HANOVER RESEARCH

1101 Connecticut Ave. NW, Suite 300, Washington, DC 20036
P 202.756.2971 F 866.808.6585 www.hanoverresearch.com

FLES Evaluation Update Report 3: FLES Year 2, Title 1 School versus Non-FLES, Title 1 Schools

Prepared for Arlington Public Schools

This report is one part of a four-part series of update reports looking into the link between early childhood language training and student performance in other academic areas. Here, we focus solely on the comparisons among schoolchildren at a FLES Year 2, Title 1 School and at other non-FLES, Title 1 schools in the Arlington Public Schools district.

Key Findings

In this report, Hanover Research examines the benefits of early childhood language training in various non-language related areas among FLES Year 2, Title 1 School students enrolled in the FLES program. Students in non-FLES, Title 1 schools were used as the comparison group.

Please note that additional factors which were not taken into account by this study because of data limitations may be playing a role in explaining differences in student performances between FLES-enrolled students at the Year 2, Title 1 School and the comparison group of non-FLES students. We discussed some of these limitations in the earlier report.

Below, we present the key findings from this analysis.

Key Findings

Early Language Programs and Perceived Benefits in other Academic Areas

- The **data shows significant evidence of FLES-enrolled students at the FLES Year 2, Title 1 School deriving substantial academic benefits** from early childhood language training. Students enrolled in the Year 2, Title 1 School had significantly higher scores on the Reading, Science, and Social Studies areas of the Stanford 10 in Grade 4, and the Reading and Science SOL in Grade 5.
- Our analysis indicates that students enrolled at **FLES Year 2 School perform approximately 28 points better on the Reading section, 11 points better on the Science section, and 16 points better on the Social Studies section of the Stanford 10 exam in Grade 4** in comparison to non-FLES students. Similarly, the FLES Year 2, Title 1 School students on average also **perform 33 and 67 points better than non-FLES students on the Reading and Science areas of the SOL in Grade 5** when holding other factors constant.

- These results suggest **substantial academic benefits, particularly in the subject areas of Reading and Science**, as results indicated that FLES-enrolled students outperformed non-FLES students in both of these areas in Grade 4 and Grade 5 (as measured by the Grade 4 Stanford 10 and the SOL in Grade 5).

- Results from this comparison are particularly important as the data indicates no prior differences in student quality or performance as measured by the DRP in Grade 2. Based on this benchmark, we can be more confident that **the observed differences in student performances across FLES and non-**

FLES students in Grades 4 and 5 were due to benefits of the FLES program.

Trends in Student Performance across Each Grade

- DRP examination data, which was used to examine differences in the performances among **Grade 2** schoolchildren, indicates that the performance of students enrolled in the FLES Year 2, Title 1 School does not differ from its non-FLES enrolled counterparts. No differences were expected here as the Year 2, Title 1 School is a second FLES year school.

- Analysis of student performance in **Grade 3**, which was based solely on the SOL exam, does not indicate a significant difference in the performances of FLES and non-FLES students in any subject area. Results, however, indicate that there is a **statistically significant interaction between the effects of Limited English Proficient (LEP) status with FLES enrollment** when analyzing three scores (History, Math, and Science). There is also a **statistically significant interaction between the effects of gifted status with FLES enrollment** when analyzing Math and Science SOL scores.

- Student performance in **Grade 4** was based on student data from the DRP, SOL, and the Stanford 10 examinations, making it the most closely examined grade. Generally, when significant, results indicate **FLES-enrolled students at the FLES Year 2, Title 1 School to score higher on each test**. This was true for the Reading, Science, and Social Studies subject areas on the Stanford 10 exam.

- A **comparison of Grade 2 and Grade 4** DRP Instructional Score scores to measure student progress, however, indicates **no significant differences in the progress made by the FLES Year 2, Title 1 School or non-FLES schoolchildren**.

- Student performance in **Grade 5** was measured through the SOL. Results indicated a difference in the scores among these two groups for the Reading and Science SOL. Results indicated that a **FLES-enrolled student at the Year 2, Title 1 School scores approximately 33 points higher on the Reading SOL and 67 points higher on the Science SOL**, holding other factors constant. Results indicated no difference in the other areas tested by the SOL (Math and Writing) between FLES and non-FLES enrolled students.

Trends in Student Performance across Various Subject Areas

- The FLES was implemented in Grade 3 at the FLES Year 2, Title 1 School and exam results suggest that **students are gaining additional benefits in**

the areas of Reading and Science. Although results from the Grade 4 Reading SOL were not significant, results indicate that FLES-enrolled students perform better in the Stanford 10 Reading and the Grade 5 Reading SOL. Similarly, results clearly indicate that FLES-enrolled students perform better than non-FLES students in the Stanford 10 Science and the Grade 5 Science SOL.

- **DRP Exam results from Grade 2 and Grade 4 students indicate that there are no differences in the performances of FLES-enrolled students at the FLES Year 2, Title 1 School and non-FLES students** (as reflected by both the raw and instructional scores). There is **also no evidence indicating differences in progress** among students in the FLES program and their counterparts in the Grade 4 DRP.

- Results indicate **no differences between the groups in the History, Math, and Writing subject areas**. With the exception of Writing, these areas were tested in more than one grade. Students were tested in the area of History in Grades 3 and 4 and in the area of Math in Grades 3, 4, and 5.

