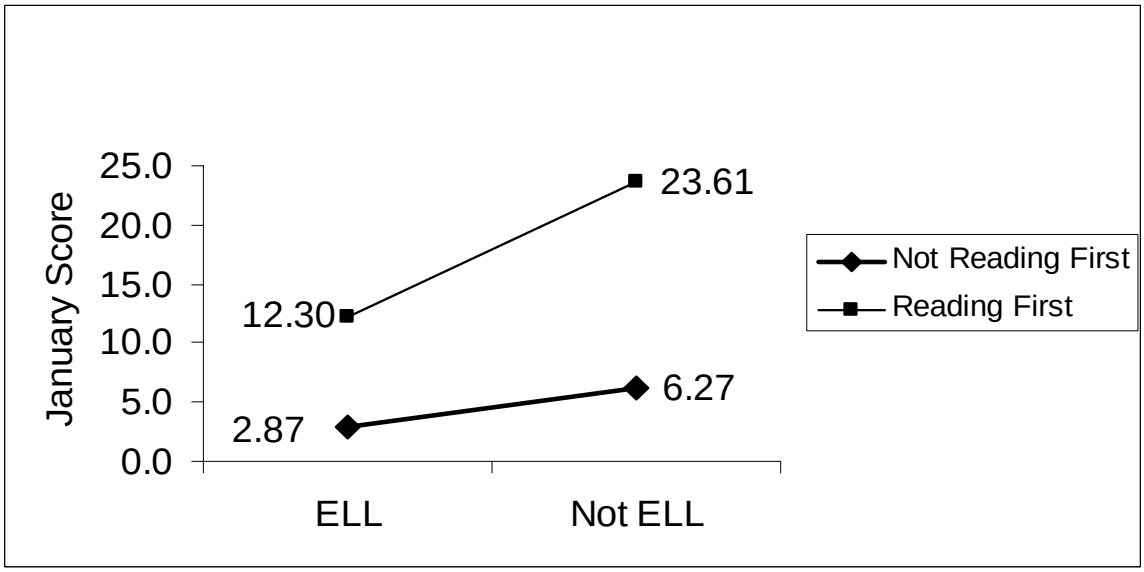

Figure 5e: Word Use Fluency for Reading First Versus Not Reading First ELL and Non-ELL Kindergarteners

The overall conclusion from these analyses is that all-day K improves reading readiness performance over half-day K, as measured by the DIBELS benchmarks. But Reading First improves performance even more than all-day K, with students in all-day K and a Reading First program performing the best. Furthermore, all-day K has the potential of bringing ELL students up to the performance level of non-ELL half-day students and Reading First brings the ELL

students beyond the level of non-ELL non-Reading First students. However, it should be noted that this comparison may favor Reading First inordinately due to the use of benchmarks specifically designed to measure the reading readiness focus and core outcomes of the Reading First program.

Part 2: Results of the March Mathematics Assessment Using the Kindergarten Student Profile

For the mathematics assessment, nine benchmarks on the Kindergarten Student Profile ("yellow card") were selected by the Elementary Mathematics Specialist:

1. Constructs multiple set combinations (numbers 3 through10)
2. Constructs equivalent forms of whole numbers 0 through 10 using manipulatives
3. Labels sets verbally (numbers 0 through 20)
4. Makes a set to represent a given number (numbers 0 through 20)
5. Names numerals (numbers 0 through 20)
6. Matches sets with numerals (numbers 0 through 20)
7. Models addition using manipulatives (numbers 0-10)
8. Models subtraction using manipulatives (numbers 0-10)
9. Solves word problems presented orally (addition or subtraction; numbers 0 through 9)

These benchmarks correspond to most of the Groups and Manipulates Objects, Number Sense, and Numerical Operations performance objectives from the *Arizona Academic Content Standard* for Kindergarten in mathematics.[1]

The school's Basic Skills Specialist or the student's teacher or classroom aide performed the assessments with the students from approximately March 7th - 25th. Students were marked as either "exhibiting" or "not exhibiting" the benchmark. Chi-square analyses were performed on the 135 total benchmark/level combinations to determine whether the percent of students exhibiting the benchmark/level combination was significantly different based on students' enrollment in an all or half-day kindergarten program, enrollment or not in the Reading First curriculum, ELL, free/reduced lunch status, and age. Tables 4a-4i show the attainment frequencies, along with the results of the chi-square analyses for each of the above

benchmark/level combinations. Table 5 tallies the number of significant differences seen for each main effect. Note that the effects of ELL, all-day K, and Reading First show the highest number of significantly different frequencies. Consequently, these three factors will be explored in more depth.

Table 4a: Percent Attainments of "Constructs Multiple Set Combinations" by All-day and Half-day Kindergarten Students

	% of Students Attaining			Other Main Effect Factors, Sig. Diff? (α=.05)				
Number	Half-Day K	All-Day K	Sig. Diff? (α=.05)	ReadFirst	Gender	ELL	FRLunch	Age
3	62.2%	82.2%	**Y**	**Y**	N	**Y**	N	N
4	48.7%	75.2%	**Y**	**Y**	N	**Y**	N	N
5	32.6%	57.3%	**Y**	**Y**	N	**Y**	N	N
6	19.7%	26.6%	N	**Y**	N	**Y**	N	N
7	14.2%	16.8%	N	**Y**	N	**Y**	N	N
8	11.1%	11.9%	N	**Y**	N	**Y**	N	N
9	10.8%	10.5%	N	**Y**	N	**Y**	N	N
10	10.8%	9.4%	N	**Y**	N	**Y**	**Y**	N

Interpretation: 62.2% of students attending half-day K were able to construct multiple set combinations of the number 3.

Table 4b: Percent Attainments of "Constructs Equivalent Forms of Whole Numbers Using Manipulatives" by All-day and Half-day Kindergarten Students

	% of Students Attaining			Other Main Effect Factors, Sig. Diff? (α=.05)				
Number	Half-Day K	All-Day K	Sig. Diff? (α=.05)	ReadFirst	Gender	ELL	FRLunch	Age
0	62.0%	78.0%	**Y**	**Y**	N	N	N	N
1	61.6%	81.8%	**Y**	**Y**	N	N	N	N
2	58.8%	83.6%	**Y**	**Y**	N	N	N	N
3	48.7%	83.2%	**Y**	**Y**	N	N	N	N
4	44.4%	80.4%	**Y**	**Y**	N	N	N	N
5	38.7%	76.2%	**Y**	**Y**	N	N	N	N
6	37.6%	72.0%	**Y**	**Y**	N	N	N	N
7	34.4%	69.2%	**Y**	**Y**	N	N	N	N
8	34.8%	66.4%	**Y**	**Y**	N	N	N	**Y**
9	32.3%	66.8%	**Y**	**Y**	N	N	N	**Y**
10	32.6%	66.8%	**Y**	**Y**	N	N	N	**Y**

Table 4c: Percent Attainments of "Labels Sets Verbally" by All-day and Half-day Kindergarten Students

	% of Students Attaining			Other Main Effect Factors, Sig. Diff? (α=.05)				
Number	Half-Day K	All-Day K	Sig. Diff? (α=.05)	ReadFirst	Gender	ELL	FRLunch	Age
0	95.3%	89.5%	**Y**	**Y**	N	**Y**	N	N
1	97.8%	92.5%	**Y**	N	N	**Y**	**Y**	N
2	97.5%	92.7%	**Y**	N	N	**Y**	**Y**	N
3	97.1%	93.7%	N	N	N	**Y**	**Y**	N
4	95.7%	92.7%	N	N	N	**Y**	N	N
5	95.7%	91.3%	**Y**	N	N	**Y**	N	N
6	93.5%	92.7%	N	N	N	**Y**	**Y**	N
7	91.8%	89.2%	N	N	N	**Y**	N	N
8	91.4%	90.9%	N	N	N	**Y**	N	N
9	90.0%	90.6%	N	N	N	**Y**	N	N
10	91.0%	89.5%	N	N	N	**Y**	N	N
11	82.8%	82.1%	N	N	N	**Y**	N	N
12	77.4%	79.3%	N	N	N	**Y**	N	**Y**
13	77.4%	77.6%	N	N	N	**Y**	N	N
14	74.9%	77.6%	N	N	N	**Y**	N	N
15	69.5%	72.4%	N	N	N	**Y**	N	**Y**
16	69.5%	75.2%	N	N	N	**Y**	N	**Y**
17	68.5%	73.4%	N	N	N	**Y**	N	N
18	67.7%	73.1%	N	N	N	**Y**	N	N
19	67.0%	72.4%	N	N	N	**Y**	N	N
20	66.7%	72.0%	N	N	N	**Y**	N	**Y**

Table 4d: Percent Attainments of "Makes a Set to Represent a Given Number" by All-day and Half-day Kindergarten Students

	% of Students Attaining			Other Main Effect Factors, Sig. Diff? (α=.05)				
Number	Half-Day K	All-Day K	Sig. Diff? (α=.05)	ReadFirst	Gender	ELL	FRLunch	Age
0	95.7%	90.9%	**Y**	N	**Y**	**Y**	N	N
1	98.2%	95.5%	N	N	N	**Y**	N	N
2	97.1%	95.1%	N	N	N	**Y**	N	N
3	95.7%	95.5%	N	N	**Y**	**Y**	N	N
4	95.0%	94.4%	N	N	N	**Y**	N	N
5	95.0%	97.9%	N	N	N	**Y**	N	N
6	91.8%	95.5%	N	N	N	N	N	N
7	90.3%	95.8%	**Y**	N	N	**Y**	N	N
8	89.6%	94.8%	**Y**	N	N	N	N	N
9	88.2%	93.7%	**Y**	N	N	N	N	N
10	87.5%	92.0%	N	N	N	**Y**	N	**Y**
11	78.5%	79.4%	N	N	N	**Y**	N	**Y**
12	75.3%	78.7%	N	N	N	**Y**	N	**Y**
13	74.5%	73.1%	N	N	N	**Y**	N	**Y**
14	72.4%	74.5%	N	N	N	**Y**	N	**Y**
15	67.7%	73.4%	N	**Y**	N	**Y**	N	**Y**
16	65.9%	68.5%	N	N	N	**Y**	N	**Y**
17	66.7%	70.6%	N	N	N	**Y**	N	**Y**
18	63.8%	68.5%	N	N	N	**Y**	N	**Y**
19	64.2%	68.5%	N	N	N	**Y**	N	**Y**
20	63.1%	67.5%	N	N	N	**Y**	N	**Y**

Table 4e: Percent Attainments of "Names Numerals" by All-day and Half-day Kindergarten Students

	% of Students Attaining			Other Main Effect Factors, Sig. Diff? (α=.05)				
Number	Half-Day K	All-Day K	Sig. Diff? (α=.05)	ReadFirst	Gender	ELL	FRLunch	Age
0	96.8%	96.2%	N	N	N	**Y**	N	N
1	99.6%	99.7%	N	N	N	N	N	N
2	97.1%	100.0%	**Y**	N	**Y**	N	N	N
3	96.4%	99.3%	**Y**	N	**Y**	N	N	N
4	97.5%	99.3%	N	N	N	**Y**	N	N
5	97.1%	97.2%	N	N	N	**Y**	N	N
6	93.2%	95.5%	N	N	N	**Y**	N	N
7	91.4%	92.3%	N	N	N	**Y**	N	N
8	89.6%	94.4%	**Y**	N	N	N	N	N
9	85.7%	90.2%	N	N	N	**Y**	N	N
10	88.9%	93.7%	**Y**	N	N	N	N	N
11	81.7%	88.1%	**Y**	N	N	N	N	N
12	60.2%	73.8%	**Y**	N	N	N	N	**Y**
13	62.7%	81.1%	**Y**	**Y**	N	**Y**	N	N
14	74.9%	80.4%	N	N	N	**Y**	N	**Y**
15	64.9%	75.5%	**Y**	N	N	**Y**	N	**Y**
16	73.1%	81.5%	**Y**	N	N	**Y**	N	**Y**
17	74.9%	81.8%	**Y**	N	N	**Y**	N	**Y**
18	71.0%	81.5%	**Y**	N	N	**Y**	N	**Y**
19	66.3%	77.6%	**Y**	N	N	**Y**	N	**Y**
20	63.4%	75.2%	**Y**	N	N	**Y**	N	**Y**

Table 4f: Percent Attainments of "Matches Sets With Numerals" by All-day and Half-day Kindergarten Students

	% of Students Attaining			Other Main Effect Factors, Sig. Diff? (α=.05)				
Number	Half-Day K	All-Day K	Sig. Diff? (α=.05)	ReadFirst	Gender	ELL	FRLunch	Age
0	95.7%	90.9%	**Y**	N	**Y**	**Y**	N	N
1	97.8%	96.2%	N	N	**Y**	**Y**	N	N
2	96.1%	95.8%	N	N	**Y**	**Y**	N	N
3	95.0%	95.5%	N	N	**Y**	**Y**	N	N
4	95.0%	95.8%	N	**Y**	**Y**	**Y**	N	N
5	94.6%	94.1%	N	N	**Y**	**Y**	N	N
6	90.7%	93.7%	N	N	N	**Y**	N	N
7	89.2%	92.0%	N	**Y**	N	**Y**	N	N
8	89.2%	93.7%	N	N	N	N	N	N
9	87.1%	94.1%	**Y**	N	N	**Y**	N	N
10	88.2%	95.5%	**Y**	**Y**	N	N	N	**Y**
11	76.0%	82.2%	N	N	N	N	**Y**	**Y**
12	66.7%	79.7%	**Y**	N	N	N	N	**Y**
13	68.5%	77.3%	**Y**	N	N	N	N	**Y**
14	69.9%	75.5%	N	N	N	N	N	**Y**
15	62.4%	72.7%	**Y**	N	N	N	N	**Y**
16	62.7%	71.0%	**Y**	N	N	**Y**	N	**Y**
17	63.1%	71.0%	**Y**	N	N	**Y**	N	**Y**
18	63.4%	69.6%	N	N	N	N	N	**Y**
19	60.2%	66.8%	N	N	N	**Y**	N	**Y**
20	57.7%	71.7%	**Y**	N	N	**Y**	N	**Y**

Table 4g: Percent Attainments of "Models Addition Using Manipulatives" by All-day and Half-day Kindergarten Students

	% of Students Attaining			Other Main Effect Factors, Sig. Diff? (α=.05)				
Number	Half-Day K	All-Day K	Sig. Diff? (α=.05)	ReadFirst	Gender	ELL	FRLunch	Age
0	60.1%	75.2%	**Y**	**Y**	N	**Y**	N	N
1	58.4%	83.2%	**Y**	**Y**	N	**Y**	N	N
2	62.4%	85.0%	**Y**	**Y**	N	**Y**	N	N
3	59.9%	83.6%	**Y**	**Y**	N	**Y**	N	N
4	57.0%	79.4%	**Y**	**Y**	N	**Y**	N	N
5	45.9%	76.9%	**Y**	**Y**	N	**Y**	N	N
6	44.1%	64.7%	**Y**	**Y**	N	**Y**	N	N
7	41.9%	59.4%	**Y**	**Y**	N	**Y**	N	N
8	40.9%	55.2%	**Y**	**Y**	N	**Y**	N	N
9	37.6%	51.4%	**Y**	N	N	**Y**	N	N
10	38.0%	48.3%	**Y**	N	N	**Y**	N	N

Table 4h: Percent Attainments of "Models Subtraction Using Manipulatives" by All-day and Half-day Kindergarten Students

	% of Students Attaining			Other Main Effect Factors, Sig. Diff? (α=.05)				
Number	Half-Day K	All-Day K	Sig. Diff? (α=.05)	ReadFirst	Gender	ELL	FRLunch	Age
0	45.9%	40.9%	N	**Y**	N	**Y**	**Y**	N
1	44.1%	47.9%	N	**Y**	N	N	N	N
2	47.7%	46.9%	N	**Y**	N	N	N	N
3	44.1%	46.2%	N	**Y**	N	N	N	N
4	42.1%	45.5%	N	**Y**	N	N	N	N
5	37.3%	44.1%	N	**Y**	N	N	N	N
6	33.7%	37.4%	N	**Y**	N	N	N	N
7	31.2%	28.0%	N	**Y**	N	**Y**	**Y**	N
8	30.1%	28.3%	N	**Y**	N	**Y**	**Y**	N
9	30.8%	27.3%	N	**Y**	N	**Y**	**Y**	N
10	29.4%	24.8%	N	**Y**	N	**Y**	**Y**	N

Table 4i: Percent Attainments of "Solves Word Problems Presented Orally; Addition or Subtraction" by All-day and Half-day Kindergarten Students

	% of Students Attaining			Other Main Effect Factors, Sig. Diff? (α=.05)				
Number	Half-Day K	All-Day K	Sig. Diff? (α=.05)	ReadFirst	Gender	ELL	FRLunch	Age
0	34.4%	61.2%	**Y**	**Y**	N	**Y**	N	N
1	30.1%	67.8%	**Y**	**Y**	N	**Y**	N	N
2	35.5%	67.8%	**Y**	**Y**	N	**Y**	N	N
3	36.6%	65.4%	**Y**	**Y**	N	N	N	N
4	29.4%	63.3%	**Y**	**Y**	N	**Y**	N	N
5	29.0%	58.7%	**Y**	**Y**	N	**Y**	N	N
6	25.4%	53.5%	**Y**	**Y**	N	**Y**	N	N
7	26.2%	38.8%	**Y**	N	N	**Y**	**Y**	N
8	25.1%	38.1%	**Y**	N	N	**Y**	**Y**	N
9	23.7%	37.8%	**Y**	N	N	**Y**	**Y**	N

Table 5: Number of Significantly Different Percent Attainments of Mathematical Benchmark/Level Skill Combinations for Kindergarten Students

Main Effect	**Number of Significantly Different Combinations**	**Percent of Total Benchmark/Level Combinations (N=135)**
ELL	99	73%
All-day K	65	48%
Reading First	52	39%
Age	37	27%
FRLunch	14	10%
Gender	10	7%

Reviewing Tables 4a-4i, note that all-day K students showed significantly higher attainment frequencies than half-day K students for 42.3% of the benchmark/level combinations, statistically equivalent attainment for 53.3% of the combinations, along with significantly lower attainment for 4.4% of the combinations. By benchmark, all-day K generally yielded significantly higher attainment percentages for mathematics benchmarks # 2 *("Constructs Equivalent Forms of Whole Numbers Using Manipulatives"*), 5 (*"Names Numerals"*), 7 (*"Models Addition Using Manipulatives"*) and 9 (*"Solves Word Problems Presented Orally; Addition or Subtraction"*).

