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FLES Evaluation Update Report 1: FLES Year 1, 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 an FLES Year 1, 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 the FLES Year 1, 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 data limitations may be playing a role in explaining differences in student performances between FLES-enrolled students at the FLES Year 1, Title 1 School and the comparison group of non-FLES students. For one, students at the two FLES Year 1 Schools may not be representative of the entire population of FLES enrolled students. It could also be the case that the quality of the students from these two schools may not be the same as the quality of students from other non-FLES schools. Future research efforts in this area might involve an analysis of data from both FLES and non-FLES students prior to FLES enrollment. For example, data from a standardized exam in Grade 1 could be used to compare the quality and ability of students prior to FLES enrollment to develop a baseline and see if there is an underlying difference between the two groups of students to begin with.

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 Year 1, Title 1 School enrolled students deriving substantial academic benefits** from early childhood language training. Students enrolled in the FLES Year 1, Title 1 School had significantly higher scores on the History and Math SOL in Grade 3, the Reading SOL and the Science and Social Studies areas of the Stanford 10 in Grade 4, and the Writing SOL in Grade 5.

- Regression results indicate students at the FLES Year 1, Title 1 School have approximately 45 points and 28 points higher on the History SOL and Math SOL in Grade 3, holding other factors constant. Similarly, results from Grade 4 indicate that FLES students score 29 points higher on the Reading SOL and approximately 7 and 11 percentile points higher on the Science and Social Studies sections of the Stanford 10 in comparison to non-FLES students. Lastly, results from Grade 5 show the FLES Year 1, Title 1 School students to score about 34 points higher than non-FLES students in the Grade 5 Writing SOL. However, because all of these significant results were in different

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subject areas and across different grade levels, the results do not suggest consistent academic benefits in any subject area in particular.

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 1, Title 1 School does not differ** from its non-FLES counterparts. Results also indicate that there is a statistically significant interaction between the effects of Limited English Proficient (LEP) status with FLES enrollment when analyzing both Grade 2 DRP Scores.

- Analysis of student performance in **Grade 3**, which was based solely on the SOL exam, indicates a significant difference in the performances of FLES and non-FLES students in the History and Math SOL. Results indicate that **Grade 3 History and Math SOL scores were higher among FLES-enrolled schoolchildren at the FLES Year 1, Title 1 School.** However, there was no difference in the performances on the Reading and Science SOL.

- 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 1, Title 1 School to score higher on each test**. This was true for the Reading SOL and the Social Studies and Science areas on the Stanford 10 exam.

- A **comparison of Grade 2 and Grade 4** DRP Instructional Score scores to measure student progress also indicates **no significant differences in the progress made by FLES 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 only for the Writing SOL. Results indicated that a **FLES-enrolled student scores 34 points higher on the Grade 5 Writing SOL**, holding other factors constant. Besides the Writing SOL, results indicated no difference in any other of the other areas tested by the SOL (Reading, Science, and Math) between FLES and non-FLES enrolled students.

Trends in Student Performance across Various Subject Areas

- **DRP Exam results from Grade 2 and Grade 4 students indicate that there are no differences in the performances of FLES-enrolled students and non-FLES students** (as reflected by both the raw and instructional

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scores). There is **also no evidence indicating difference in progress** among students in the FLES program and their counterparts in the Grade 4 DRP.

- Results indicate **no consistent differences between the groups in all subject areas**. With the exception of Social Studies and Writing, each subject area was tested in more than one grade. However, as mentioned earlier, significant differences were observed for a subject area in a single grade level only.

- The Stanford 10 was the only exam used to differentiate among student performances in the areas of Social Studies and Writing. **Results from the Writing and Social Studies areas 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.
  - Similarly, the performance of disadvantaged students, regardless of FLES enrollment, is lower in comparison to non-disadvantaged students across each exam and grade when the coefficient was significant.
  - Results indicate unanimously that disabled students perform significantly lower than non-disabled students. The coefficient was negative and significant in analyzing each exam at all grade levels.
  - LEP status, regardless of FLES enrollment, has no impact on student performance.
  - Gifted students score higher across each area and test consistently higher 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

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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.

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Section One: Methodology

In our research, we use a multivariate regression to examine differences in test scores among students from FLES-affiliated schools versus students from the non-FLES schools. 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.** Scores from all tests across all years were used. 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 Program Description	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.

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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, race, 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

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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)
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

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Grade	Dependent Variable (Score/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
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.