- The Stanford 10 was the only exam used to differentiate among student performances in the area of Social Studies. **Results from the Social Studies area of the Stanford 10 indicate that FLES students were likely to perform better than other groups of students.**

Trends among entire population of students (ignoring FLES/non-FLES status)

- Without looking into the interaction effects and distinguishing among student performances by enrollment in FLES programs or otherwise, results for the various demographic factors indicate that:

    - Overall, higher school attendance generally has little impact on student performances. The variable was largely insignificant. However, when significant, the coefficient was positive – indicating gains in student scores with higher attendance.
    - The performance of disadvantaged students, regardless of FLES enrollment, is lower in comparison to non-disadvantaged students when the coefficient was significant.
    - Results similarly indicate that disabled students perform significantly lower than non-disabled students. The coefficient was negative and significant in analyzing results from most exams from Grades 3 to 5.
    - LEP status, regardless of FLES enrollment, has little impact on student performance.

- Gifted students score higher across each area and test consistently from Grade 2 through Grade 5.
- Our analysis indicates no evidence to indicate that either male or female students consistently outperform the other. However, when significant differences do arise, results indicate that male students generally perform better on the assessments analyzed in this report.
- There were no differences in the performances of Asian students and White students. Black students clearly performed lower on each test and across all grades in comparison to White or Asian students. Hispanic students do better relative to Black students, but worse in comparison to White or Asian students in four tests (Reading and Science in the Grade 3 SOL and History and Math in the Grade 4 SOL).

Section One: Methodology

In this particular update, we focus solely on the comparisons among schoolchildren at the FLES Year 2, Title 1 School and at other non-FLES, Title 1 schools in the Arlington Public Schools district. Otherwise, the methodology and analytical technique used in this report is identical to what is outlined in the Methodology section of the other FLES Evaluation update reports. The FLES and non-FLES schools used for comparison purposes in each update report are summed up below in Table 1. These four separate comparisons allow us to directly compare student performances across Grades 2 through 5, and examine for any **significant differences in academic performance between the groups of students enrolled in the FLES program compared to students not enrolled in the program.** Each individual regression is based on a test score from a particular year. Test dates are from 2006-07 to 2009-10. (Grade 2 2006-07, Grade 3 2007-08, Grade 4 2008-09, and Grade 5 2009-10).

The FLES schools in each comparison were two FLES Year 1 Schools, an FLES Year 2, Title 1 School, and the schools which implemented the FLES in the third year. Student performances at the FLES Year 1, Title 1 Schools were compared with other non-FLES Title 1 schools. The others which were not Title 1 were compared with all other non-FLES schools in general.

In all comparisons, the sample of students analyzed included only those students from both FLES and non-FLES schools who had been continuously enrolled from grades 2 through 5. We also exclude any data from Immersion schools.

Table 1: FLES and Non-FLES Schools Comparisons in Each Update Report

Update Report	FLES School	Comparison Group
1	FLES Year 1, Title 1 School	Title 1, Non-FLES Schools
2	FLES Year 1, non-Title 1 School	All Non-FLES Schools
3	FLES Year 2, Title 1 School	Title 1, Non-FLES Schools
4	FLES Year 3, non-Title 1 School	All Non-FLES Schools

We choose **multivariate regression** as our method of analysis for several reasons. Firstly, it is an important tool which can: (a) establish whether a group of independent variables are related to a particular outcome, and (b) indicate what proportion of the variation in the outcome (dependent variable) is explained by the predictors, at a given level of confidence. Thus, the relationship between a dependent variable and a set of independent variables is modeled as a linear regression equation which features a constant and a set of slope values, also called regression coefficients. The absolute value of the standardized regression coefficients can be compared to

one another in order to discern which independent variable or variables are more strongly related, and therefore more predictive of, the outcome of interest.

More importantly for the purposes of this study, the added advantage of using this method of analysis is that it also **takes into account the effect of all demographic factors** without having to weigh across different demographic areas (Race, Gender, Gifted Status, Disability, etc). As an example, suppose we are analyzing student performances on the Grade 2 DRP, as measured by the Raw Score based on the following three independent variables – gender, white, and disadvantaged status. Here, our hypothetical regression equation might look as follows:

$$\textbf{DRP Score} = \beta_0 + \beta_1 \textbf{Male} + \beta_2 \textbf{White} + \beta_3 \textbf{Disadvantaged},$$

where the $\beta_{\#}$ represents the coefficient from the multiple regression.

By including each of the three variables (gender, race, and disadvantaged status) in the regression, we are distinguishing or controlling for the effects of each of the different demographic factors by using these categorical variables as 'switches' which are equal to 1 if the individual exhibits a certain characteristic or zero if they do not.