Tables 6a-6i show that ELL students exhibit lower frequencies of attainment in all 135 benchmark/level combinations than non-ELL students, with significantly lower frequencies in benchmarks #1 (*"Constructs Multiple Set Combinations"),* 3 *("Labels Sets Verbally"*), 4 *("Makes a Set to Represent a Given Number")* , 5 (*"Names Numerals"*), 6 *("Matches Sets With Numerals"),* 7 (*"Models Addition Using Manipulatives"*) and 9 *("Solves Word Problems Presented Orally; Addition or Subtraction").* However, when the students are categorized by all-day versus half-day K program, the all-day K ELL students show significantly higher attainment percentages than the half-day K ELL students for 45.1% of the benchmark/level combinations, statistically equivalent attainment for 47.5% of the combinations, and significantly lower attainment for 7.4% of the combinations. Comparing these results to the 28.1%, 69.7% and 2.2% for significantly higher, statistically equivalent and significantly lower attainment percentages, respectively, the conclusion can be made that all-day K impacts ELL students more favorably than non-ELL students. Lastly, in terms of the magnitude of the positive effect of all-day K on ELL students, note that *nearly one-third* (32.5%) of the attainment percentages of the all-day K ELL students either *meets or exceeds* the attainment percentages of half-day non-ELL students, suggesting, as with the January reading assessment, that all-day K "catches the ELL student up" to the attainment levels of the non-ELL student without the benefit of all-day K. For those benchmark/level combinations for which the all-day K ELL students do not meet or exceed the half-day K, non-ELL student attainment percentages, these ELL students are at 44% to 99% of the non-ELL attainment levels.

Table 6a: Percent Attainments of "Constructs Multiple Set Combinations" for ELL and Non-ELL Kindergarten Students Split Out by All-Day and Half-Day Program

	% Attainment			ELL % Attainment			Non-ELL % Attainment		
Number	ELL	Non-ELL	Sig. Diff? (α=.05)	Half-Day K	All-Day K	Sig. Diff? (α=.05)	Half-Day K	All-Day K	Sig. Diff? (α=.05)
3	67.0%	80.0%	**Y**	53.1%	80.0%	**Y**	74.8%	85.3%	**Y**
4	55.8%	71.1%	**Y**	41.3%	69.4%	**Y**	58.8%	83.6%	**Y**
5	39.7%	52.8%	**Y**	23.8%	54.7%	**Y**	44.5%	61.2%	**Y**
6	19.1%	28.9%	**Y**	11.3%	26.5%	**Y**	31.1%	26.7%	N
7	11.8%	20.9%	**Y**	6.3%	17.1%	**Y**	25.2%	16.4%	N
8	7.6%	17.0%	**Y**	4.4%	10.6%	**Y**	20.2%	13.8%	N
9	7.6%	14.9%	**Y**	5.6%	9.4%	N	17.6%	12.1%	N
10	6.7%	14.9%	**Y**	5.0%	8.2%	N	18.5%	11.2%	N

Interpretation: 67.0% of ELL students were able to construct multiple set combinations of the number 3, whereas, 80.0% of non-ELL students. In addition, of the ELL students, 53.1% of the half-day K students exhibited the trait, while 80.0% of the all-day K students exhibited the trait.

Table 6b: Percent Attainments of "Constructs Equivalent Forms of Whole Numbers Using Manipulatives" for ELL and Non-ELL Kindergarten Students Split Out by All-Day and Half-Day Program

	% Attainment			ELL % Attainment			Non-ELL % Attainment		
Number	ELL	Non-ELL	Sig. Diff? (α=.05)	Half-Day K	All-Day K	Sig. Diff? (α=.05)	Half-Day K	All-Day K	Sig. Diff? (α=.05)
0	67.3%	74.0%	N	58.8%	75.3%	**Y**	66.4%	81.9%	**Y**
1	70.0%	74.5%	N	59.4%	80.0%	**Y**	64.7%	84.5%	**Y**
2	70.3%	72.8%	N	56.9%	82.9%	**Y**	61.3%	84.5%	**Y**
3	66.1%	66.4%	N	47.5%	83.5%	**Y**	50.4%	82.8%	**Y**
4	59.7%	66.8%	N	39.4%	78.8%	**Y**	51.3%	82.8%	**Y**
5	55.5%	60.9%	N	35.0%	74.7%	**Y**	43.7%	78.4%	**Y**
6	53.3%	57.4%	N	34.4%	71.2%	**Y**	42.0%	73.3%	**Y**
7	51.2%	53.2%	N	32.5%	68.8%	**Y**	37.0%	69.8%	**Y**
8	48.8%	53.6%	N	31.9%	64.7%	**Y**	38.7%	69.0%	**Y**
9	49.1%	50.6%	N	31.3%	65.9%	**Y**	33.6%	68.1%	**Y**
10	48.5%	51.9%	N	30.0%	65.9%	**Y**	36.1%	68.1%	**Y**

Table 6c: Percent Attainments of "Labels Sets Verbally" for ELL and Non-ELL Kindergarten Students Split Out by All-Day and Half-Day Program

	% Attainment			ELL % Attainment			Non-ELL % Attainment		
Number	ELL	Non-ELL	Sig. Diff? (α=.05)	Half-Day K	All-Day K	Sig. Diff? (α=.05)	Half-Day K	All-Day K	Sig. Diff? (α=.05)
0	88.8%	97.4%	**Y**	93.1%	84.7%	**Y**	98.3%	96.6%	N
1	93.3%	97.9%	**Y**	97.5%	89.2%	**Y**	98.3%	97.4%	N
2	92.7%	98.3%	**Y**	96.3%	89.4%	**Y**	99.2%	97.4%	N
3	93.0%	98.7%	**Y**	95.6%	90.6%	N	99.2%	98.3%	N
4	91.5%	97.9%	**Y**	93.8%	89.4%	N	98.3%	97.4%	N
5	90.6%	97.4%	**Y**	93.8%	87.6%	N	98.3%	96.6%	N
6	90.6%	96.6%	**Y**	91.9%	89.4%	N	95.8%	97.4%	N
7	87.6%	94.5%	**Y**	90.0%	85.3%	N	94.1%	94.8%	N
8	87.9%	95.7%	**Y**	88.8%	87.1%	N	95.0%	96.6%	N
9	87.3%	94.5%	**Y**	87.5%	87.1%	N	93.3%	95.7%	N
10	87.3%	94.5%	**Y**	89.4%	85.3%	N	93.3%	95.7%	N
11	78.7%	87.7%	**Y**	80.0%	77.5%	N	86.6%	88.8%	N
12	75.1%	83.0%	**Y**	73.8%	76.3%	N	82.4%	83.6%	N
13	73.3%	83.4%	**Y**	73.8%	72.9%	N	82.4%	84.5%	N
14	72.4%	81.7%	**Y**	71.3%	73.5%	N	79.8%	83.6%	N
15	66.1%	77.9%	**Y**	66.9%	65.3%	N	73.1%	82.8%	N
16	67.9%	78.7%	**Y**	66.9%	68.8%	N	73.1%	84.5%	**Y**
17	66.1%	77.9%	**Y**	65.6%	66.5%	N	72.3%	83.6%	**Y**
18	64.5%	78.7%	**Y**	63.8%	65.3%	N	73.1%	84.5%	**Y**
19	63.9%	77.9%	**Y**	63.1%	64.7%	N	72.3%	83.6%	**Y**
20	63.6%	77.4%	**Y**	62.5%	64.7%	N	72.3%	82.8%	N

Table 6d: Percent Attainments of "Makes a Set to Represent a Given Number" for ELL and Non-ELL Kindergarten Students Split Out by All-Day and Half-Day Program

	% Attainment			ELL % Attainment			Non-ELL % Attainment		
Number	ELL	Non-ELL	Sig. Diff? (α=.05)	Half-Day K	All-Day K	Sig. Diff? (α=.05)	Half-Day K	All-Day K	Sig. Diff? (α=.05)
0	90.3%	97.4%	**Y**	93.8%	87.1%	**Y**	98.3%	96.6%	N
1	94.8%	99.6%	**Y**	96.9%	92.9%	N	100.0%	99.1%	N
2	94.2%	98.7%	**Y**	95.6%	92.9%	N	99.2%	98.3%	N
3	93.3%	98.7%	**Y**	93.8%	92.9%	N	98.3%	99.1%	N
4	91.8%	98.7%	**Y**	91.9%	91.8%	N	99.2%	98.3%	N
5	94.8%	98.7%	**Y**	92.5%	97.1%	N	98.3%	99.1%	N
6	92.7%	94.9%	N	89.4%	95.9%	**Y**	95.0%	94.8%	N
7	91.2%	95.7%	**Y**	88.1%	94.1%	**Y**	93.3%	98.3%	N
8	90.9%	94.0%	N	88.1%	93.5%	**Y**	91.6%	96.6%	N
9	89.1%	93.6%	N	86.9%	91.2%	**Y**	89.9%	97.4%	**Y**
10	87.0%	93.6%	**Y**	85.6%	88.2%	N	89.9%	97.4%	**Y**
11	77.9%	80.4%	N	78.1%	77.6%	**Y**	79.0%	81.9%	N
12	73.3%	82.1%	**Y**	72.5%	74.1%	**Y**	79.0%	85.3%	N
13	69.4%	79.9%	**Y**	71.3%	67.6%	**Y**	78.8%	81.0%	N
14	68.5%	80.4%	**Y**	68.1%	68.8%	**Y**	78.2%	82.8%	N
15	64.5%	79.1%	**Y**	63.8%	65.3%	**Y**	73.1%	85.3%	**Y**
16	63.0%	73.2%	**Y**	63.1%	62.9%	**Y**	69.7%	76.7%	N
17	63.3%	76.2%	**Y**	62.5%	64.1%	**Y**	72.3%	80.2%	N
18	60.0%	74.9%	**Y**	58.1%	61.8%	**Y**	71.4%	78.4%	N
19	61.2%	73.6%	**Y**	60.0%	62.4%	**Y**	69.7%	77.6%	N
20	59.1%	74.0%	**Y**	58.8%	59.4%	**Y**	68.9%	79.3%	N

Table 6e: Percent Attainments of "Names Numerals" for ELL and Non-ELL Kindergarten Students Split Out by All-Day and Half-Day Program

	% Attainment			ELL % Attainment			Non-ELL % Attainment		
Number	ELL	Non-ELL	Sig. Diff? (α=.05)	Half-Day K	All-Day K	Sig. Diff? (α=.05)	Half-Day K	All-Day K	Sig. Diff? (α=.05)
0	94.5%	99.1%	**Y**	95.0%	94.1%	N	99.2%	99.1%	N
1	99.4%	100.0%	N	99.4%	99.4%	N	100.0%	100.0%	N
2	97.9%	99.6%	N	95.6%	100.0%	**Y**	99.2%	100.0%	N
3	97.0%	99.1%	N	95.0%	98.8%	N	98.3%	100.0%	N
4	97.3%	100.0%	**Y**	95.6%	98.8%	N	100.0%	100.0%	N
5	95.5%	99.6%	**Y**	95.0%	95.9%	N	100.0%	99.1%	N
6	92.1%	97.4%	**Y**	91.3%	92.9%	N	95.8%	99.1%	N
7	89.1%	95.7%	**Y**	88.8%	89.4%	N	95.0%	96.6%	N
8	90.3%	94.5%	N	87.5%	92.9%	N	92.4%	96.6%	N
9	84.2%	93.2%	**Y**	81.9%	86.5%	N	90.8%	95.7%	N
10	90.3%	92.8%	N	88.8%	91.8%	N	89.1%	96.6%	N
11	82.7%	88.1%	N	78.8%	86.5%	N	85.7%	90.5%	N
12	64.2%	71.1%	N	56.3%	71.8%	**Y**	65.5%	76.7%	N
13	67.5%	78.3%	**Y**	58.1%	76.3%	**Y**	68.9%	87.9%	**Y**
14	72.1%	85.5%	**Y**	69.4%	74.7%	N	82.4%	88.8%	N
15	66.1%	76.2%	**Y**	61.9%	70.0%	N	68.9%	83.6%	**Y**
16	73.9%	82.1%	**Y**	70.0%	77.6%	N	77.3%	87.1%	N
17	73.9%	84.7%	**Y**	69.4%	78.2%	N	82.4%	87.1%	N
18	71.8%	82.6%	**Y**	65.6%	77.6%	**Y**	78.2%	87.1%	N
19	67.0%	79.1%	**Y**	58.1%	75.3%	**Y**	77.3%	81.0%	N
20	63.9%	77.0%	**Y**	56.3%	71.2%	**Y**	73.1%	81.0%	N

Table 6f: Percent Attainments of "Matches Sets With Numerals" for ELL and Non-ELL Kindergarten Students Split Out by All-Day and Half-Day Program

	% Attainment			ELL % Attainment			Non-ELL % Attainment		
Number	ELL	Non-ELL	Sig. Diff? (α=.05)	Half-Day K	All-Day K	Sig. Diff? (α=.05)	Half-Day K	All-Day K	Sig. Diff? (α=.05)
0	89.4%	98.7%	**Y**	93.1%	85.9%	**Y**	99.2%	98.3%	N
1	95.5%	99.1%	**Y**	96.9%	94.1%	N	99.2%	99.1%	N
2	93.6%	99.1%	**Y**	93.8%	93.5%	N	99.2%	99.1%	N
3	93.0%	98.3%	**Y**	92.5%	93.5%	N	98.3%	98.3%	N
4	93.0%	98.7%	**Y**	91.9%	94.1%	N	99.2%	98.3%	N
5	91.8%	97.9%	**Y**	91.9%	91.8%	N	98.3%	97.4%	N
6	90.0%	95.3%	**Y**	88.1%	91.8%	N	94.1%	96.6%	N
7	87.9%	94.4%	**Y**	86.9%	88.8%	N	92.4%	96.6%	N
8	90.6%	92.8%	N	87.5%	93.5%	N	91.6%	94.0%	N
9	88.5%	93.6%	**Y**	85.0%	91.8%	N	89.9%	97.4%	**Y**
10	90.3%	94.0%	N	86.3%	94.1%	**Y**	90.8%	97.4%	**Y**
11	79.1%	79.1%	N	76.3%	81.8%	N	75.6%	82.8%	N
12	70.9%	76.6%	N	62.5%	78.8%	**Y**	72.3%	81.0%	N
13	71.2%	75.3%	N	66.3%	75.9%	N	71.4%	79.3%	N
14	70.6%	75.7%	N	67.5%	73.5%	N	73.1%	78.4%	N
15	64.5%	71.9%	N	59.4%	69.4%	N	66.4%	77.6%	N
16	63.0%	72.3%	**Y**	60.0%	65.9%	N	66.4%	78.4%	**Y**
17	62.7%	73.2%	**Y**	59.4%	65.9%	N	68.1%	78.4%	N
18	63.3%	71.1%	N	61.3%	65.3%	N	66.4%	75.9%	N
19	59.1%	69.8%	**Y**	56.3%	61.8%	N	65.5%	74.1%	N
20	60.3%	71.1%	**Y**	53.1%	67.1%	**Y**	63.9%	78.4%	**Y**

Table 6g: Percent Attainments of "Models Addition Using Manipulatives" for ELL and Non-ELL Kindergarten Students Split Out by All-Day and Half-Day Program

	% Attainment			ELL % Attainment			Non-ELL % Attainment		
Number	ELL	Non-ELL	Sig. Diff? (α=.05)	Half-Day K	All-Day K	Sig. Diff? (α=.05)	Half-Day K	All-Day K	Sig. Diff? (α=.05)
0	59.4%	79.1%	**Y**	48.1%	70.0%	**Y**	75.4%	82.8%	N
1	65.8%	78.3%	**Y**	48.8%	81.8%	**Y**	71.4%	85.3%	**Y**
2	68.8%	80.9%	**Y**	52.5%	84.1%	**Y**	75.6%	86.2%	**Y**
3	67.3%	78.3%	**Y**	50.0%	83.5%	**Y**	73.1%	83.6%	N
4	62.4%	76.6%	**Y**	45.0%	78.8%	**Y**	73.1%	80.2%	N
5	56.4%	68.9%	**Y**	35.0%	76.5%	**Y**	60.5%	77.6%	**Y**
6	49.4%	61.7%	**Y**	34.4%	63.5%	**Y**	57.1%	66.4%	N
7	44.5%	59.6%	**Y**	33.1%	55.3%	**Y**	53.8%	65.5%	N
8	42.7%	55.7%	**Y**	32.5%	52.4%	**Y**	52.1%	59.5%	N
9	38.2%	53.6%	**Y**	28.8%	47.1%	**Y**	49.6%	57.8%	N
10	36.4%	52.8%	**Y**	28.8%	43.5%	**Y**	50.4%	55.2%	N

Table 6h: Percent Attainments of "Models Subtraction Using Manipulatives" for ELL and Non-ELL Kindergarten Students Split Out by All-Day and Half-Day Program

	% Attainment			ELL % Attainment			Non-ELL % Attainment		
Number	ELL	Non-ELL	Sig. Diff? (α=.05)	Half-Day K	All-Day K	Sig. Diff? (α=.05)	Half-Day K (Roosevelt)	All-Day K	Sig. Diff? (α=.05)
0	37.6%	51.5%	**Y**	36.3%	38.8%	N	58.8%	44.0%	**Y**
1	42.7%	50.6%	N	35.0%	50.0%	**Y**	56.3%	44.8%	N
2	43.9%	51.9%	N	38.8%	48.8%	N	59.7%	44.0%	**Y**
3	42.4%	48.9%	N	35.6%	48.8%	**Y**	55.5%	42.2%	**Y**
4	41.9%	46.4%	N	34.6%	48.8%	**Y**	52.1%	40.5%	N
5	38.5%	43.8%	N	30.0%	46.5%	**Y**	47.1%	40.5%	N
6	33.9%	37.9%	N	26.9%	40.6%	**Y**	42.9%	32.8%	N
7	25.8%	34.9%	**Y**	25.0%	26.5%	N	39.5%	30.2%	N
8	25.5%	34.5%	**Y**	23.8%	27.1%	N	38.7%	30.2%	N
9	25.2%	34.5%	**Y**	23.8%	26.5%	N	40.3%	28.4%	N
10	22.1%	34.0%	**Y**	21.9%	22.4%	N	39.5%	28.4%	N

Table 6i: Percent Attainments of "Solves Word Problems Presented Orally; Addition or Subtraction" for ELL and Non-ELL Kindergarten Students Split Out by All-Day and Half-Day Program

	% Attainment			ELL % Attainment			Non-ELL % Attainment		
Number	ELL	Non-ELL	Sig. Diff? (α=.05)	Half-Day K	All-Day K	Sig. Diff? (α=.05)	Half-Day K	All-Day K	Sig. Diff? (α=.05)
0	42.7%	55.3%	**Y**	27.5%	57.1%	**Y**	43.7%	67.2%	**Y**
1	45.2%	54.9%	**Y**	23.1%	65.9%	**Y**	39.5%	70.7%	**Y**
2	48.2%	57.0%	**Y**	27.5%	67.6%	**Y**	46.2%	68.1%	**Y**
3	48.2%	55.3%	N	30.0%	65.3%	**Y**	45.4%	65.5%	**Y**
4	42.1%	52.8%	**Y**	20.6%	62.4%	**Y**	41.2%	64.7%	**Y**
5	39.7%	50.2%	**Y**	21.3%	57.1%	**Y**	39.5%	61.2%	**Y**
6	34.8%	46.4%	**Y**	17.5%	51.2%	**Y**	36.1%	56.9%	**Y**
7	25.2%	43.0%	**Y**	18.8%	31.2%	**Y**	36.1%	50.0%	**Y**
8	24.8%	41.3%	**Y**	17.5%	31.8%	**Y**	35.3%	47.4%	N
9	23.3%	41.3%	**Y**	15.6%	30.6%	**Y**	34.5%	48.3%	**Y**

The Reading First students scored significantly higher in 37.2% of the benchmark/level combinations, statistically equivalent attainment for 62.1% of the combinations, and significantly lower attainment for 0.7% of the combinations, as shown in Tables 4a-4i. Reading First students generally showed significantly higher attainment percentages for the same benchmarks as the all-day kindergarteners, plus benchmark #1 (*"Constructs Multiple Set Combinations"*) and 8 (*"Models Subtraction Using Manipulatives"*), but not #5 (*"Names Numerals"*). This shows that Reading First, with its focus on reading readiness skills, has a lower (but not nonexistent) impact on mathematics proficiencies than all-day K.