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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 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

[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.

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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 an issue 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 1, Title 1 School vs. Title 1 Comparison

In this particular update, data from 38 FLES-enrolled schoolchildren at the FLES Year 1, 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**

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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 the 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 **some evidence of FLES-enrolled students deriving additional benefits from early childhood language training**. Regression analysis shows the coefficients on the FLES School dummy to be positive and significant for the History and Math SOL in Grade 3, the Reading SOL and the Science and Social Studies areas of the Stanford 10 in Grade 4, and the Writing SOL in Grade 5. This indicates that there is statistical evidence to conclude that FLES 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	-1.11
2	Grade 2 DRP Instructional Score (p=.75)	0.99
3	Grade 3 History SOL	45.49***
3	Grade 3 Math SOL	27.77*
3	Grade 3 Reading SOL	-6.50
3	Grade 3 Science SOL	2.81
4	Grade 4 History SOL	5.70
4	Grade 4 Math SOL	13.94
4	Grade 4 Reading SOL	28.50*
4	Grade 4 DRP Raw Score	0.01
4	Grade 4 DRP Instructional Score (p=.75)	0.01
4	Grade 4 Stanford 10 Total Reading Percentile Rank	4.17

[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.

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Grade	Exam	FLES School Dummy Coefficient[2]
4	Grade 4 Stanford 10 Total Math Percentile Rank	4.47
4	Grade 4 Stanford 10 Science Percentile Rank	7.42*
4	Grade 4 Stanford 10 Social Studies Percentile Rank	11.42*
5	Grade 5 Math SOL	17.21
5	Grade 5 Reading SOL	7.91
5	Grade 5 Science SOL	0.71
5	Grade 5 Writing SOL	34.16**

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

- *Overall Results: Interaction Terms* – In general, results using the interaction terms **did not indicate major differences between FLES students 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 3 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 low-performing trend among students with disabilities. Results from all regression models indicate that **disabled students perform significantly lower on the assessments than non-disabled students**. The coefficient on the variable was negative and significant in analyzing each exam at all grade levels. 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 20 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.

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- *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. However, when significant, the coefficient was largely positive – 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 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, which 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. The coefficients were consistently negative and significant. However, it is 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 do better relative to Black students, but worse in comparison to White or Asian students.**

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 FLES programs or otherwise. Please note that only students' 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 were provided and used in our analysis.[3] Independent DRP Scores, which indicates the most difficult text a student can read and understand without any help, were not provided.

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

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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.

- Our analysis indicates that there is **no evidence indicating differences** in both DRP scores (raw and instructional) between FLES-enrolled students and others.
- Results from the interaction terms indicate that the **effect of LEP status** was significantly different among FLES and non-FLES students in analyzing both DRP Raw and Instructional Scores. The **effects of race (Asian)** and **disadvantaged status** were also significantly different among FLES and non-FLES students in analyzing the DRP Instructional Scores.
- Results show a significant difference in the performance of LEP students enrolled in FLES and non-FLES schools. Our analysis indicates that **performance of LEP students as reflected by both the Raw and Instructional scores is significantly higher** in FLES-affiliated schools as compared to otherwise.
- However, results also indicate **Asian or disadvantaged students enrolled in the FLES Year 1, Title 1 School have a significantly lower** score than their counterparts in non-FLES schools.

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	-1.11	0.99
FLESGender		
FLESAsian		-29.36***
FLESBlack		
FLESHispanic		
FLESdp07		
FLESDisadvantaged07		-10.31*
FLESSPED (Disabled)07		
FLESLEP07	14.13**	31.35***
FLESGifted07		
DaysPres2007	0.17	0.32**
Disadv2007	-2.00	-1.52
Disabled2007	-6.26*	-10.00*
LEP2007	-2.80	-8.21**

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Variable	Grade 2 DRP Raw Score	Grade 2 DRP Instructional Score (p=.75)
Gifted2007	6.86***	10.51***
Student Gender	2.28	3.66
Asian	-2.10	-1.84
Black	-8.50***	-15.93***
Hispanic	-5.77*	-9.74**
Constant	32.86***	49.58***

* 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 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 FLES and non-FLES students. Table 8 contains the complete regression results.