If we code Male equal to one for males, then the β_1 coefficient on the Male variable gives us the difference in the scores between males and females, holding other factors constant and controlling for ethnicity and disadvantaged status. We can also see the hypothetical DRP score for a particular case of interest if we had coded White equal to one for white students, Disadvantaged equal to one for disadvantaged students. For example the DRP Score for:

- A Male who is of White ethnicity and disadvantaged is: $\beta_0 + \beta_1 + \beta_2 + \beta_3$.
- A Male who is of White ethnicity, not disadvantaged is: $\beta_0 + \beta_1 + \beta_2$.
- A Female of White ethnicity and disadvantaged is: $\beta_0 + \beta_2 + \beta_3$.
- A Female of non-White ethnicity, not disadvantaged is: β_0

Furthermore, in using multiple regressions, no additional tests are needed to examine if the differences in test scores among the different school-types were statistically significant (i.e. not due to chance). Results from the regression model include p-values which allow us to deduce this information. Regression coefficients and significance on each variable allow us to see the difference among two groups of students and more importantly, if these differences were statistically significant. For example, the coefficient on the FLES dummy variable (1 for FLES School and 0 for others) would quantify the difference in the performances of FLES-enrolled students vs. others enrolled in non-FLES programs, while controlling for the different demographic factors. The accompanying p-value would allow us to confidently conclude if these differences were statistically significant or due to chance alone.

In our analysis, we run a "stepwise regression" which is used to incorporate all variables of interest. In order to create a mirror demographic profile and control the effects of the different demographics, all of the variables given below in Table 3 were deliberately included in the regression. However, **please note that only the statistically significant "interaction variables" were included** in order to have the best fitting and most parsimonious specification. Additionally, please note that under some specifications, **post-regression tests also suggest that additional factors may be playing a role in explaining differences in student performances** between FLES and non-FLES enrolled students.

In the section below, we discuss the dependent variables and each of the independent variables, including a brief discussion of the various interaction variables.

Section 1.1: Dependent Variable

In our analysis, the dependent (Y) variable in each regression was the individual test/performance score in each grade. Student performance in Grade 2 was measured using data on student performance on the DRP examination. The SOL was used to measure student performance among Grade 3 and Grade 5 students. Student performance on the SOL, DRP, and the Stanford 10 were used to compare performances among Grade 4 children. We also created two new variables, DRP Raw Score Change and DRP 75 change to reflect student progress from Grade 2 to Grade 4 on the two scores reported from the DRP examinations. A regression was run for each exam and subject area, for a total of 21 regressions. Table 2 below lists the dependent variable of the various regressions run for each grade level. Note that we only use the scaled scores, raw score, or percentile rank data for the regression analysis, and not the performance level data.

Table 2: Grade Level, Exams, and Regression Dependent Variables

Grade	Dependent Variable (Score/Percentile Rank)
2	Grade 2 DRP Raw Score
2	Grade 2 DRP Instructional Score (p=.75)
3	Grade 3 History SOL
3	Grade 3 Math SOL
3	Grade 3 Reading SOL
3	Grade 3 Science SOL
4	Grade 4 History SOL
4	Grade 4 Math SOL
4	Grade 4 Reading SOL
4	Grade 4 DRP Raw Score
4	Grade 4 DRP Instructional Score (p=.75)

Grade	Dependent Variable (Score/Percentile Rank)
4	Grade 4 Stanford 10 Total Reading Percentile Rank
4	Grade 4 Stanford 10 Total Math Percentile Rank
4	Grade 4 Stanford 10 Science Percentile Rank
4	Grade 4 Stanford 10 Social Studies Percentile Rank
4	DRP Raw Score Change
4	DRP 75 Change
5	Grade 5 Math SOL
5	Grade 5 Reading SOL
5	Grade 5 Science SOL
5	Grade 5 Writing SOL

Section 1.2: Independent Variables

The dependent variables discussed above were modeled as a factor of various explanatory or independent variables. There were eight key independent variables of interest in our analysis, the majority of which related primarily to student demographics. These independent variables included a FLES School dummy variable, each of the demographic variables (Free/reduced lunch, SPED, LEP, Gifted, Race, Gender, School), the Number of Days Present in the Year and various "Interaction variables".

Most explanatory variables included in the regression analysis were also binary (0, 1) variables and equal to 0 or 1, depending on the demographic characteristic represented. The complete set of independent variables we examine are listed in Table 3. Various interaction terms were also included in the regression as independent variables. These are discussed in the next section.

Table 3: List of Independent Variables

Variable	Variable Type	Value
FLES School	Binary	Equal to 1 if FLES School, O otherwise
DaysPresent	Continuous	Number of days present in school year
DisAdvantaged	Binary	Equal to 1 if Student was economically disadvantaged during school year, 0 otherwise
SPED (disabled)	Binary	Equal to 1 if Student was disabled during school year, 0 otherwise
LEP	Binary	Equal to 1 if Student had LEP status, 0 otherwise
Gifted	Binary	Equal to 1 if student had Gifted status, 0 otherwise
Gender	Binary	Equal to 1 for male students, 0 for female students
Asian	Binary	Equal to 1 if student is of Asian ethnicity, 0 otherwise

Variable	Variable Type	Value
Black	Binary	Equal to 1 if student is of Black ethnicity, 0 otherwise
Hispanic	Binary	Equal to 1 if Student is of Hispanic ethnicity, 0 otherwise
American Indian	Binary	Equal to 1 if Student is of American Indian ethnicity, 0 otherwise

* Note that data for DaysPresent, Disadvantaged status, SPED, LEP, and gifted status pertain to each year/grade level and were included accordingly in analyzing performances at each grade level.