Lastly, age showed significantly different for benchmarks #4 (*"Makes a Set to Represent a Given Number"*), 5 *("Names Numerals")* and 6 (*"Matches Sets With Numerals"*), with older students showing higher attainment levels than younger students, especially at the number levels 10 and higher. Gender and free & reduced lunch status effects showed no patterns of significant differences.

Part 3: Results of the May Reading Assessment Using the MPS First Grade Reading Inventory

For the end-of-kindergarten-year reading assessment, the school's Basic Skills Specialist, or the student's teacher or classroom aide administered Part 1 of the MPS First Grade Reading Inventory (MPS-FGRI) to the selected students within the May 2nd to May 13th time interval. Four subcomponent scores of ***initial letter sounds***, ***final sounds***, ***alphabet dictation*** and ***blending***, plus the ***total score*** from the inventory were used as dependent variables in ten analysis of variance models, two models for each dependent variable, were conducted. As with the DIBELS general model, the MPS-FGRI general model structure was:

dependent variable = set of main independent variables (ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE) with or without two-way interaction effects with all-day/half-day K variable

Specifically, the MPS-FGRI ANOVA models can be found in Appendix A.

After performing the ten ANOVAs, it was discovered that the mean performance of all-day kindergarten students was significantly higher than half-day kindergarten students and that students in the Reading First curriculum scored significantly higher than the non-Reading First students in all ten of the analyses. Table 7 summarizes these results.

Table 7
Significant Factors Using Analysis of Variance of MPS-FGRI Scores (α=0.05)

Dependent Variable	Main and Interaction Effects Models (significance)	Main Effects Only Models (significance)
Initial Letter Sounds	GENDER (0.007) ALLDAY*READFIRST (0.010) AGE (0.022) ELL (0.038)	ALLDAY (0.000) READFIRST (0.002) GENDER (0.010) AGE (0.024) ELL (0.034)
Final Sounds	ALLDAY (0.000) READFIRST (0.000) ELL (0.008) GENDER (0.023) AGE (0.042)	ALLDAY (0.000) READFIRST (0.000) ELL (0.005) GENDER (0.032)
Alphabetic Dictation	ALLDAY*READFIRST (0.005) ALLDAY*GENDER (0.029)	ALLDAY (0.000) READFIRST (0.000) GENDER (0.006) ELL (0.047)
Blending	ALLDAY (0.000) ELL (0.000) READFIRST (0.000) AGE (0.006) GENDER (0.021)	ALLDAY (0.000) ELL (0.000) READFIRST (0.000) AGE (0.010) GENDER (0.030)
Total Score-Part 1	ELL (0.001) GENDER (0.001) ALLDAY*READFIRST (0.004) AGE (0.021)	ALLDAY (0.000) READFIRST (0.000) ELL (0.001) GENDER (0.003) AGE (0.041)

The mean performances of all-day versus half-day kindergarten students for each MPS-FGRI subcomponent and its total score, are shown in Figures 6a-6e. Mean performances of Reading First versus non-Reading First kindergarten students are shown in Figures 7a-7e, with ELL and non-ELL student means in Figures 8a-8e. Appendix B contains the graphs of the means of the other factors (age, free & reduced lunch status and gender) and interactions found to be significant. All-day K, Reading First and non-ELL mean scores prove to be the highest.

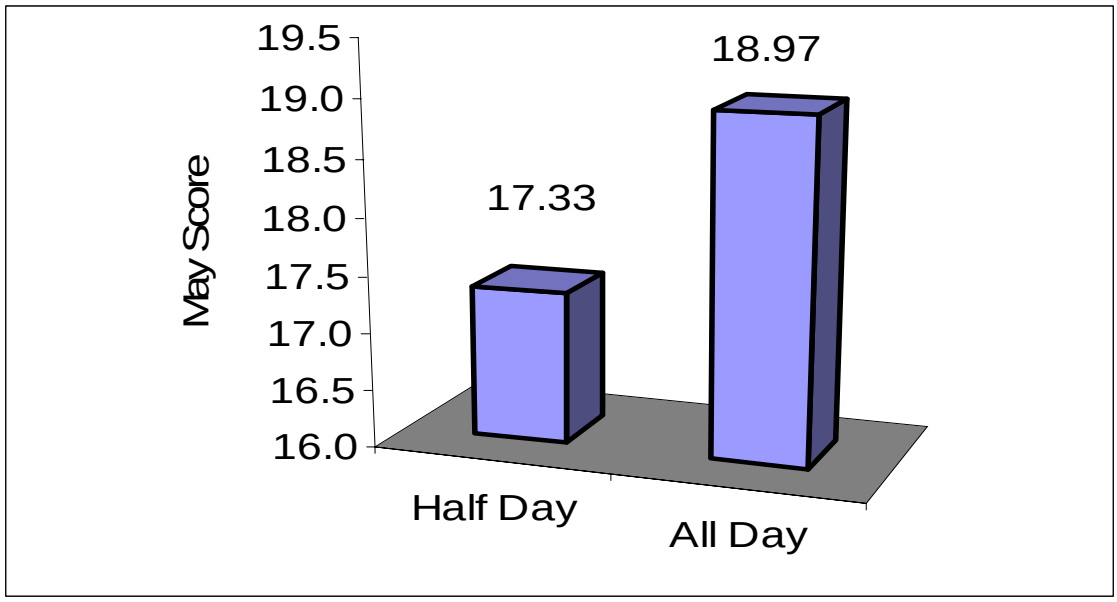

Figure 6a: Mean Initial Letter Sounds Scores for All-Day Versus Half-Day Kindergarteners

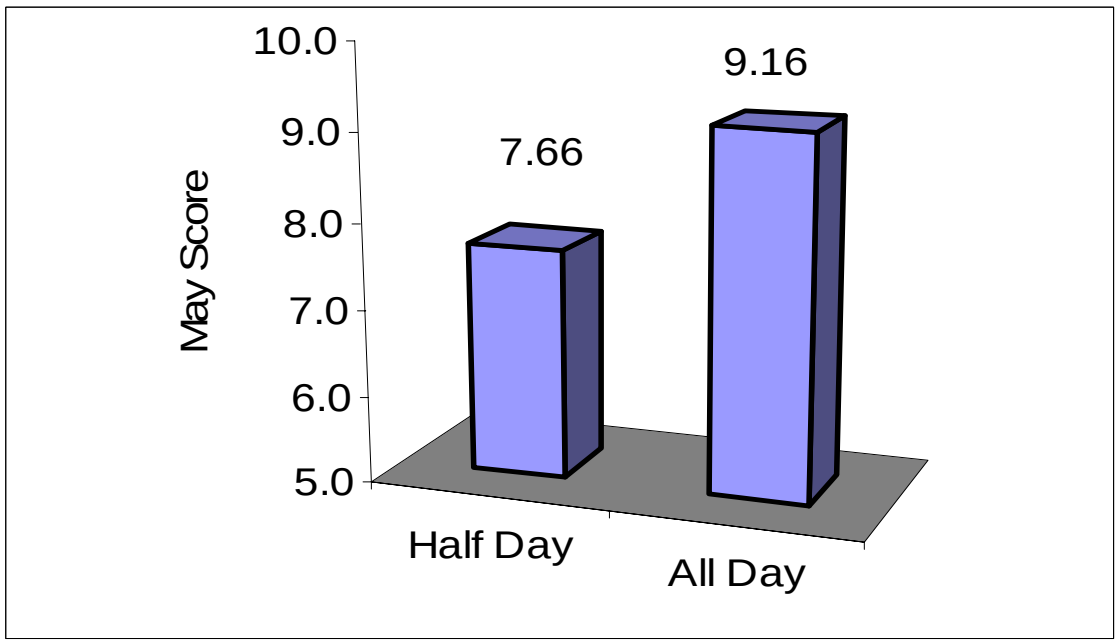

Figure 6b: Mean Final Sounds Scores for All-Day Versus Half-Day Kindergarteners

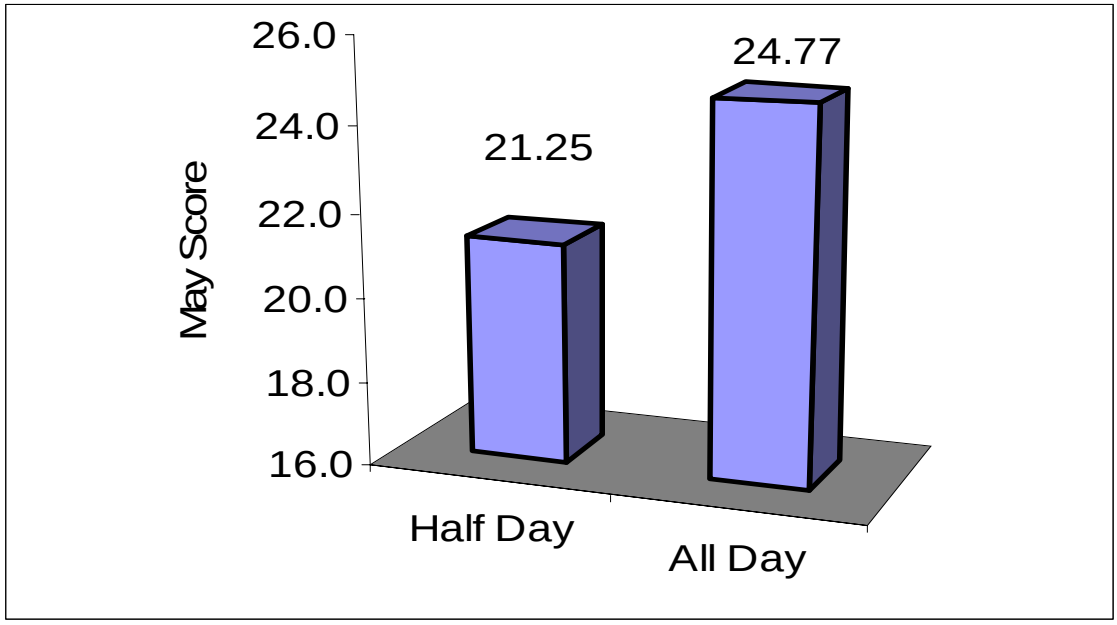

Figure 6c: Mean Alphabetic Dictation Scores for All-Day Versus Half-Day Kindergarteners

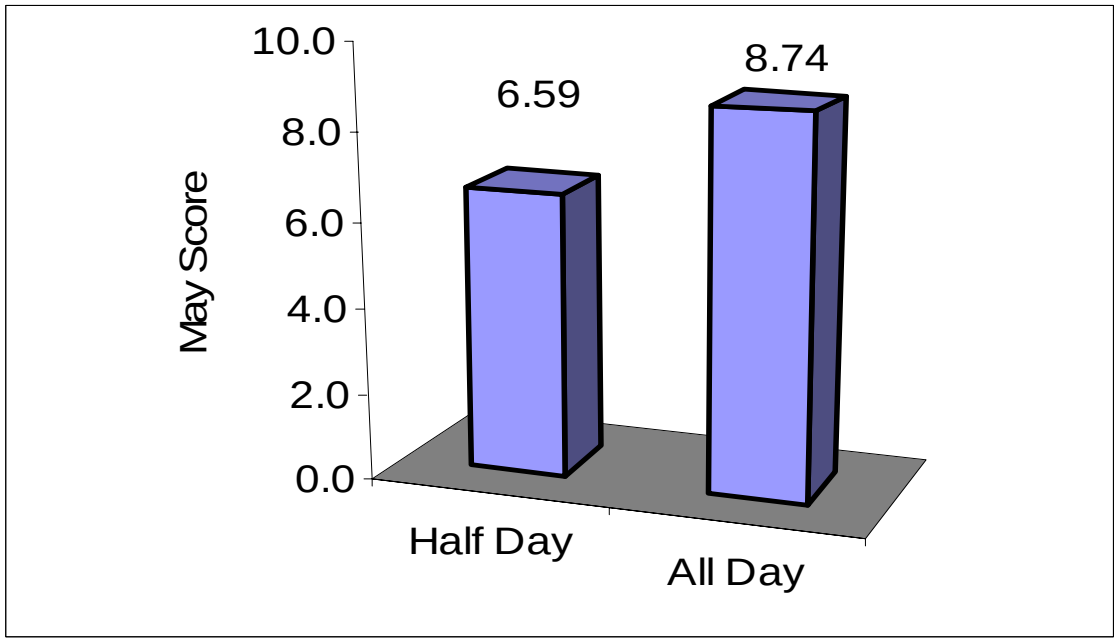

Figure 6d: Mean Blending Scores for All-Day Versus Half-Day Kindergarteners

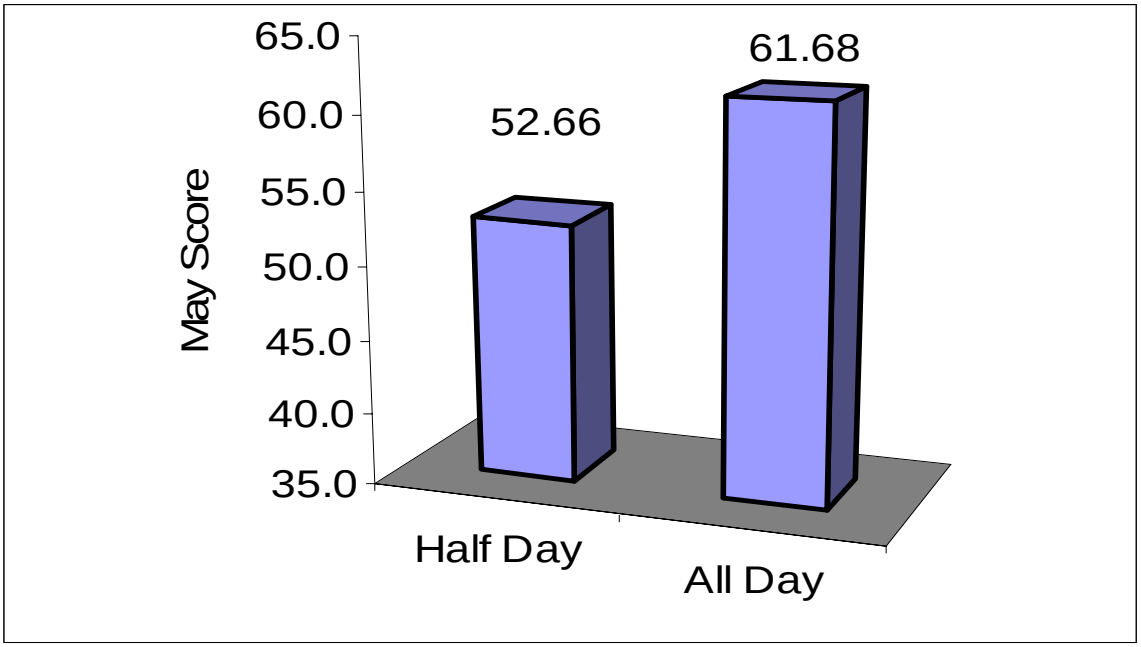

Figure 6e: Mean Total Score – Part 1 for All-Day Versus Half-Day Kindergarteners

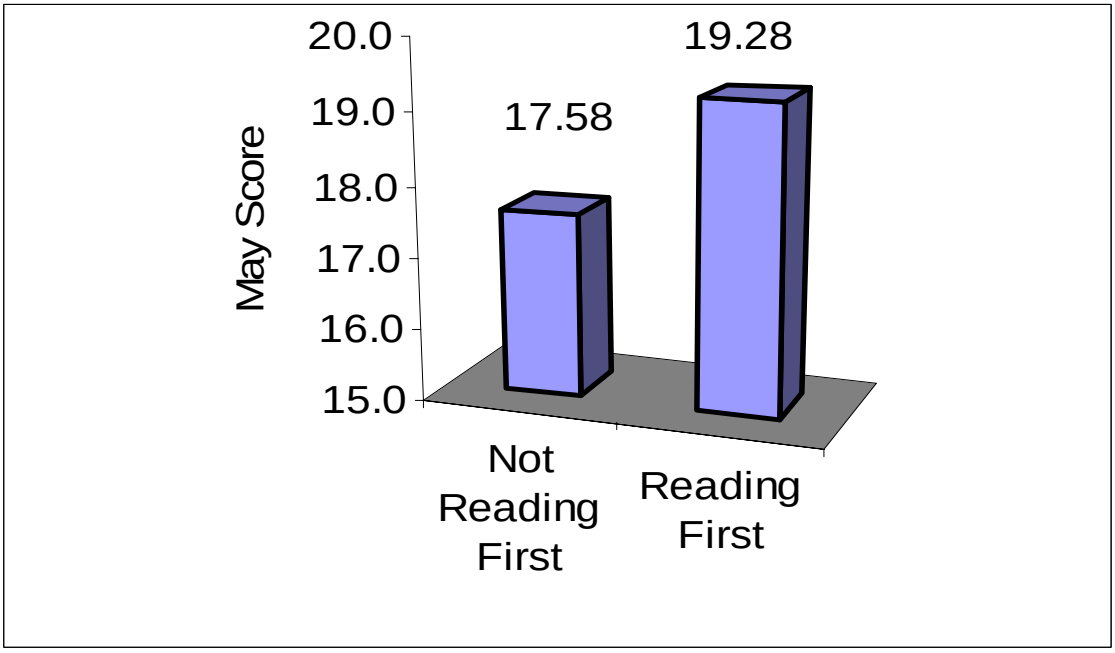

Figure 7a: Mean Initial Letter Sounds Scores for Reading First Versus Not Reading First Kindergarteners