Grade 3 History SOL

- Analysis indicates that **FLES-enrolled students at the FLES Year 1, Title 1 School perform higher on the Grade 3 history SOL** in comparison to students at other non-FLES, Title 1 schools. The coefficient on the FLES school dummy variable was positive and significant.
- None of the interaction terms were significant or included in the regression model based on the step-wise procedure. This indicated that there were no significant differences between the performances of FLES and non-FLES students based on their Gender, Race, Attendance, or Disadvantaged, Disability, Gifted or LEP status.

Grade 3 Math SOL

- The FLES School Dummy was significant, indicating that there is a **difference in the performance of FLES compared to non-FLES students** in the Grade 3 Math SOL.
- Although FLES enrollment was significant by itself, it is not significant when taking into account student Gender, Race, Attendance, or Disadvantaged, Disability, Gifted or LEP status.

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Grade 3 Reading SOL

- Regression result for the FLES School Dummy does not indicate significant differences in the Grade 3 Reading SOL scores among FLES enrolled schoolchildren. The coefficient on the variable was insignificant.
- Of all interaction variables, only the FLESBlack variable was significant. Results here indicate that a Black student in a FLES school has a greater marginal impact on Grade 3 Reading SOL score than among Black students in non-FLES schools.
- Our analysis indicates no difference in the performances of FLES and non-FLES students based on student gender, school attendance, disadvantaged, disabled, gifted or LEP status.

Grade 3 Science SOL

- The FLES School Dummy indicates that the performance of FLES and non-FLES students on the Grade 3 Science SOL was not significantly different.
- Regression results indicate none of the interaction variables to be significant.

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	45.49***	27.77*	-6.50	2.81
FLESGender				
FLESAsian				
FLESBlack			64.89*	
FLESHispanic				
FLESdp08				
FLESDisadvantaged08				
FLESSPED (Disabled)08				
FLESLEP08				
FLESGifted08				
DaysPres2008	0.81	2.02**	0.79	0.27
Disadv2008	-17.16	-28.89**	-20.05*	-24.43*
Disabled2008	-54.11***	-79.46***	-61.08***	-39.75***
LEP2008	7.92	9.79	-2.53	3.41
Gifted2008	57.68***	67.34***	76.14***	53.67***
Student Gender	14.34	17.64*	-2.75	9.84
Asian	-4.89	2.87	-1.73	-16.50
Black	-65.73***	-50.58***	-55.57***	-71.43***

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Variable	Grade 3 History SOL	Grade 3 Math SOL	Grade 3 Reading SOL	Grade 3 Science SOL
Hispanic	-24.41	-25.01	-29.85*	-40.03**
Constant	519.38***	505.18***	488.60***	510.39***

* 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

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 FLES and non-FLES students.
- For both regression models, none of the interaction variables were included by the step-wise regression model, indicating that there was no difference in the Grade 4 DRP Scores based on any of the demographic variables.

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 also indicate significant differences in student progress on the DRP (reflected by the raw score) with race and FLES enrollment. **Asian and Hispanic students in the FLES program show more progress** on the DRP than their counterparts in the non-FLES program.

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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	0.01	0.01	-2.85	-2.62
FLESGender				
FLESAsian			8.23**	
FLESBlack				
FLESHispanic			7.89**	
FLESdp2009				
FLESDisadvantaged09				
FLESSPED (Disabled)09				
FLESLEP09				
FLESGifted09				
DaysPres2009	-0.07	-0.09	0.09	0.04
Disadv2009	-4.53**	-5.64**	-2.13	-0.42
Disabled2009	-11.31***	-13.09***	-5.15*	-3.73
LEP2009	-2.20	-3.85	-0.82	-2.00
Gifted2009	10.21***	12.99***	0.87	-0.11
Student Gender	2.40	2.58	1.08	0.18
Asian	-1.28	-1.92	-1.55	0.63
Black	-5.75**	-7.48**	-3.78*	-1.98
Hispanic	-3.57	-4.13	-1.76	2.85
Constant	38.23***	54.21***	10.44***	10.92***

* 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.

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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 in the scores of FLES and non-FLES students**.
- Of the interaction terms, only the FLESHispanic was negative and significant. **Hispanic students in the FLES programs score lower** on the Grade 4 Math SOL as compared to Hispanic 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 similar to the results from the History and Math Areas.

- However, the FLES School dummy was significant, indicating that there is a **significant difference in the Reading SOL performance of students enrolled in FLES programs** versus otherwise. Results indicate FLES-enrolled students to score 28.5 points higher than non-FLES students in the Grade 4 Reading SOL.
- However, none of the interaction variables were significant, indicating no differences in the performance of FLES or non-FLES students across the demographic factors.