Section 1.3: Independent Variables – Interaction Variables

We also included several "Interaction variables" in the regressions to gather additional information on the **differences between student performances at FLES and non-FLES schools with regards to each individual demographic variable**. These dummy interaction variables were created by multiplying one binary variable with another. For example, the FLESGender variable was created using the FLES School and Gender variables. Note that the inclusion of interaction terms in regression analysis also requires the inclusion of the two individual variables from which it was created.

Using these interaction-type variables, we test whether the effects of various demographic factors is different among FLES and non-FLES students. For example, the inclusion of the aforementioned FLESGender variable in our regression models allows us to see if there exist significant differences in the performances of male students enrolled in FLES programs versus male students not enrolled in FLES programs. The coefficient on these variables gives us the marginal impact of the particular set of characteristics. A significant value of -5.36 for the FLESGender variable indicates that being male and in the FLES program has the additional impact of lowering the exam score by 5.36 points. Note, however, that this is not the total difference between the two groups of students.[1]

The complete list of these "Interaction variables" is listed in Table 4 below.

Table 4: Explanation of Interaction Variables

Interaction Variable	Variable Type	Value
FLESGender	Binary	Is equal to 1 if student is Male and enrolled in a FLES School
FLESAsian	Binary	Is equal to 1 if student is Asian and enrolled in a FLES School
FLESBlack	Binary	Is equal to 1 if student is Black and enrolled in a FLES School
FLESHispanic	Binary	Is equal to 1 if student is Hispanic and enrolled in a FLES School
FLESDisadvantaged	Binary	Is equal to 1 if student is Economically disadvantaged and enrolled in a

[1] For example, if regression results indicate: Score = β_0 - 14.44*FLES Dummy + 1.34 Gender – 5.36 FLESGender, then the score of (1) FLES, Male students = -18.46 (-14.44+1.34-5.36), (2) Non-FLES, Male Students = 1.34 (0+1.34+0). The difference in total score between these two students would be 19.8 points.

Interaction Variable	Variable Type	Value
		FLES School
FLESSPED (Disabled)	Binary	Is equal to 1 if student had disability status during school year and enrolled in a FLES School
FLESLEP	Binary	Is equal to 1 if student had LEP status and enrolled in a FLES School
FLESGifted	Binary	Is equal to 1 if student had Gifted Status and enrolled in a FLES School

Section 1.4: Methodological Changes from Earlier Version

The four-part updated set of reports follow the same methodology as the earlier report submitted to the Arlington Public Schools district, with one exception. We change our earlier methodology in using student attendance data. In the updated analysis, we modify the given attendance data and normalize it relative to the average i.e. we compute the difference in each student's school attendance relative to the average. This was done by first computing the average school attendance for each year (2007 through 2010) and then subtracting it from actual attendance during the school year.

This procedure was necessary because the variable *FLESdpYY* variable (*FLES * DaysPresYY)* proved to be significant in our regression analysis and was highly correlated with the *DaysPresYY* variable (where YY is the year). This was not a problem in the earlier analysis because the interaction variable was not significant in any of the regressions.

Section 1.5: Sample Size of the FLES Year 2, Title 1 School vs. Title 1 Comparison

In this comparison between FLES students at the FLES Year 2, Title 1 School and at other non-FLES, Title 1 schools, data from 39 FLES-enrolled schoolchildren at the FLES Year 2, Title 1 School is compared against 203 non-FLES students at other Title 1 schools. The complete breakdown of students by schools is given below.

Table 5: Number of Students from Non-FLES, Title 1 Schools

School Name	Number of Students
Abingdon	23
Barrett	36
Campbell	19
Carlin Springs	40
Drew	53
Hoffman Boston	32
Grand Total	**203**

Section Two: FLES Evaluation Results

In the first part of our analysis (Section 2.1), we provide an overview of the major results and discuss the main trends in student performances. We also examine student performances across various demographic factors, specifically without looking into the interaction effects. For example, in this first section we examine if male students were likely to perform better than female students, without distinguishing between the performances of male FLES students versus male non-FLES students.

In the next section (Section 2.2), wherein we provide the regression results by grade level and type of exam, we focus solely on the interaction terms and on the differences in performance between FLES and non-FLES students across each demographic group. Please note that in this latter section, we limit our discussion of regression results specifically to the FLES terms (the FLES School dummy and the various FLES interaction terms).

Section 2.1: Overall Results

Overall, our analysis indicates that **FLES-enrolled students derive additional benefits from early childhood language training, particularly in the areas of Reading and Science (Table 6).** Regression analysis shows the coefficients on the FLES School dummy to be positive and significant for the Reading, Science, and Social Studies areas of the Stanford 10 in Grade 4, and the Reading and Science SOL in Grade 5. This indicates that there is statistical evidence to conclude that the FLES Year 2, Title 1 School students did better than non-FLES students in these exams.