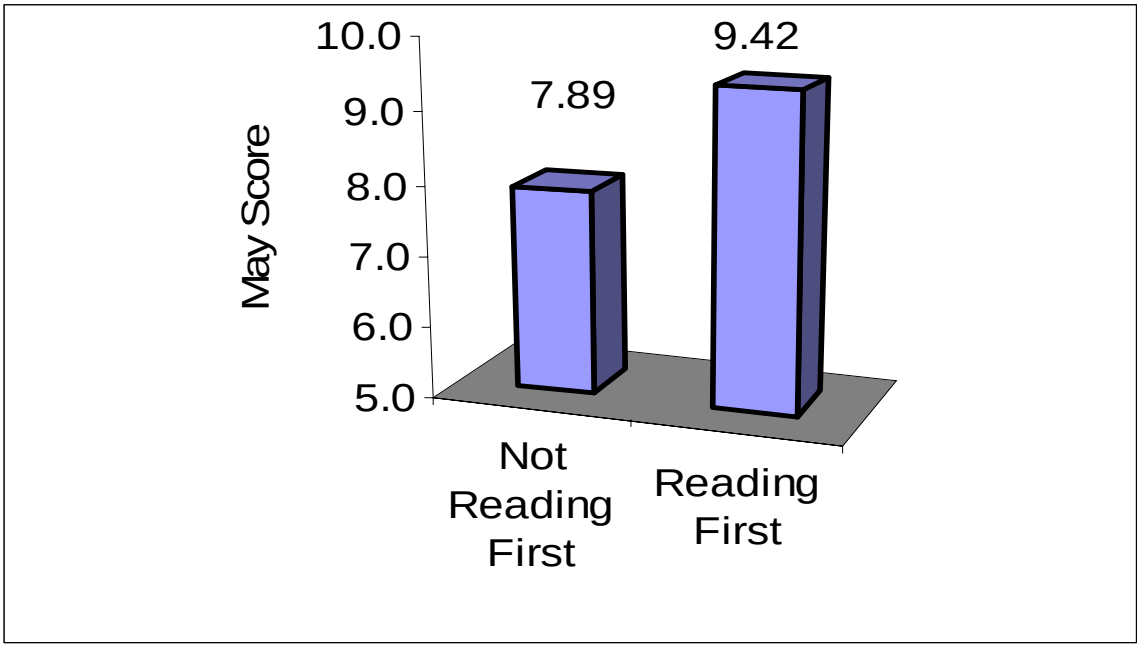

Figure 7b: Mean Final Sounds Scores for Reading First Versus Not Reading First Kindergarteners

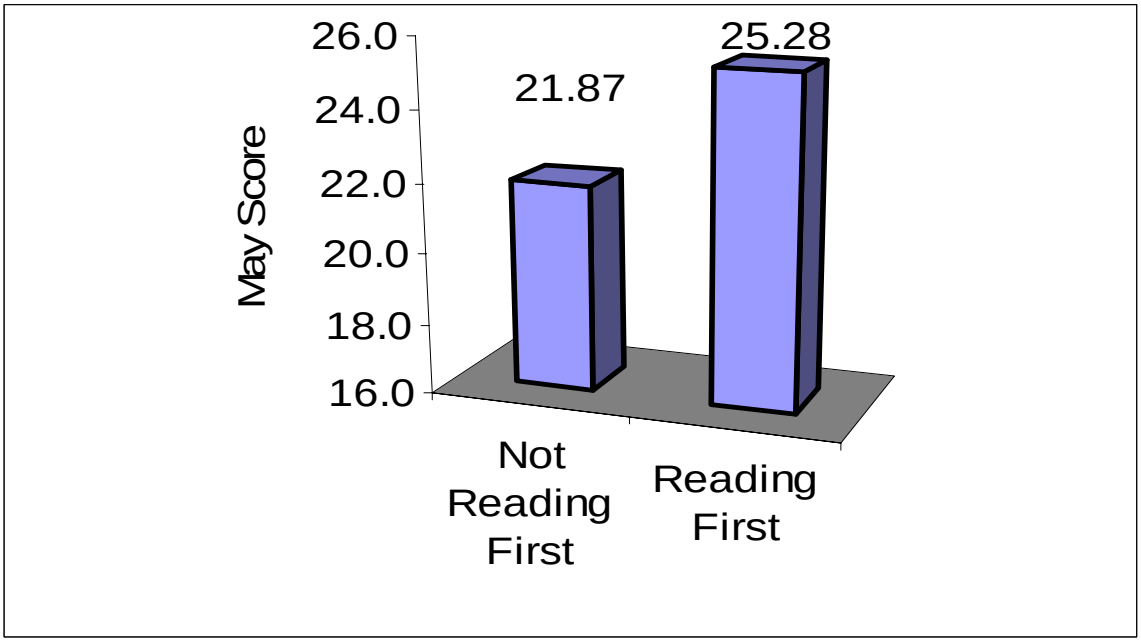

Figure 7c: Mean Alphabetic Dictation Scores for Reading First Versus Not Reading First Kindergarteners

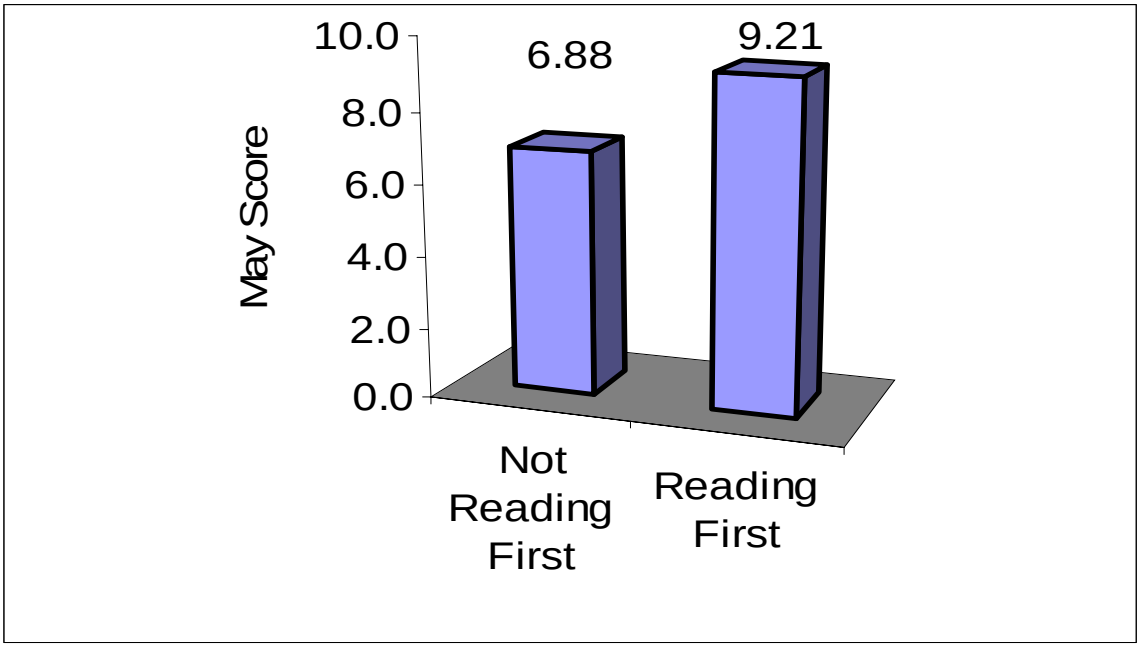

Figure 7d: Mean Blending Scores for Reading First Versus Not Reading First Kindergarteners

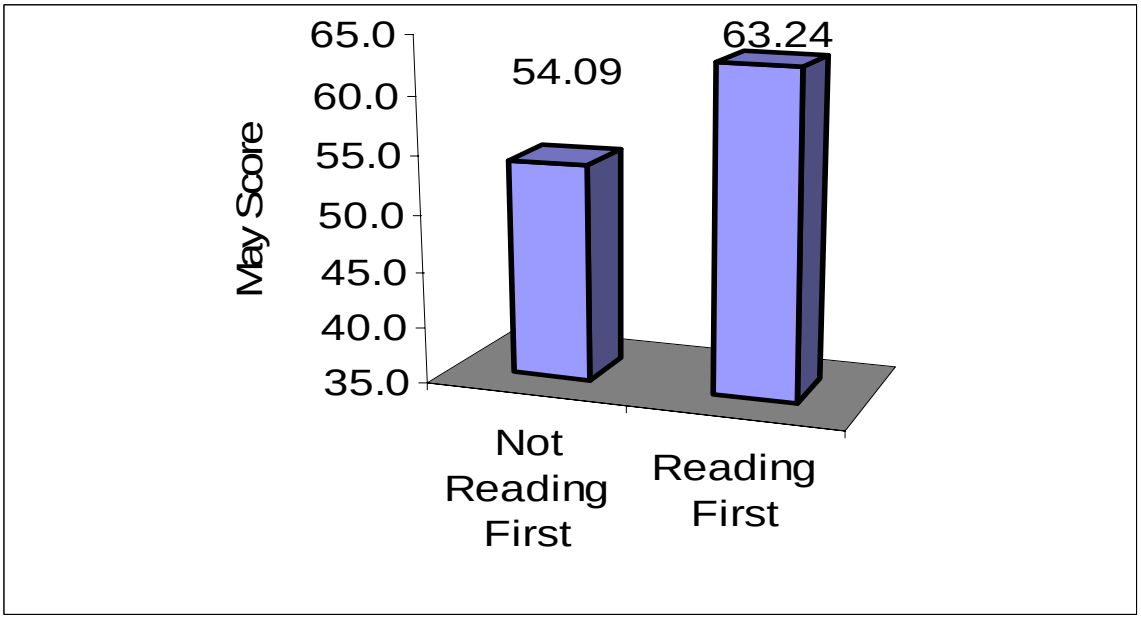

Figure 7e: Mean Total Score – Part 1 for Reading First Versus Not Reading First Kindergarteners