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	5.70	13.94	28.50*
FLESGender			
FLESAsian			
FLESBlack			
FLESHispanic		-55.79*	
FLESdp2009			
FLESDisadvantaged09			
FLESSPED09			
FLESLEP09			
FLESGifted09			
DaysPres2009	0.91	1.54**	0.74
Disadv2009	-20.63*	-24.05*	-19.59
Disabled2009	-43.19***	-56.25***	-53.48***

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Variable	Grade 4 History SOL	Grade 4 Math SOL	Grade 4 Reading SOL
LEP2009	11.98	17.10	-2.10
Gifted2009	64.69***	83.23***	84.34***
Student Gender	14.73	10.92	6.59
Asian	-28.05	-20.31	-17.61
Black	-47.31***	-49.76**	-45.96*
Hispanic	-47.03**	-33.78*	-27.04
Constant	454.58***	487.54***	476.82***

* 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 Science and Social Studies exams. Results indicated that the **performance of FLES-enrolled students in these two subjects 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 Reading and Math sections.
- Results from the regressions indicated a **significant difference in the performance of FLES and non-FLES students across race** in two subject areas. Results indicate that Hispanic students enrolled in the FLES program have a lower performance on the Grade 4 Stanford 10 Math. Similarly, Asian students enrolled in the FLES program perform lower than their counterparts on the Social Studies subject area.
- Results from the Stanford 10 Math also indicate that **FLES students derive significantly higher benefits from higher school attendance**. Results indicate that for every day of attendance above the average, a FLES student's percentile rank on the exam increases by 2.30 on average.

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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	4.17	4.47	7.42*	11.42*
FLESGender				
FLESAsian				-23.78*
FLESBlack				
FLESHispanic		-20.53*		
FLESdp2009		2.30***		
FLESDisadvantaged09				
FLESDisabled09				
FLESLEP09				
FLESGifted09				
DaysPres2009	0.35	-0.19	0.09	0.00
Disadv2009	-7.55	-4.56	-10.57*	-9.47*
Disabled2009	-21.12***	-19.95***	-11.47*	-11.66*
LEP2009	-0.72	3.80	-2.12	-3.11
Gifted2009	25.41***	23.22***	17.05***	22.76***
Student Gender	0.41	4.99	5.96	3.22
Asian	-8.25	-0.50	0.42	-3.60
Black	-16.94**	-17.86***	-14.43**	-16.55**
Hispanic	-14.17*	-6.10	-2.69	-8.70
Constant	64.85***	63.88***	71.54***	66.11***

* 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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Grade 5

Results from the SOL exam are used to compare the performances of Grade 5 students at FLES schools and others. Across all four areas of the SOL exam – Math, Reading, Science, and Writing, regression results do not indicate any differences between the two groups of students. All regression results indicate the coefficients on FLES interaction terms and the FLES school dummy to be insignificant, with one exception.

Only the FLES school dummy on the Grade 5 Writing SOL was significant. Results here indicated that FLES students score about 34 points higher on the Grade 5 Writing SOL compared to non-FLES students, holding other factors constant. Additionally, only the FLESDisadvantaged10 variable was included in the step-wise regression model for the Writing SOL. This indicated that disadvantaged FLES-enrolled students at the FLES Year 1, Title 1 School had significantly lower scores one the Writing SOL as compared to disadvantaged students in non-FLES schools.

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	17.21	7.91	0.71	34.16**
FLESGender				
FLESAsian				
FLESBlack				
FLESHispanic				
FLESdp2010				
FLESDisadvantaged10				-41.98*
FLESSPED (Disabled)10				
FLESLEP10				
FLESGifted10				
DaysPres2010	0.14	0.18	0.26	-0.00
Disadv2010	-17.17	-9.47	-17.64*	-4.12
Disabled2010	-62.50***	-47.70***	-40.69***	-41.86***
LEP2010	-12.27	-13.28	-1.55	9.66
Gifted2010	63.95***	62.42***	66.34***	51.86***
Student Gender	23.22*	9.79	20.12**	-10.41
Asian	18.63	5.76	-12.32	-3.83
Black	-41.17*	-49.80***	-36.64**	-19.41
Hispanic	-24.70	-38.54*	-34.03**	-9.43
Constant	509.78***	482.34***	476.10***	457.96***

* 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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