Table 6: Summary of Results for FLES School Dummy

Grade	Exam	FLES School Dummy Coefficient[2]
2	Grade 2 DRP Raw Score	-0.88
2	Grade 2 DRP Instructional Score (p=.75)	-3.44
3	Grade 3 History SOL	31.99
3	Grade 3 Math SOL	41.40
3	Grade 3 Reading SOL	-17.02
3	Grade 3 Science SOL	23.38
4	Grade 4 History SOL	17.57
4	Grade 4 Math SOL	42.05
4	Grade 4 Reading SOL	2.52
4	Grade 4 DRP Raw Score	-2.72
4	Grade 4 DRP Instructional Score (p=.75)	-3.44
4	Grade 4 Stanford 10 Total Reading Percentile Rank	27.64**

[2] By itself, the coefficient on the FLES School dummy variable gives the score of a FLES student holding other factors constant or when all other binary type variables included in the model equal zero. For a description of each binary variable, including what the 0/1 coding represent, please see Table 4.

Grade	Exam	FLES School Dummy Coefficient[2]
4	Grade 4 Stanford 10 Total Math Percentile Rank	-7.77
4	Grade 4 Stanford 10 Science Percentile Rank	11.45**
4	Grade 4 Stanford 10 Social Studies Percentile Rank	15.61*
5	Grade 5 Math SOL	-16.96
5	Grade 5 Reading SOL	32.52*
5	Grade 5 Science SOL	67.07**
5	Grade 5 Writing SOL	1.38

* p<.05, ** p<.01, *** p<.001

- *Overall Results: Interaction Terms* – In general, results using the interaction terms **did not indicate major differences between the FLES Year 2, Title 1 School and others**. The majority of the stepwise regressions models used to distinguish among the performances of FLES and non-FLES students across demographic areas in grades 2, 3, 4, and 5 included only a few interaction terms, if at all. We cover the results of regression analysis from each exam and grade following the discussion of overall results.
- *Overall Results: Days Present* – Ignoring FLES enrollment status, **higher school attendance has little impact on student performances**. The DaysPresYY variable (where YY is the year), was largely insignificant. Although when it was significant (in 2 out of 21 instances), it was always positive.
- *Overall Results: Disadvantaged Status* – Similarly, results also indicate that the **performance of disadvantaged students, regardless of FLES enrollment, is consistently lower in comparison to non-disadvantaged students** when results show the variable to be significant.
- *Overall Results: SPED (Disabled Status)* – Results clearly indicate a lower-performing trend among students with disabilities. Results from all regression models indicate that **disabled students score significantly lower on the assessments when compared with non-disabled students**. The coefficient on the variable was negative and significant in analyzing most exam results from Grade 3 to Grade 5. It is also interesting to note that the values here were also more negative than for the Disadvantaged variable, indicating that **disability status has a more negative impact on student performance than disadvantaged status**.
- *Overall Results: LEP* – LEP status, was largely insignificant, indicating that LEP **status, by itself, is a non-factor in determining student performance**. The coefficient on the LEP variable was not significant in 19 of the 21 regressions run.
- *Overall Results: Gifted* – Results clearly indicate that **gifted students score higher across each area and test consistently from Grade 2 through**

Grade 5. The coefficient on the variable was always positive and strongly significant at the 0.001 level of confidence.

- *Overall Results: Gender* – Our analysis indicates no evidence to suggest that male students perform better than females based on the overall set of results, although results for some individual tests were positive and significant, indicating that in these instances, male students had significantly higher scores than female students. It is interesting to note that this was true for the Math SOL among Grade 3 students, the DRP and Stanford 10 Science in Grade 4, and the Science and Math SOL in Grade 5.
- *Overall Results: Asian* – Across all regressions, results indicate that there were no **differences in the performances** of Asian students and White students, who were used as the reference group. The coefficient on the Asian variable was consistently insignificant.
- *Overall Results: Black* – Black students clearly **performed lower on each test and across all grades** in comparison to White or Asian students. The coefficient on the Black variable was always negative and highly statistically significant.
- *Overall Results: Hispanic* – Similar to Black students, results indicate that Hispanic students also performed lower than white students. However, the results indicate the majority of the coefficients to be insignificant (in 17 out of 21 regressions). When significant, however, the coefficients were consistently negative. It is also interesting to note that the coefficients on the Hispanic variable are consistently less negative than on the Black variables across all regressions. This indicates that **Hispanic students perform better relative to Black students, but worse in comparison to White or Asian students on the Reading and Science SOL in Grade 3 and the History and Math SOL in Grade 4.**

Section 2.2: Regression Results by Grade level and Examination

Next, we provide results from each of the twenty-one different regressions across Grades 2 through 5. Our discussion in this section focuses primarily on the differences in performances of FLES versus non-FLES enrolled students.

Grade Two

Student performance on the DRP exam was the only available data to distinguish academic performance among Grade 2 students enrolled in the FLES Year 2, Title 1 School or otherwise. Please note that only the raw score on the DRP and the instructional score were provided. The instructional score indicates the most difficult

text a student can read and understand with teachers' or parents' help.[3] Independent DRP Scores, which indicate the most difficult text a student can read and understand without any help, were not provided.

Grade 2 DRP Raw Scores and Grade 2 DRP Instructional Score

Table 7 below gives the table of regression results used to compare student performances in Grade 2. Here, we use the two scores (raw and instructional) from the Grade 2 DRP examination.