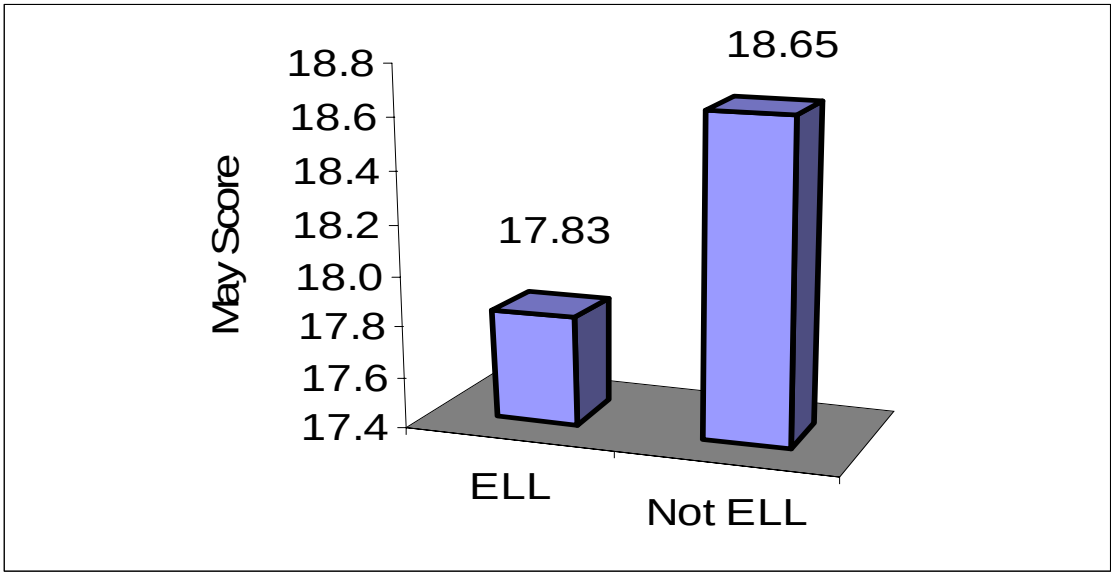

Figure 8a: Mean Initial Letter Sounds Scores for ELL and Non-ELL Kindergarteners

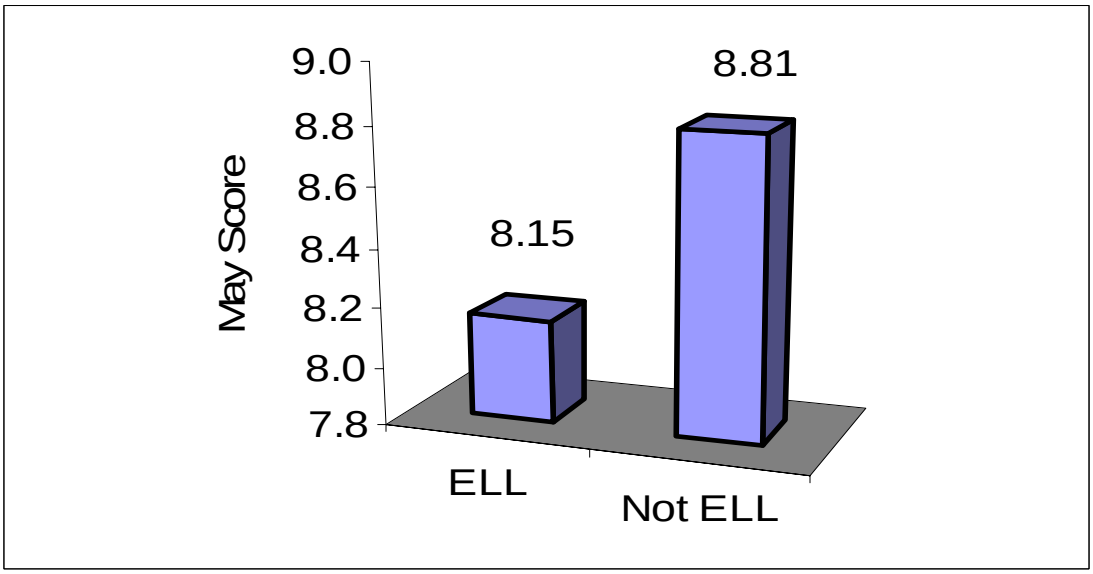

Figure 8b: Mean Final Sounds Scores for ELL and Non-ELL Kindergarteners

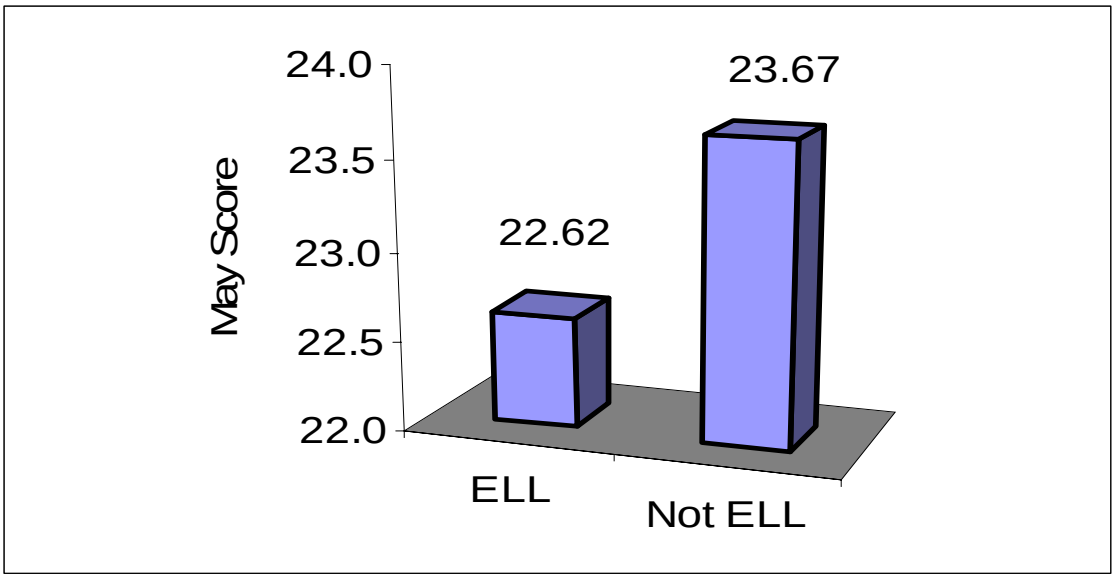

Figure 8c: Mean Alphabetic Dictation Scores for ELL and Non-ELL Kindergarteners

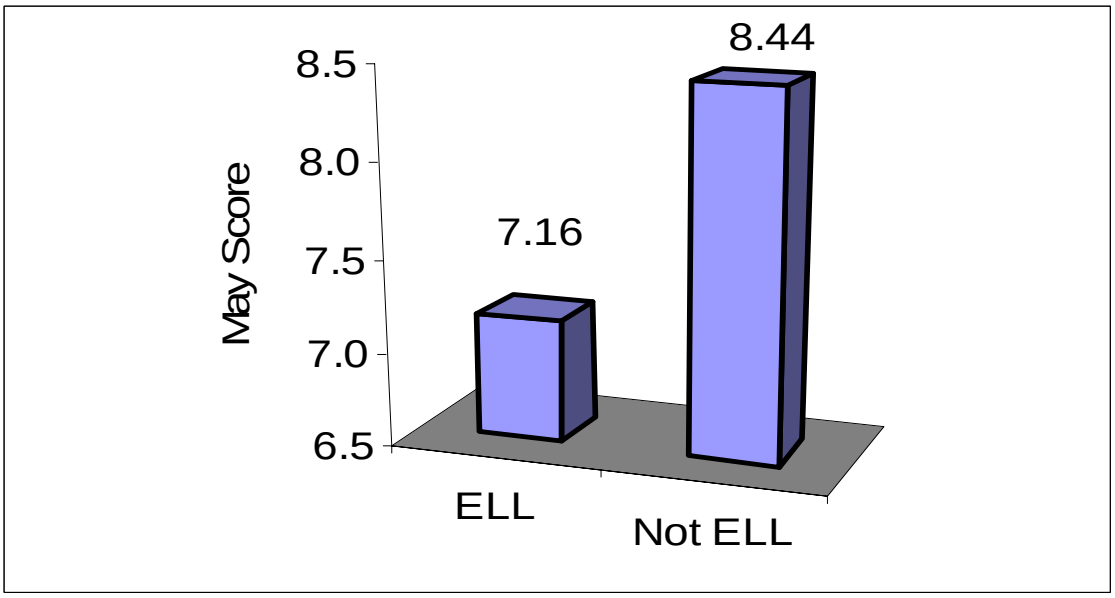

Figure 8d: Mean Blending Scores for ELL and Non-ELL Kindergarteners

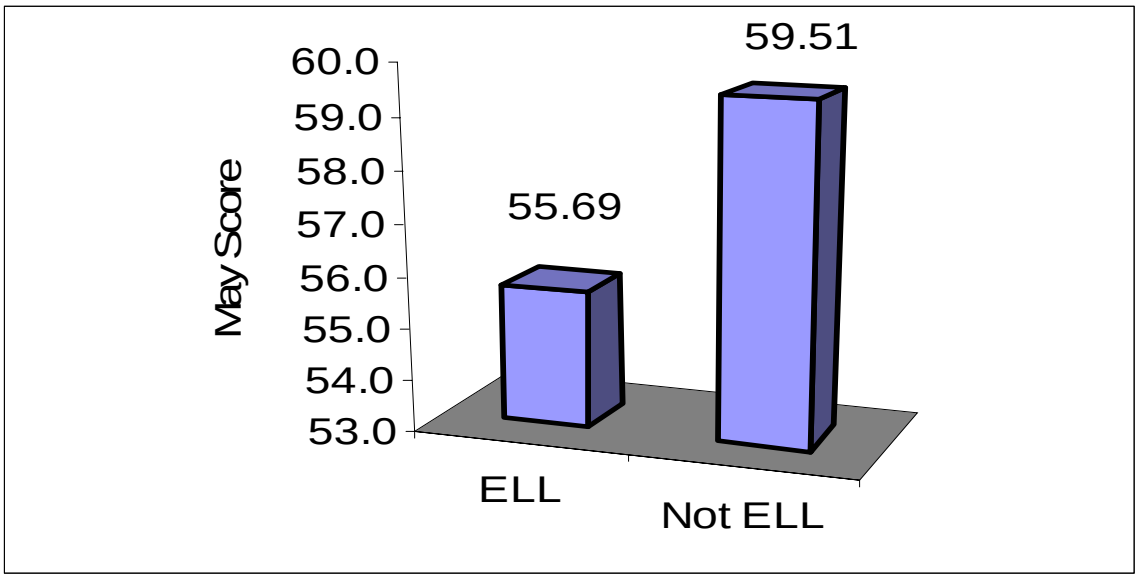

Figure 8e: Mean Total Score – Part 1 for ELL and Non-ELL Kindergarteners

Stepwise regression was also performed for each dependent variable to determine which of the main effects contributed the most toward explaining the variance seen in the dependent variable value. Table 8 lists the results of the stepwise regression analyses. Note that all-day K has a larger effect on variance (albeit a small one) than Reading First for all of the benchmarks except ***blending***.

Table 8
Percent of Variance Explained by Predictor Variables

MPS-FGRI Benchmark	All-Day Contribution	Reading First Contribution
Initial Letter Sounds	0.065	0.062
Final Sounds	0.115	0.109
Alphabetic Dictation	0.131	0.112
Blending	0.139	0.150
Total Score – Part 1	0.163	0.154

Furthermore, in order to assess the joint effect of all-day K and Reading First, since the interaction effect proved significant for three of the ANOVA models as shown in Table 7, Figures 8a-8e show the results of all-day versus half-day kindergarteners split out by reading program (Reading First and not-Reading First). Note that students not in a Reading First

program but in all-day K had a performance mean of 87% to 97% of the performance mean for all students in Reading First, regardless of half-day or all-day status.

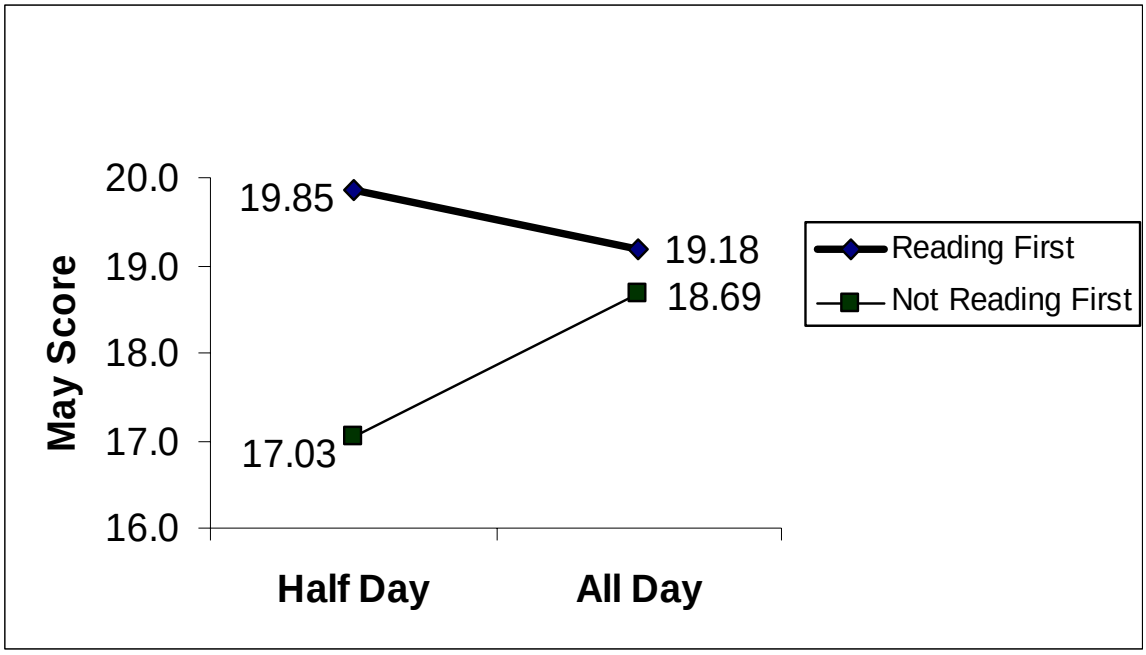

Figure 8a: Initial Letter Sounds for All-Day Versus Half-Day Kindergarteners by Reading First Program

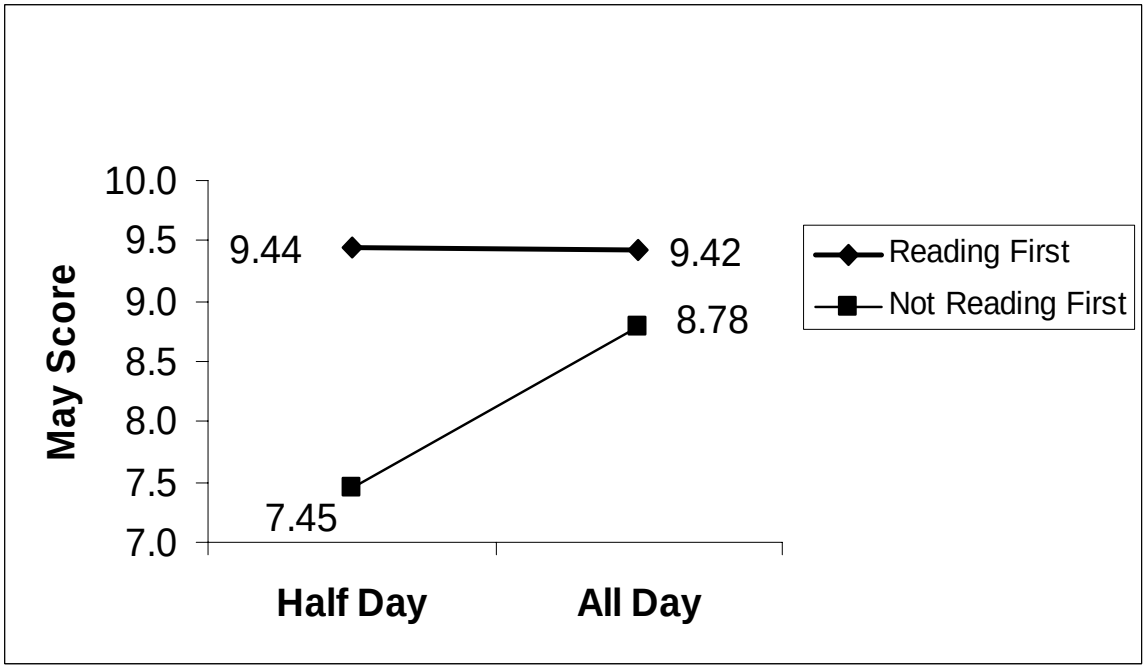

Figure 8b: Final Sounds for All-Day Versus Half-Day Kindergarteners by Reading First Program

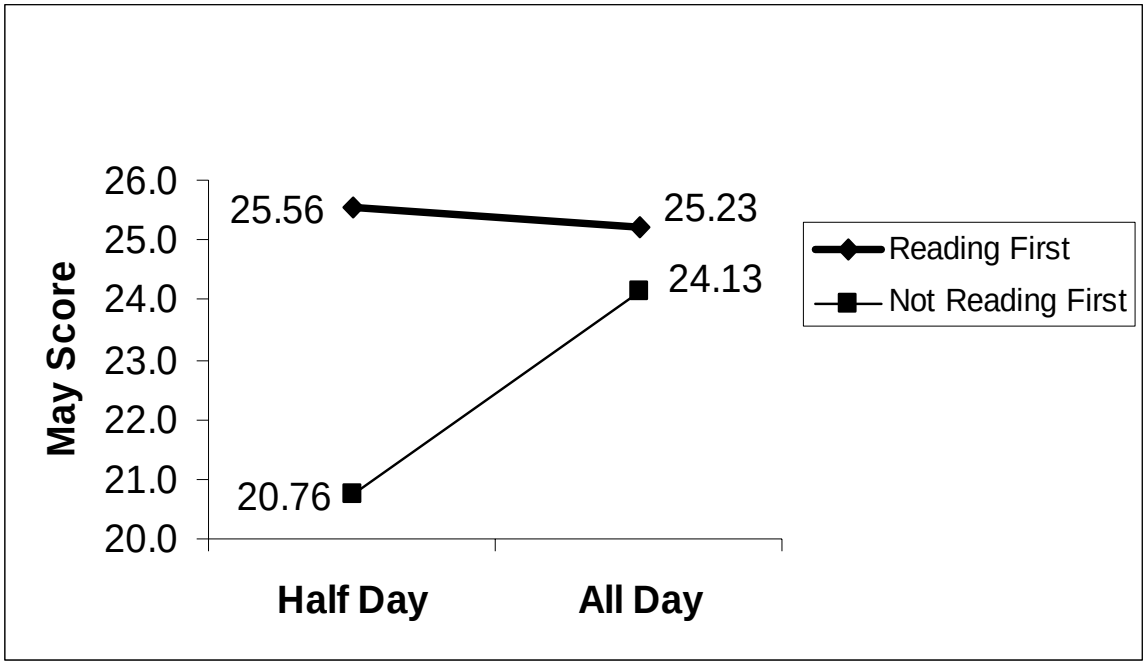

Figure 8c: Alphabetic Dictation for All-Day Versus Half-Day Kindergarteners by Reading First Program

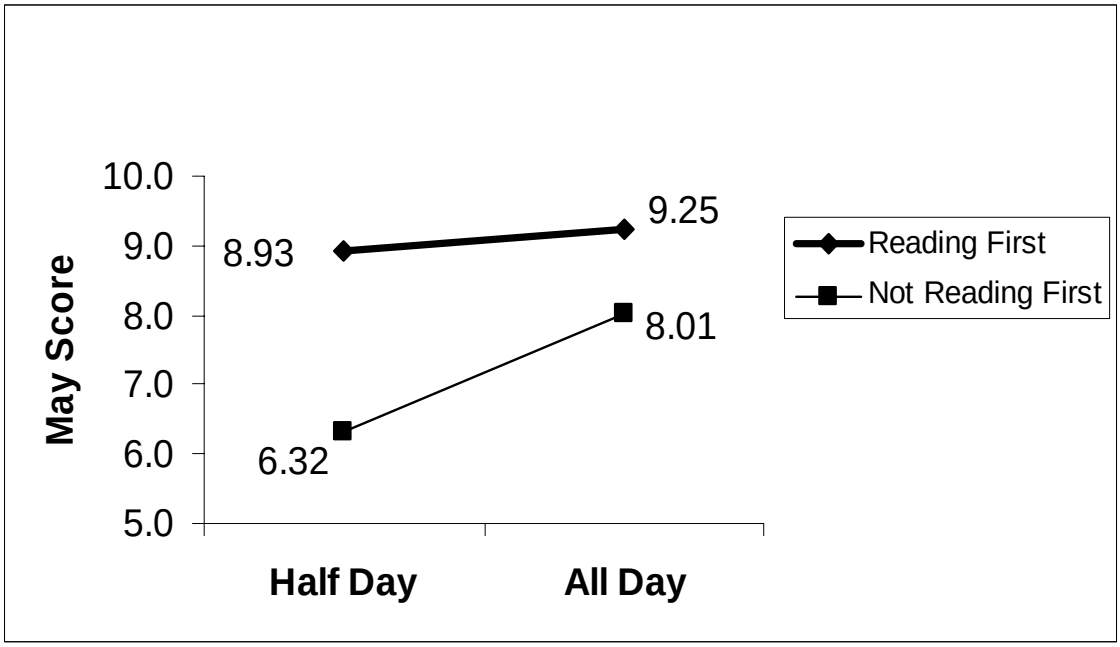

Figure 8d: Blending for All-Day Versus Half-Day Kindergarteners by Reading First Program

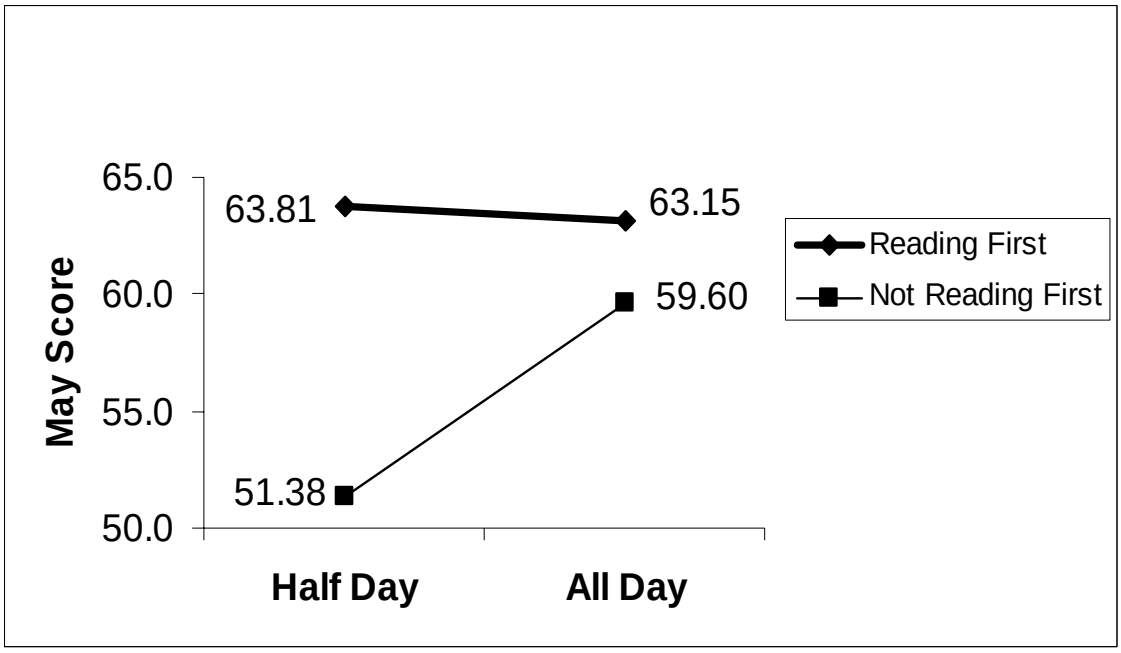

Figure 8e: Total Score-Part 1 All-Day Versus Half-Day Kindergarteners by Reading First Program

Lastly, due to the significant ELL effect in both sets of models, Figures 9a-9e illustrate the effects of all-day K on ELL students. Note that all-day K brings the performance of ELL students up to an average of 108% of the level of half-day non-ELL students, but only up to the average of 97% level of the all-day K non-ELL students, for all five benchmarks.