- The FLES program was implemented starting in Grade 3 at the FLES Year 2, Title 1 School. Hence, as expected, our analysis indicates that there is **no difference in either of the DRP scores** (raw and instructional) when comparing the FLES Year 2, Title 1 School students and others in Grade 2. There are also no observed differences when taking into account the interaction with the various demographic factors.
- The exam results here from Grade 2 students prior to the start of FLES enrollment also allows us to establish a benchmark and gauge student quality across the FLES Year 2, Title 1 School and non-FLES schools. As the difference in student scores between the two groups were not significant, we can be more confident that the observed differences between the two groups in later grades is due to the FLES program, and not due to differences in student ability or quality.
- Results from both regressions are almost identical with respect to the sign on the coefficients and statistical significance level for each of the other non-interaction independent variables.
- Across both sets of regression results, results from the interaction terms indicate that the effect of various demographic factors and FLES enrollment was not statistically different in analyzing both DRP Raw and Instructional Scores.

Table 7: Regression Results - Grade 2 DRP Exam Performance Comparison

Variable	Grade 2 DRP Raw Score	Grade 2 DRP Instructional Score (p=.75)
FLES School	-0.88	-3.44
FLESGender		
FLESAsian		
FLESBlack		
FLESHispanic		
FLESdp2007		
FLESDisadvantaged07		

[3] San Diego Unified School District, "DRP Frequently Asked Questions", https://studata.sandi.net/assessment/drp_faq.asp#Q4

Variable	Grade 2 DRP Raw Score	Grade 2 DRP Instructional Score (p=.75)
FLESSPED (Disabled)07		
FLESLEP07		
FLESGifted07		
DaysPres07	0.15	0.25
Disadv2007	-0.87	-1.67
Disabled2007	-7.03	-10.61
LEP2007	-4.14	-8.25*
Gifted2007	6.47***	11.07***
Student Gender	2.25	3.36
Asian	-0.46	-2.22
Black	-8.05***	-14.87***
Hispanic	-3.16	-7.12
Constant	32.10***	49.12***

* p<.05, ** p<.01, *** p<.001
Note: Blank cells indicate that the variable was not significant and was thus not included in the model.

Grade Three

Among Grade 3 students, individual scores from the SOL examination in four areas – English, Mathematics, Science, and History/Social Science – were used to distinguish between the academic performances of the FLES Year 2, Title 1 School and non-FLES students. Table 8 contains the complete regression results.

Grade 3 SOL Exam Results

- Analysis of student performances in all Grade 3 examinations indicates that there are **no differences in the performance of FLES-enrolled at the FLES Year 2, Title 1 School** in comparison to students at other non-FLES, Title 1 schools based on FLES enrollment alone. The coefficient on the FLES school dummy variable was always insignificant.
- However, several results from the interaction terms were significant and included in the regression model based on the stepwise procedure. There were **significant differences** between the performances of FLES and non-FLES students **based on their LEP and gifted status**.
- Results from the History, Math, and Science SOL in Grade 3 indicate that FLES-enrolled students with LEP status have a lower score in comparison to students with LEP status at non-FLES schools.

- Similarly, results indicate that gifted students at the FLES Year 2, Title 1 School perform lower on the Math and Science SOL in Grade 3 than their counterparts in non-FLES programs.

Table 8: Regression Results - Grade 3 SOL Exam Performance Comparison

Variable	Grade 3 History SOL	Grade 3 Math SOL	Grade 3 Reading SOL	Grade 3 Science SOL
FLES School	31.99	41.40	-17.02	23.38
FLESGender				
FLESAsian				
FLESBlack				
FLESHispanic				
FLESdp2008				
FLESDisadvantaged08				
FLESSPED (Disabled)08				
FLESLEP08	-112.20***	-65.07*		-61.49**
FLESGifted08		-85.50**		-76.92**
DaysPres08	0.74	1.40*	0.39	0.81
Disadv2008	-13.28	-28.75*	-18.15	-23.21*
Disabled2008	-64.81***	-83.27***	-60.93***	-47.56***
LEP2008	8.50	4.56	-3.64	-7.68
Gifted2008	62.77***	70.33***	64.18***	56.67***
Student Gender	15.29	21.54*	-3.94	11.53
Asian	-10.67	4.74	-1.32	-7.29
Black	-69.61***	-56.10***	-58.62***	-70.45***
Hispanic	-25.71	-20.41	-38.68**	-33.92*
Constant	520.19***	506.06***	495.26***	511.71***

* p<.05, ** p<.01, *** p<.001

Note: Blank cells indicate that the variable was not significant and was thus not included in the model.

Grade 4

Results from three exams given to Grade 4 students in FLES and non-FLES schools were analyzed. These included the DRP, SOL, as well as the Stanford 10. In addition, we also use student performances on the Grade 2 and Grade 4 DRP examinations to measure progress between FLES and non-FLES students. We discuss the results from each below.

Grade 4 DRP Raw Scores and Grade 4 DRP Instructional Score

Table 9 gives the regression results comparing student performances in the Grade 4 DRP examination – firstly using the DRP raw score as the dependent variable and then the instructional score. Similar to results from the Grade 2 DRP, results from both models again were almost identical with regards to the FLES dummy:

- The FLES school dummy was insignificant in both models, indicating **no difference in the DRP scores** of the FLES Year 2, Title 1 School and non-FLES students.
- For both regression models, the following interaction variables – FLESBlack, FLESdp2009 and FLESSPED were included by the stepwise regression model, indicating that there is a significant difference in the Grade 4 DRP Scores based on these demographic variables.
- Results indicate that a **Black or a disabled student enrolled in a FLES program will have a higher raw and institutional score** in comparison to a Black or a disabled student enrolled in a non-FLES school.
- Although **attendance** by itself is not significant in explaining student performance, it is significant when taking into account FLES enrollment. Results indicate that a FLES student who attends each additional day of school more than the overall average actually faces decreases in their DRP exam scores.