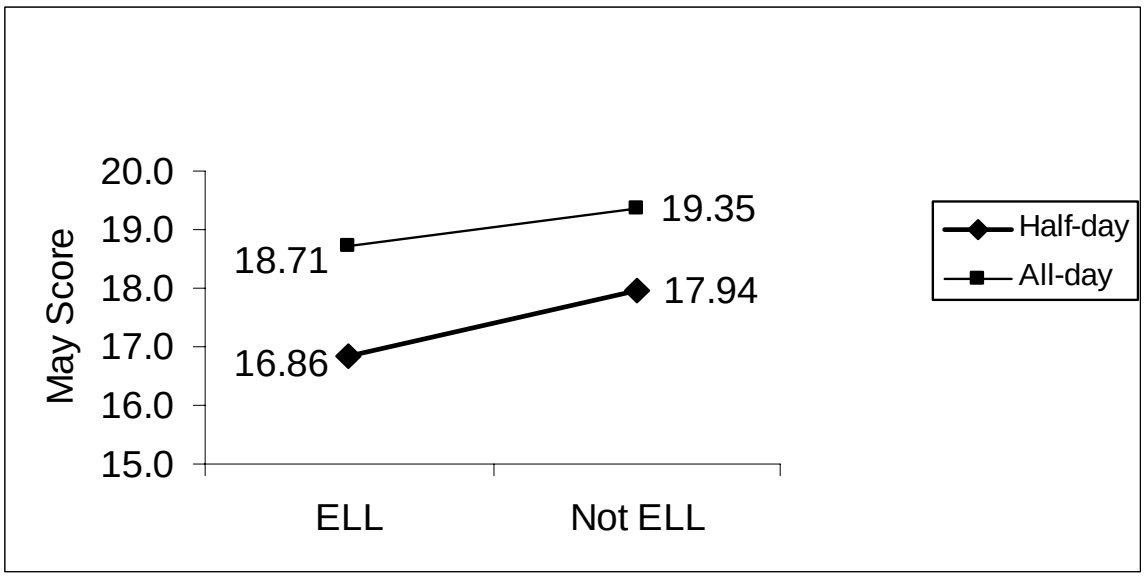

Figure 9a: Initial Letter Sounds Means for All-Day Versus Half-Day ELL and Non-ELL Kindergarteners

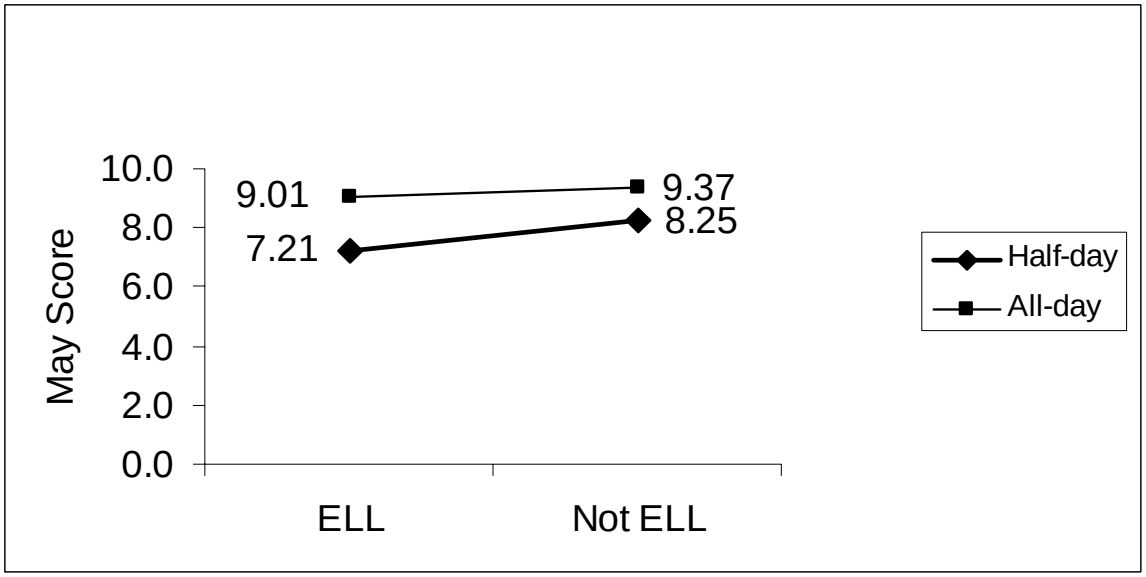

Figure 9b: Final Sounds Means for All-Day Versus Half-Day ELL and Non-ELL Kindergarteners

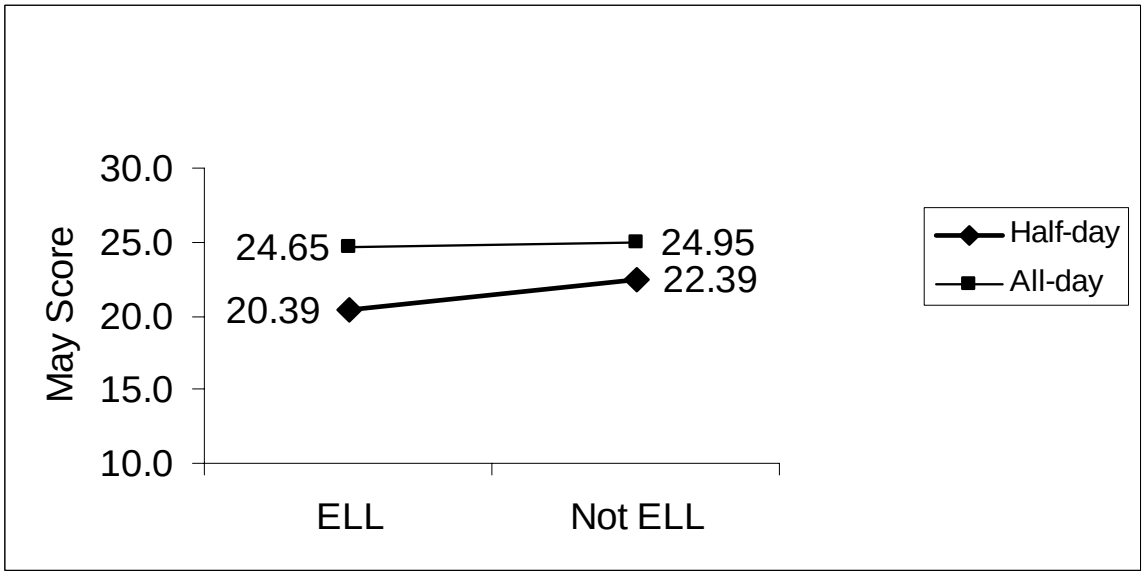

Figure 9c: Alphabetic Dictation Means for All-Day Versus Half-Day ELL and Non-ELL Kindergarteners

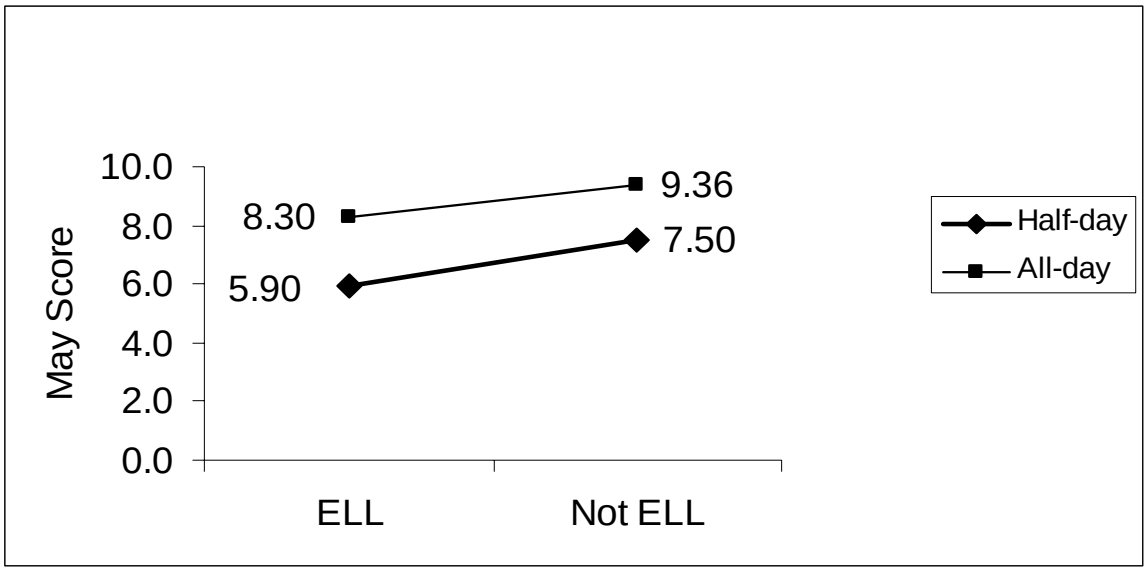

Figure 9d: Blending Means for All-Day Versus Half-Day ELL and Non-ELL Kindergarteners

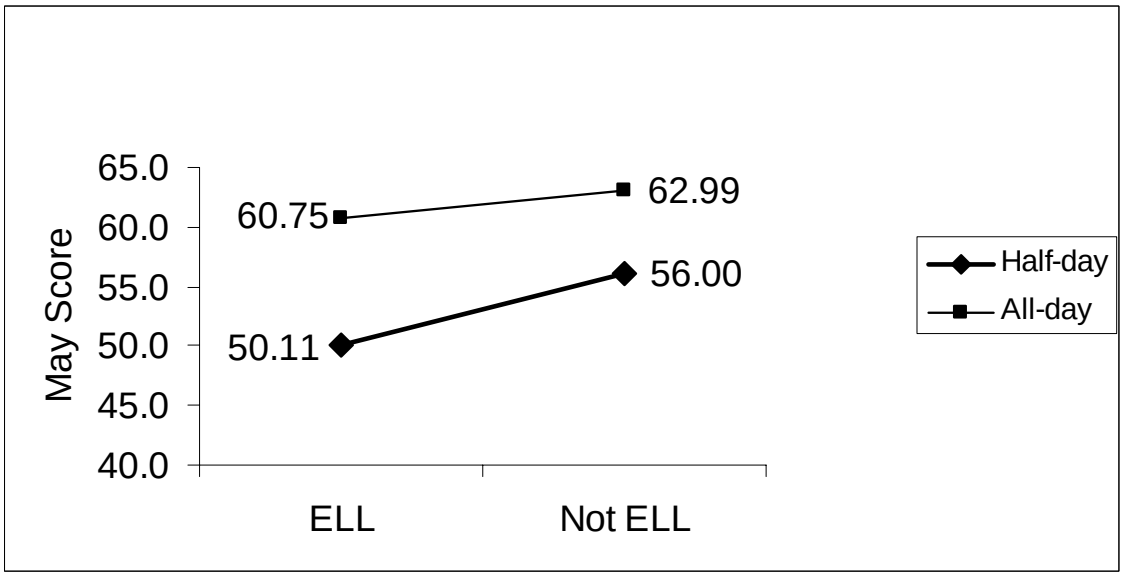

Figure 9e: Total Score-Part 1 Means for All-Day Versus Half-Day ELL and Non-ELL Kindergarteners

Likewise, Figures 10a-10e show the effects of the Reading First program on ELL students. Note that Reading First brings the performance of ELL students up to an average of 110% of the level of non-Reading First non-ELL students, but only up to the average of 97% level of the Reading First non-ELL students, for all five benchmarks.

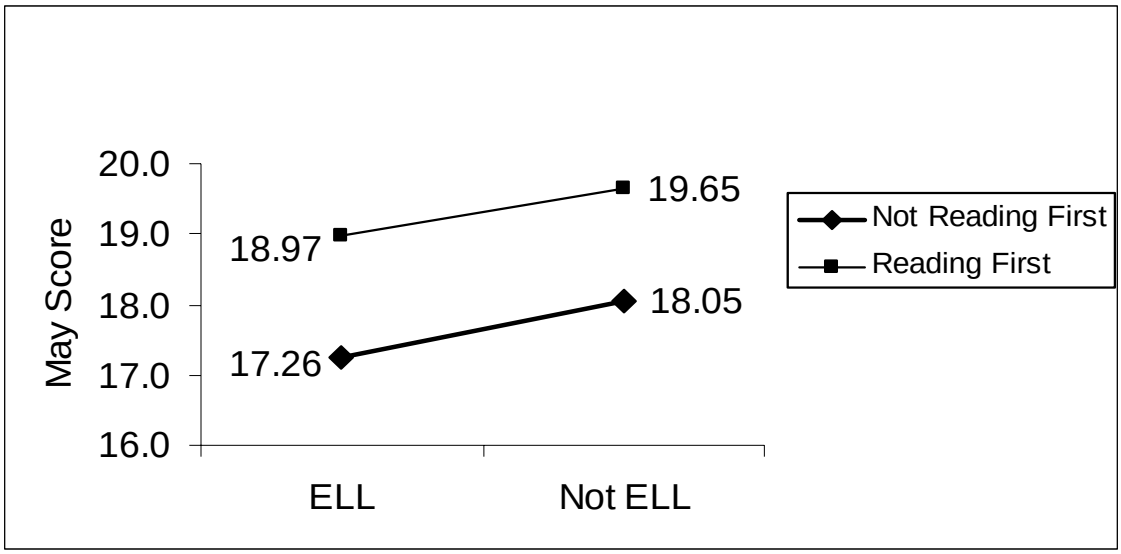

Figure 10a: Initial Letter Sounds Means for Reading First and Non-Reading First ELL and Non-ELL Kindergarteners

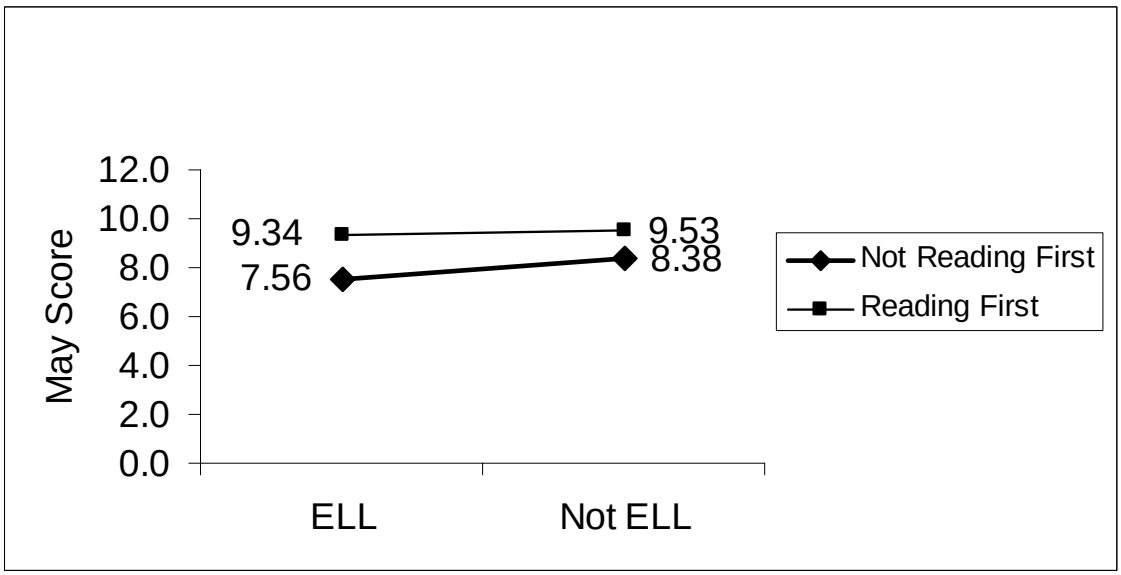

Figure 10b: Final Sounds Means for Reading First and Non-Reading First ELL and Non-ELL Kindergarteners

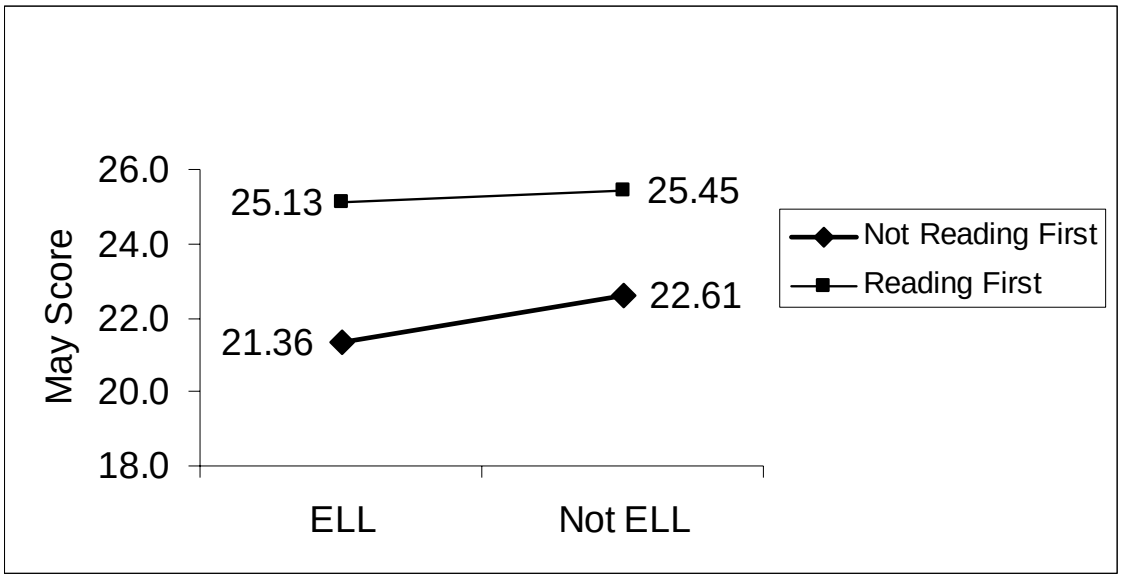

Figure 10c: Alphabetic Dictation Means for Reading First and Non-Reading First ELL and Non-ELL Kindergarteners

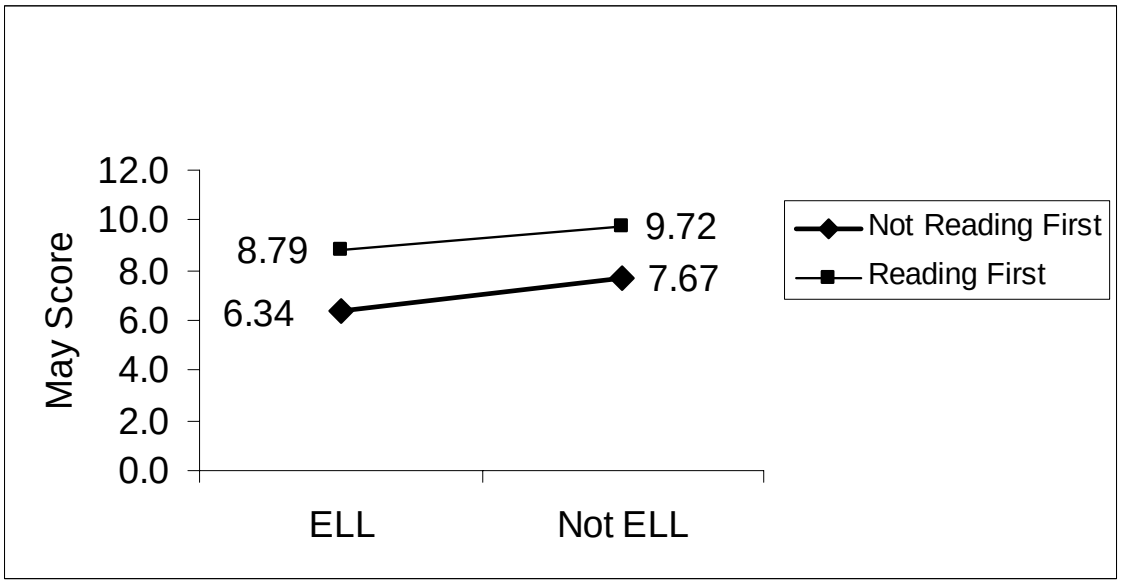

Figure 10d: Blending Means for Reading First and Non-Reading First ELL and Non-ELL Kindergarteners