DRP Progress: Grade 2 to Grade 4

The last two columns of Table 9 give regression results measuring the effects of various factors on student progress on the DRP. Results indicate that there is **no difference among FLES and non-FLES students** in terms of their gains on the DRP Raw or Instructional Scores:

- The FLES school dummy was insignificant, indicating that FLES students showed no difference in score gains as compared to non-FLES students.
- Results, however, indicate significant differences in student progress on the DRP (reflected by the raw score) with the interaction between demographic

factors and FLES enrollment. Black students in the FLES program show more progress on the DRP than their counterparts in the non-FLES program. Similarly, results also indicate significant differences with respect to disability and LEP status and FLES enrollment. Disabled or LEP students show more progress on the DRP than students not enrolled in the FLES program.

Table 9: Regression Results - Grade 4 DRP Exam Performance Comparison

Variable	Grade 4 DRP Raw Score	Grade 4 DRP Instructional Score (p=.75)	DRP Raw Score Change	DRP 75 Change
FLES School	-2.72	-3.44	-0.54	4.67
FLESGender				
FLESAsian				
FLESBlack	20.47**	25.90**	11.26***	
FLESHispanic				
FLESdp2009	-0.58*	-0.93**	-0.79***	
FLESDisadvantaged09				
FLESSPED (Disabled)09	13.78**	16.02**	19.32***	
FLESLEP09			5.66*	
FLESGifted09				
DaysPres09	-0.08	-0.10	0.07	0.09
Disadv2009	-3.52*	-4.56*	-2.19	-2.83
Disabled2009	-11.95***	-13.93***	-5.51	-3.63
LEP2009	-3.13	-5.04*	-0.57	0.93
Gifted2009	8.66***	10.66***	0.71	-1.59
Student Gender	2.51*	2.53	0.82	-0.89
Asian	-0.92	-1.40	-1.37	-0.72
Black	-7.74***	-9.80***	-3.75	-1.14
Hispanic	-4.46	-5.22	-1.75	-0.52
Constant	39.49***	56.05***	10.55***	12.58***

* p<.05, ** p<.01, *** p<.001
Note: Blank cells indicate that the variable was not significant and was thus not included in the model.

Grade 4 History SOL

Table 10 below gives the regression results in comparing student performances in each of the various areas of the SOL examination given to Grade 4 students. Regression results for the History SOL indicate that:

- The FLES school dummy was insignificant, indicating that there was **no difference in the scores of FLES and non-FLES students**.

- None of the interaction terms were significant or included in the model, indicating that there were no significant differences in the performance of students enrolled in FLES versus Non-FLES programs across any demographic factor examined.

Grade 4 Math SOL

Results for the Math SOL indicate similar results to the History SOL.

- The FLES school dummy was again insignificant, indicating that there was **no difference i**n the scores of FLES and non-FLES students.
- Of the interaction terms, the FLESLEP and the FLESGifted variables were negative and significant. Both **LEP and Gifted students in the FLES programs score lower** on the Grade 4 Math SOL as compared to LEP or Gifted students not enrolled in FLES programs.
- Overall, results indicated no differences in the performance of FLES and non-FLES students across the other demographic factors.

Grade 4 Reading SOL

Results for the Grade 4 Reading SOL were again very similar to the results from the History SOL.

- The FLES School dummy was insignificant, indicating that there were **no significant differences** in the Reading SOL performance of students enrolled in FLES programs versus those who were not.
- None of the interaction variables were significant, indicating no differences in the performance of FLES or non-FLES students across any of the demographic factors analyzed in this study.

Table 10: Regression Results - Grade 4 SOL Exam Performance Comparison

Variable	Grade 4 History SOL	Grade 4 Math SOL	Grade 4 Reading SOL
FLES School	17.57	42.05	2.52
FLESGender			
FLESAsian			
FLESBlack			
FLESHispanic			
FLESdp2009			
FLESDisadvantaged09			
FLESSPED (Disabled)09			

Variable	Grade 4 History SOL	Grade 4 Math SOL	Grade 4 Reading SOL
FLESLEP09		-83.85**	
FLESGifted09		-67.00*	
DaysPres09	0.56	1.23*	0.60
Disadv2009	-20.78	-21.11	-15.42
Disabled2009	-49.58***	-60.11***	-50.83***
LEP2009	6.01	15.87	-0.63
Gifted2009	62.54***	79.28***	79.07***
Student Gender	12.14	15.27	9.94
Asian	-17.86	-10.95	-16.67
Black	-44.61**	-50.78**	-50.44**
Hispanic	-38.52*	-32.87*	-35.56
Constant	455.43***	484.26***	477.39***

* p<.05, ** p<.01, *** p<.001
Note: Blank cells indicate that the variable was not significant and was thus not included in the model.

Grade 4 Stanford 10

Table 11 below gives the regression results of the comparison of student percentile rankings in the four areas of the Stanford 10 examination given to Grade 4 students (Reading, Math, Science, and Social Science). We discuss the results from all sections of the Stanford 10 below:

- The FLES variable was significant in examining student performances on the Reading, Science, and Social Studies areas. Results indicated that the **performance of FLES-enrolled students in these three subject areas was higher** than among those who were not enrolled in FLES programs. However, there is not enough evidence to suggest any differences among the two groups of students in the Math subject area.
- Results from the regressions indicated a **significant difference in the performance of FLES and non-FLES students across race**. Results indicate that Black students enrolled in the FLES program perform better on the Grade 4 Stanford 10 Math, Science, and Social Science in comparison to Black students enrolled in non-FLES schools. Similarly, Hispanic students enrolled in the FLES program perform better than their counterparts on the Social Studies subject area.
- Results also indicate that **students with LEP status enrolled in the FLES Year 2, Title 1 School perform lower** than their counterparts not enrolled in the program across the Reading, Science, and Social Studies areas of the Stanford 10. There is a similar trend among gifted students in the FLES program and their performances in the Social Studies area of the Stanford 10. Results also indicate that being a gifted student in a FLES school has a

negative marginal impact on Grade 4 Stanford 10 Reading scores when compared with gifted students in non-FLES programs.

Table 11: Regression Results - Grade 4 Stanford 10 Performance Comparison

Variable	Grade 4 Stanford 10 Total Reading Percentile Rank	Grade 4 Stanford 10 Total Math Percentile Rank	Grade 4 Stanford 10 Science Percentile Rank	Grade 4 Stanford 10 Social Studies Percentile Rank
FLES School	27.64**	-7.77	11.45**	15.61*
FLESGender				
FLESAsian				
FLESBlack		38.01*	21.96**	23.04**
FLESHispanic				33.09*
FLESdp2009				
FLESDisadvantaged09				
FLESSPED (Disabled)09		31.47**		
FLESLEP09	-33.71**		-22.88*	-32.76**
FLESGifted09	-25.16*			-23.37***
DaysPres09	0.24	-0.16	-0.03	-0.13
Disadv2009	-3.16	-2.14	-9.89*	-11.58**
Disabled2009	-18.97***	-21.64***	-9.70	-11.61*
LEP2009	-2.94	2.33	-2.10	-2.18
Gifted2009	26.41***	21.37***	16.42***	22.26***
Student Gender	2.10	4.47	7.95*	4.67
Asian	-3.54	1.34	0.88	-3.48
Black	-16.96**	-20.16***	-16.78**	-17.01**
Hispanic	-10.96	-7.77	-2.72	-8.06
Constant	60.27***	65.32***	70.70***	66.10***

* p<.05, ** p<.01, *** p<.001

Note: Blank cells indicate that the variable was not significant and was thus not included in the model.

Grade 5

Results from the SOL exam are used to compare the performances of Grade 5 students at FLES schools and others. Regression results indicate significant differences between the two groups of students across the Reading and Science areas of the SOL exam.

Grade 5 SOL Exam Results

- Results indicate that **FLES-enrolled students scored approximately 33 point higher** on the Grade 5 Reading SOL and 67 points higher on the Science SOL than students enrolled in non-FLES programs.
- However, results also indicate **that gifted students enrolled in the FLES Year 2, Title 1 School performed lower** than their peers at non-FLES programs in the Reading and Science SOL.
- The same is also true among LEP students enrolled in the FLES Year 2, Title 1 School, who score lower than their counterparts at the non-FLES program in the Science and Writing SOL.
- The FLES school dummy was insignificant in comparing student performances on the Math and Writing SOL, indicating that there was no difference in the scores of FLES and non-FLES students in these two areas based on FLES enrollment alone.

Table 12: Regression Results – Grade 5 SOL Examination Comparison

Variable	Grade 5 Math SOL	Grade 5 Reading SOL	Grade 5 Science SOL	Grade 5 Writing SOL
FLES School	-16.96	32.52*	67.07**	1.38
FLESGender				
FLESAsian				
FLESBlack				
FLESHispanic				
FLESdp2010				
FLESDisadvantaged10				
FLESSPED (Disabled)10				
FLESLEP10			-61.44**	-44.02*
FLESGifted10		-58.99**	-89.79***	
DaysPres010	0.10	0.15	0.18	-0.01
Disadv2010	-14.30	-5.61	-18.12*	-7.06
Disabled2010	-61.99***	-44.91***	-35.52***	-44.40***
LEP2010	-14.34	-19.21	-3.87	10.83
Gifted2010	62.77***	65.80***	71.23***	44.26***
Student Gender	23.47*	13.70	21.25**	-8.21
Asian	20.95	15.05	-0.67	-6.57

Variable	Grade 5 Math SOL	Grade 5 Reading SOL	Grade 5 Science SOL	Grade 5 Writing SOL
Black	-37.59*	-45.55**	-27.83*	-21.43
Hispanic	-17.93	-29.22	-21.36	-8.17
Constant	505.57***	473.85***	465.80***	462.02***

* p<.05, ** p<.01, *** p<.001
Note: Blank cells indicate that the variable was not significant and was thus not included in the model.

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