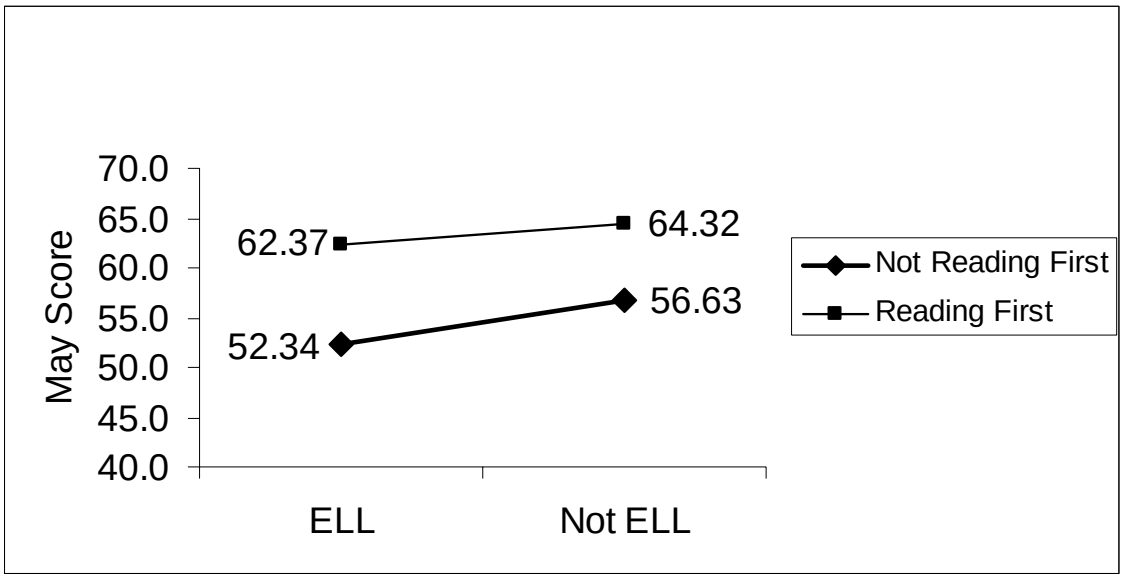

Figure 10e: Total Score-Part 1 Means for Reading First and Non-Reading First ELL and Non-ELL Kindergarteners

The overall conclusion from these analyses is that students in all-day K have a higher reading readiness performance than half-day K students as measured by the *MPS-First Grade Reading Inventory, Part 1* benchmarks. Means for students in Reading First are also higher than means of students not in Reading First. All-day K brings up the performance of students not in Reading First nearly up the performance of students in Reading First, but the all-day K/ Reading First interaction effect cannot be fully interpreted due to the low variety of schools and teachers in half-day programs using Reading First. Finally, all-day K ELL students perform at 108% of half-day non-ELL students, suggesting that all-day K performs a "catch up" function. Finally, ELL students in Reading First perform at 110% of non-ELL students not in Reading First, likewise, suggesting that Reading First also performs a "catch up" function for ELL students.

Conclusions

All-day K Effect

Students in all-day K generally performed at higher levels than half-day K students in reading and mathematics. Specifically, all-day K students exhibited *significantly higher* mean performances in the DIBELS benchmarks of initial sound fluency, letter naming fluency, phoneme segmentation fluency and nonsense word fluency; the MPS-FGRI benchmarks of initial letter sounds, final sounds, alphabetic dictation, blending and total score-part 1 (part 2 was not administered); and the following mathematics benchmarks:

2. Constructs equivalent forms of whole numbers 0 through 10 using manipulatives
5. Names numerals (numbers 0 through 20)
6. Matches sets with numerals (numbers 0 through 20)
7. Models addition using manipulatives (numbers 0-10)
9. Solves word problems presented orally (addition or subtraction; numbers 0 through 9)

Over all the mathematics benchmark/level combinations, all-day K students showed significantly higher attainment frequencies than half-day K students for 42.3% of the benchmark/level combinations, statistically equivalent attainment for 53.3% of the combinations, along with significantly lower attainment for 4.4% of the combinations.

All-day K proved to be the best predictor of the MPS-FGRI benchmarks (but not DIBELS benchmarks) of all the main effects tested, but it was weak at only 16% of variance explained. Lastly, all-day K brings up the performance of students not in Reading First nearly up the performance of students in Reading First, but the all-day K/ Reading First interaction effect cannot be fully interpreted due to the low variety of schools and teachers in half-day programs using Reading First.

Reading First Effect

Students in the Reading First reading program significantly outperformed students not in a Reading First Program for all five of the DIBELS benchmarks (initial sound fluency, letter naming fluency, phoneme segmentation fluency, nonsense word fluency and word use fluency) and all five of the MPS-FGRI benchmarks (initial letter sounds, final sounds, alphabetic dictation, blending and total score-part 1). Reading First proved to be the strongest predictor of variance in the DIBELS reading scores at 26% of variance explained, but not the MPS-FGRI scores. However, these measurements used were specifically designed to measure the reading readiness focus of the Reading First program, which may lead to a favorable bias towards Reading First program performance.

Reading First students had a significantly higher percent attainment over non-Reading First in the following mathematics benchmarks:

1. Constructs multiple set combinations (numbers 3 through10)
2. Constructs equivalent forms of whole numbers 0 through 10 using manipulatives
7. Models addition using manipulatives (numbers 0-10)
8. Models subtraction using manipulatives (numbers 0-10)
9. Solves word problems presented orally (addition or subtraction; numbers 0 through 9)

Note that this set of five benchmarks was different from the all-day/half-day set of five benchmarks. Over all the mathematics benchmark/level combinations, Reading First students showed significantly higher attainment frequencies than non-Reading First students for 37.2% of the benchmark/level combinations, statistically equivalent attainment for 62.1% of the combinations, along with significantly lower attainment for 0.7% of the combinations. However, the Reading First curriculum does not address mathematics skills, so seeing a significant impact associated with the Reading First program is unexpected. Therefore, the question should be whether the difference was due to other factors highly correlated with the Reading First program.

English-language-learner (ELL) Effect

ELL students uniformly performed significantly lower than non-ELL students in both reading readiness assessments and the mathematics assessment. However, when ELL students are analyzed unto themselves, the effects of an all-day K or Reading First program becomes evident. All-day K brings the performance of ELL students up to or above the level of half-day non-ELL students for all five DIBELS benchmarks except word use fluency (at only 90% of the half-day non-ELL student performance). ELL students in Reading First perform at 110% of non-ELL students not in Reading First, likewise, suggesting that Reading First also performs a "catch up" function for ELL students.

The all-day K ELL students show significantly higher attainment percentages in the mathematics assessment than the half-day K ELL students for 45.1% of the benchmark/level combinations, statistically equivalent attainment for 47.5% of the combinations, and significantly lower attainment for 7.4% of the combinations. Comparing these results to the 28.1%, 69.7% and 2.2% for significantly higher, statistically equivalent and significantly lower attainment percentages, respectively, the conclusion can be made that all-day K impacts ELL students more favorably than non-ELL students.

However, it should be noted that ELL all-day K students do not catch up to their non-ELL counterparts in all-day K, nor do Reading First ELL students reach the same level as non-ELL students in the same program.

Summary

When assessing reading readiness and kindergarten mathematics skills, all-day K students performed significantly better than half-day K students; students in the Reading First program performing significantly better than students not in Reading First. Students in both all-day K and Reading First performed the best. Furthermore, ELL students, when in either all-day

K or Reading First, showed performance levels fairly close to their non-ELL half-day or non-Reading First counterparts, suggesting that either an all-day K or a Reading First program can "close the performance gap" for ELL students.

Limitations of the Study:

It should be noted that the DIBELS benchmarks used in the January reading assessment were specifically designed to measure progress in the Reading First curriculum, not the full impact of a full kindergarten program (i. e., including mathematics and other areas). Hence there may be some bias is the January analysis result showing that Reading First makes more of a difference in student performance than all-day K. Furthermore, Reading First teachers receive 100 hours of training over two years (64 hours in "academies", 12 hrs per year inservice) in instructional strategy, teaching methods and evaluation methods. Likewise, because of the accountability of the Reading First grant funding, principals are more involved and the school's culture is focused on reading improvement. Lastly, the true Reading First effect cannot be clearly discerned due to Reading First being offered only at one school (Roosevelt) in a half-day program with two teachers only (Armistead and D'Amico) so the effect in result there may be due to specific school approaches and not necessarily the Reading First program. Further investigation of Roosevelt's Armistead and D'Amico curricula and instructional procedures is recommended.

In addition, the method used for the math assessment is a subjective one and, thus, prone to differing interpretations of benchmarks and thus the variability inherent in the analysis is inflated. Furthermore, many teachers, and not Basic Skills staff, performed the assessment, thus possibly biasing the reported assessments.

Recommendations for Future Study:

First, the academic performance of the 2004/05 kindergarten cohort of 600 students should be studied over time to assess the long-term academic effects of all-day K. Second, the Reading First program should be expanded to additional half-day K programs at schools with similar demographics to those housing all-day K programs. This would allow a study to determine the efficacy of two approaches to enhancing kindergarten student learning: *more time* via the all-day K approach, or *better curriculum and training* via the Reading First approach. If this cannot be done, then an extensive study of the Armistead and D'Amico instructional methods and curricula (at Roosevelt Elementary) should be done to determine why their students did so well while only in a half-day program. Lastly, additional cohorts of kindergarten students should be studied as the years progress, especially since the all-day K program will be expanded to four more schools in MPS for the 2005/06 academic year.

References

Cryan, J., Sheehan, R., Wiechel, J. & Bandy-Hedden, I. G. (1992). Success Outcomes of Full-day Kindergarten: More Positive Behavior and Increased Achievement in the Years After. *Early Childhood Research Quarterly,* 7(2); 187-203.

Fusaro, J. A. (1997). The Effect of Full-day Kindergarten on Student Achievement: A Meta-analysis. *Child Study Journal,* 27(4): 269-277.

Gullo, D. F. (1990). The Long-term Educational Effects of Half-day vs. Full-day Kindergarten. *Early Childhood Development and Care,* 160: 17-24.

Hair, J. J., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate Data Analysis.* Upper Saddle River, NJ: Prentice Hall.

Mesa Public Schools. (2004). *Arizona Academic Content Standard - Mathematics, Articulated by Grade Level-Kindergarten*. Mesa, AZ: Author.

Official DIBELS Home Page. Retreived July 7, 2005, from http://DIBELS.uoregon.edu/index.php retrieved on July 7, 2005.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical Linear Models: Applications and Data Analysis Methods.* Thousand Oaks, CA: Sage Publications.

Rogers, J. L., Howard, K. I., & Vessey, J. T. (1993). Using Significance Tests to Evaluate Equivalence Between Two Experimental Groups. *Psychological Bulletin, 113(3),* 553-565.

SPSS 13.0 for Windows, Release 13.0 (Computer software). (2004). Chicago, IL: SPSS, Inc.

Walston, J. T. & West, J. (2004*). Full-day and Half-day Kindergarten in the United States: Findings from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-99* (NCES 2004-078). U. S. Department of Education, National Center for Educational Statistics. Washington, DC: U. S. Government Printing Office.

APPENDIX A: Detail of ANOVA Models

ANOVA Models used for the DIBELS reading assessment:

ISF = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE}

LNF = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE

PSF = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE}

NWF = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE}

WUF = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE}

ISF = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE, ALLDAY*READFIRST, ALLDAY*ELL, ALLDAY*FREELUNCH, ALLDAY*GENDER, ALLDAY*AGE}

LNF = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE, ALLDAY*READFIRST, ALLDAY*ELL, ALLDAY*FREELUNCH, ALLDAY*GENDER, ALLDAY*AGE}

PSF = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE, ALLDAY*READFIRST, ALLDAY*ELL, ALLDAY*FREELUNCH, ALLDAY*GENDER, ALLDAY*AGE}

NWF = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE, ALLDAY*READFIRST, ALLDAY*ELL, ALLDAY*FREELUNCH, ALLDAY*GENDER, ALLDAY*AGE}

WUF = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE, ALLDAY*READFIRST, ALLDAY*ELL, ALLDAY*FREELUNCH, ALLDAY*GENDER, ALLDAY*AGE}

ANOVA Models used for the MPS First Grade Reading Inventory reading assessment:

initial letter sounds = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE}

final sounds = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE}

alphabetic dictation = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE}

blending = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE}

total score = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE}

initial letter sounds = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE, ALLDAY*READFIRST, ALLDAY*ELL, ALLDAY*FREELUNCH, ALLDAY*GENDER, ALLDAY*AGE}

final sounds = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE, ALLDAY*READFIRST, ALLDAY*ELL, ALLDAY*FREELUNCH, ALLDAY*GENDER, ALLDAY*AGE}

alphabetic dictation = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE, ALLDAY*READFIRST, ALLDAY*ELL, ALLDAY*FREELUNCH, ALLDAY*GENDER, ALLDAY*AGE}

blending = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE, ALLDAY*READFIRST, ALLDAY*ELL, ALLDAY*FREELUNCH, ALLDAY*GENDER, ALLDAY*AGE}

total score = {ALLDAY, READFIRST, ELL, FREELUNCH, GENDER, AGE, ALLDAY*READFIRST, ALLDAY*ELL, ALLDAY*FREELUNCH, ALLDAY*GENDER, ALLDAY*AGE}

APPENDIX B: Additional Significant Effect Graphs

Other Significant Factors in the ANOVA Models used for the DIBELS reading assessment:

Significant AGE Effects:

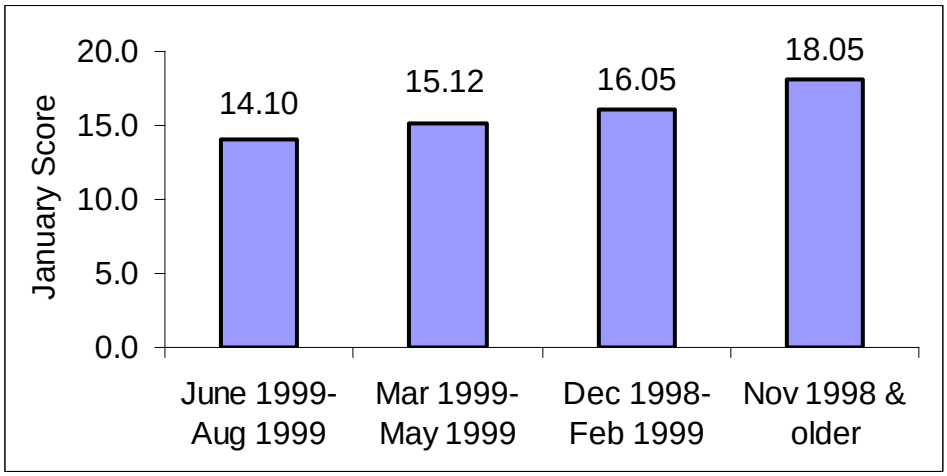

Figure B1a: Initial Sound Fluency Means by Age Quartile

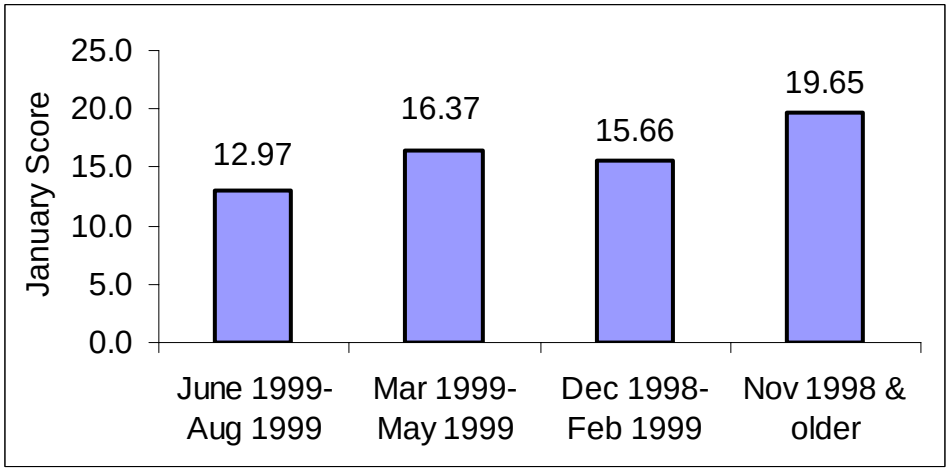

Figure B1b: Phoneme Segmentation Fluency Means by Age Quartile

Significant FREELUNCH Effects:

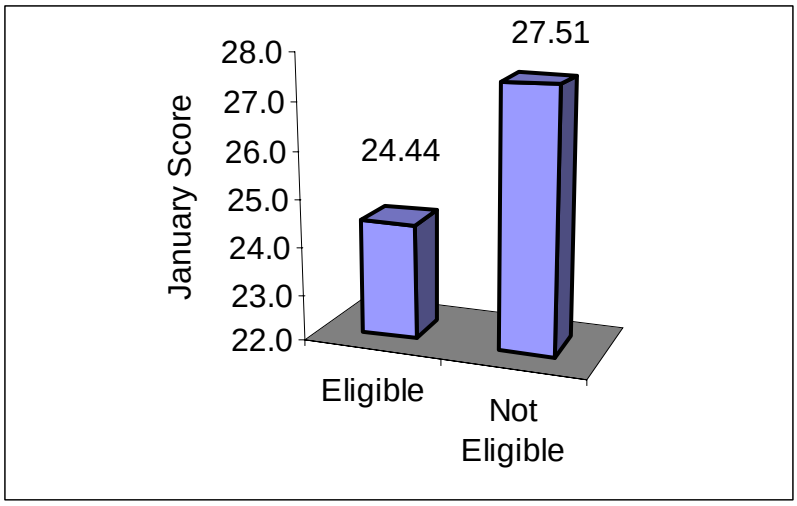

Figure B2a: Letter Naming Fluency Means by Free & Reduced Lunch Status

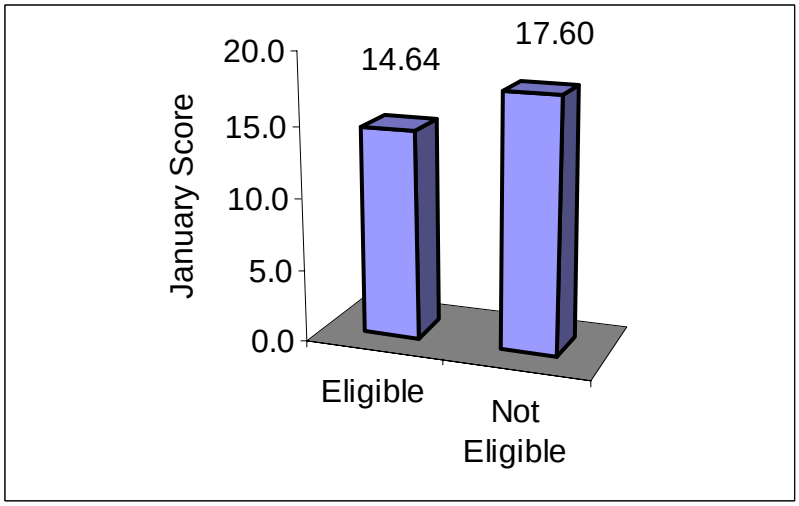

Figure B2b: Nonsense Word Fluency Means by Free & Reduced Lunch Status

Significant GENDER Effects:

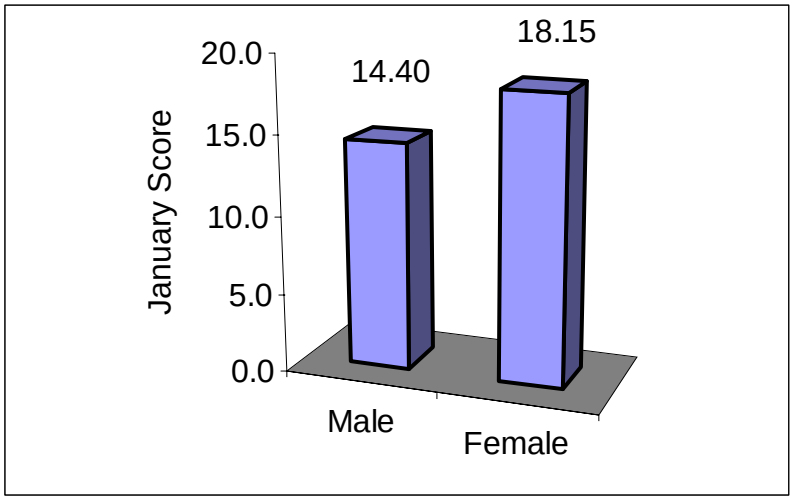

Figure B3a: Phoneme Segmentation Fluency Means by Gender

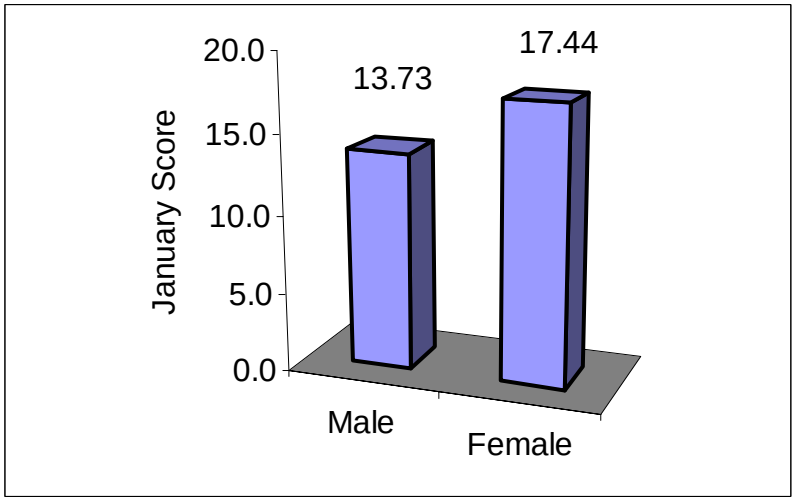

Figure B3b: Nonsense Word Fluency Means by Gender

Other Significant Factors in the ANOVA Models used for the MPS First Grade Reading Inventory reading assessment:

Significant AGE Effects:

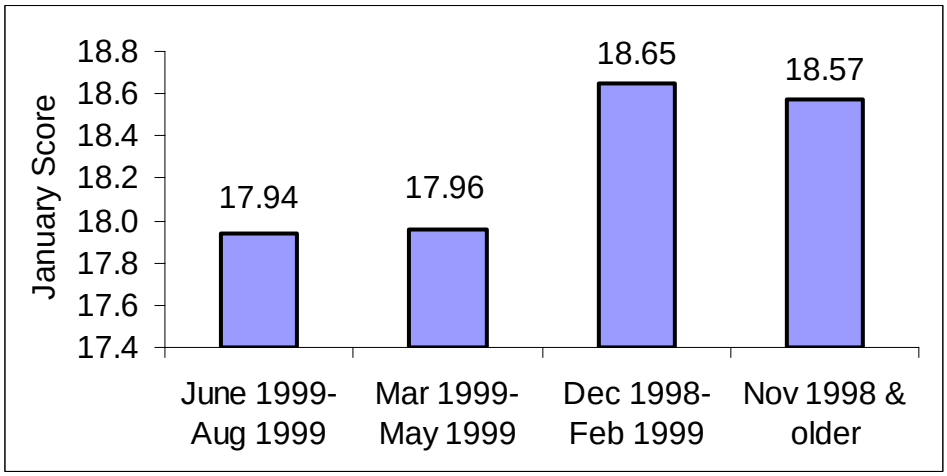

Figure B4a: Initial Letter Sounds Means by Age Quartile

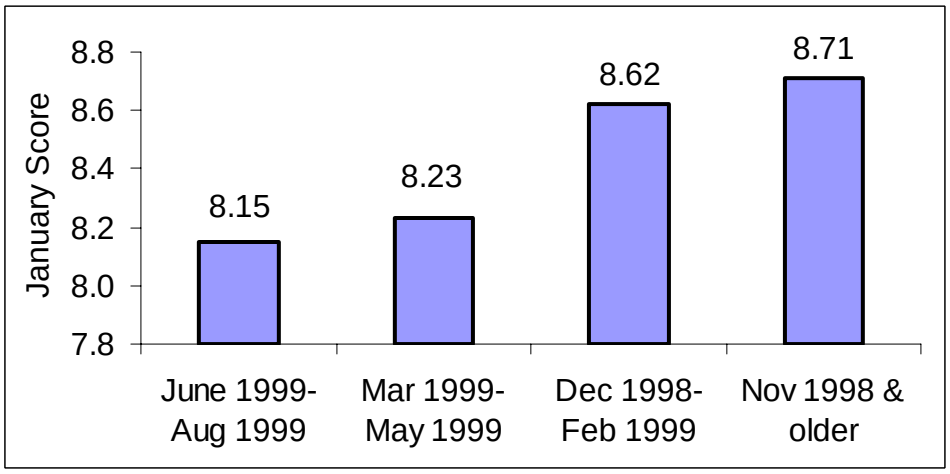

Figure B4b: Final Sounds Means by Age Quartile

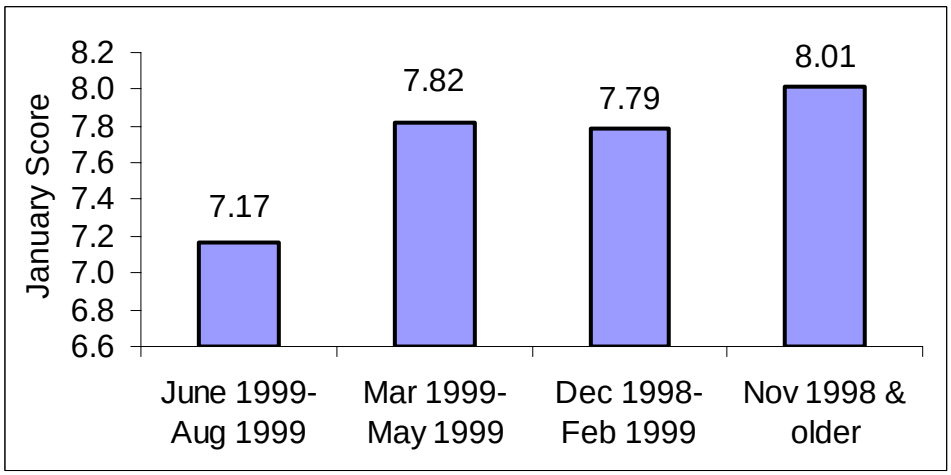

Figure B4c: Blending Means by Age Quartile

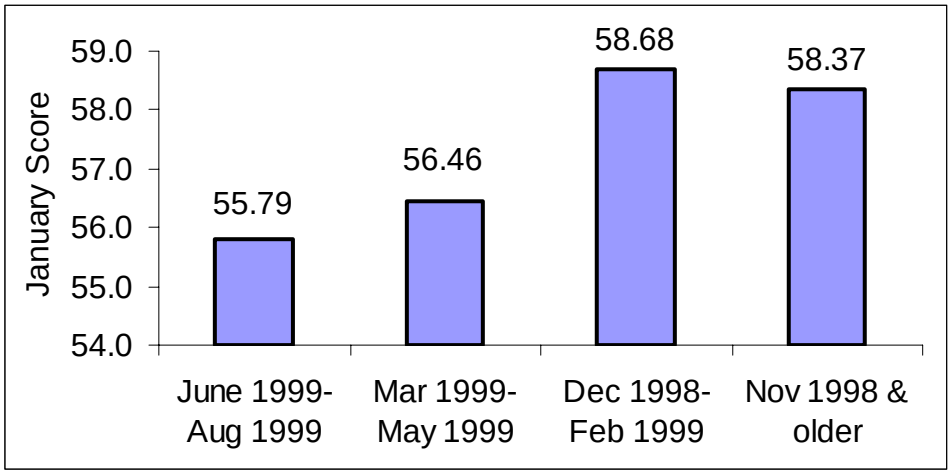

Figure B4d: Total Score-Part 1 Means by Age Quartile

Significant GENDER Effects:

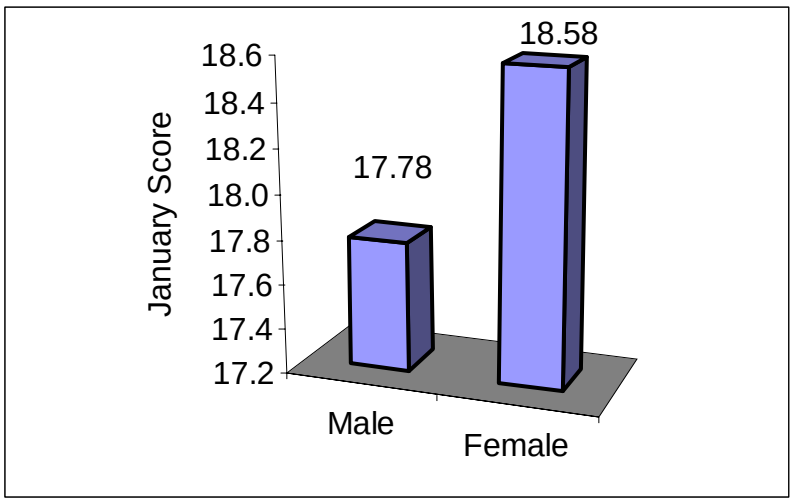

Figure B4a: Initial Letter Sounds Means by Gender

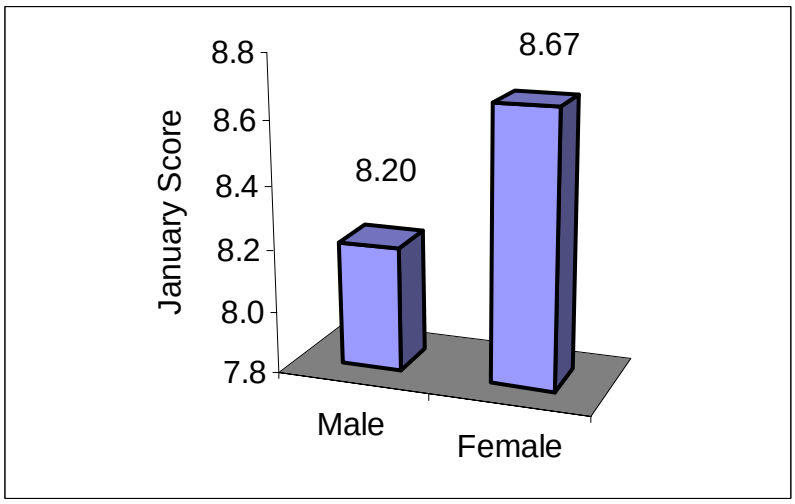

Figure B4b: Final Sounds Means by Gender

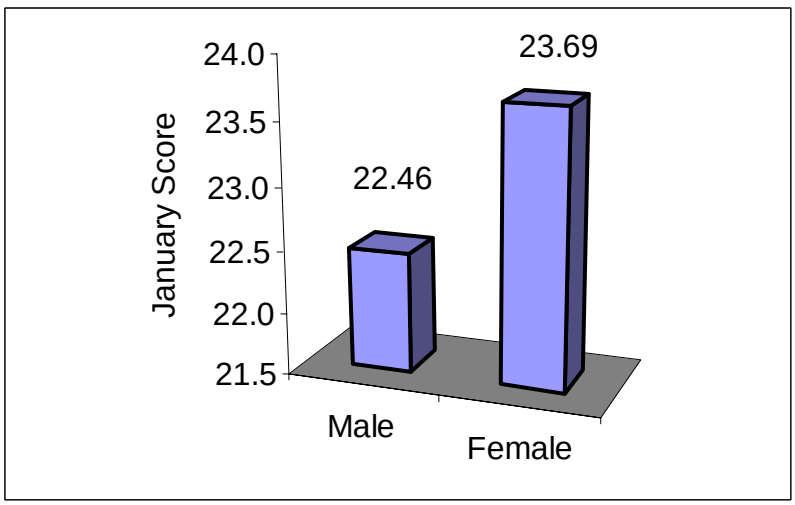

Figure B4c: Alphabetic Dictation Means by Gender

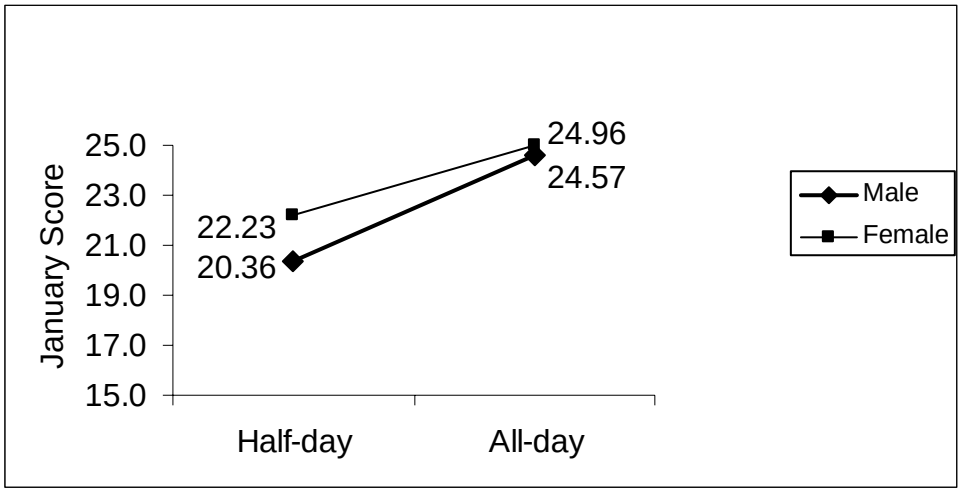

Figure B4d: Alphabetic Dictation Means by Day-length and Gender

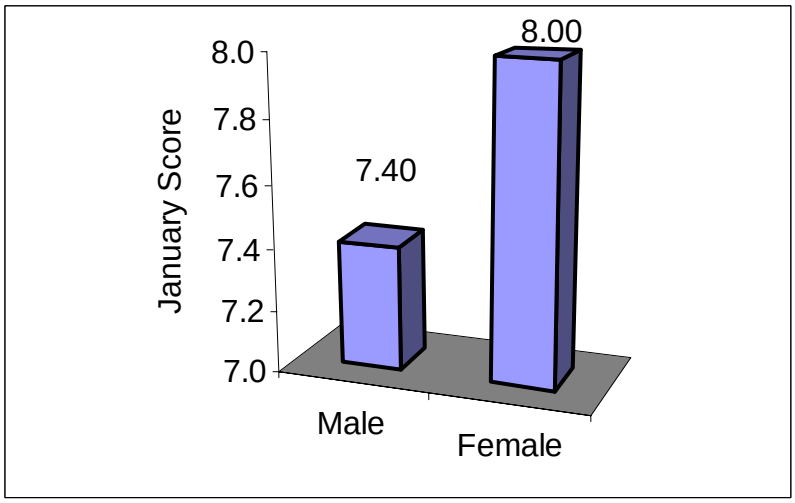

Figure B4e: Blending Means by Gender

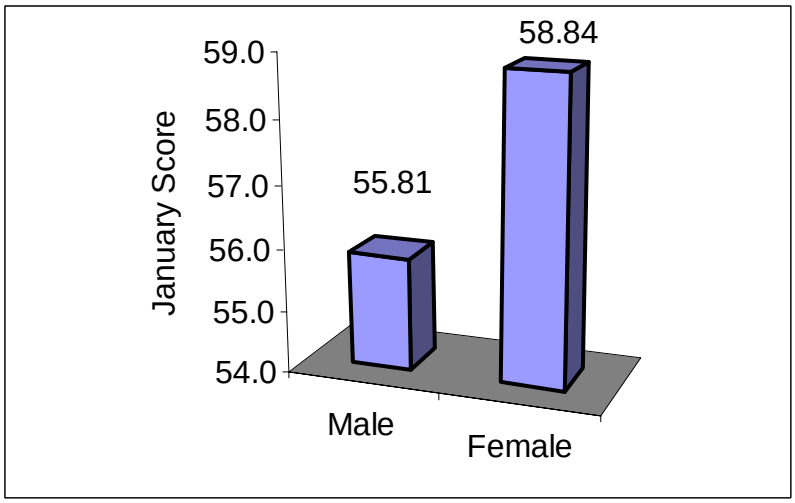

Figure B4f: Total Score-Part 1 Means by Gender