



Bureau of Legislative Research
Policy Analysis & Research Section



The Relationship Between NSLA Funding and Expenditures, and Measures of Student Performance

March 7, 2013

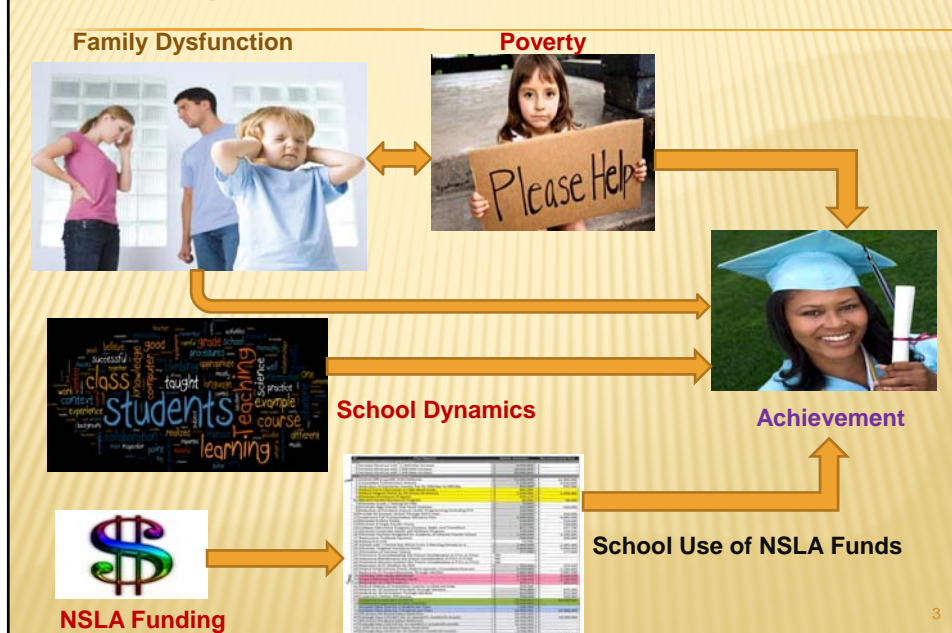
Brief Orientation to Study Methods

The gold standard research method is a double-blind experimental design, where the researcher and experimenter are both unaware of which is the intervention and control groups, and there is random assignment to an intervention group (e.g., **NSLA funded**) and a control group (**No NSLA Funding**).

Classical experimental designs also have random assignment to intervention and control groups, which has the desirable feature of randomly distributing any factors (e.g., poverty, individual characteristics), to the intervention and control groups, that might be provide an alternative explanation for an outcome (e.g., achievement).

Both types of designs are highly desirable because of the control over who gets the intervention, and random distribution of extraneous factors, or factors that offer alternative explanations for outcomes (in addition to, or place of, the intervention).

Examples of Extraneous Factors Related to Achievement



Survey Research

Survey research is commonly conducted to examine statistical relationships between interventions, extraneous factors, and outcomes when experimental designs are not attainable.

In survey research, statistical procedures are used to control for the relationships between extraneous factors and achievement while examining the relationship between the intervention (e.g., NSLA) and the outcome (e.g., student performance on the state Benchmark exams).

Literally, the relationships between extraneous factors, the intervention (NSLA), and outcome (achievement) are considered simultaneously in the same analysis (or statistical equation).

This is called controlling for the effects of the extraneous factors, while examining the relationship between NSLA and student achievement.

Data Analyses

The following statistical analyses of NSLA % and student achievement are based on the 239 school districts that existed in 2011. Districts that were consolidated in study years prior to 2011 were dropped from the analyses.

The 2011 % **NSLA funding levels** and corresponding per pupil dollar amounts were: **(1) 0 – 69% (\$496)**; **(2) 70% - 89% (\$992)**; and **(3) 90% or > (\$1,488)**.

NSLA % and expenditure data, demographic and personnel information, and student characteristics came from ADE. ACTAAP data (Benchmark) came from NORMES at the University of Arkansas – Fayetteville.

Table 1 shows the number of school districts that were in each of the NSLA funding levels for 2011. Most noteworthy is the fact that only **seven** school districts were in the highest funding level of 90% NSLA or >.

Table 2 indicates the differences in mean (or average) percentages proficient or > on the state ACTAAP exams between the 2011 NSLA funding levels.

5

Table 1. Frequencies of 2011 % NSLA

NSLA Funding Levels	NSLA %	Number of Districts	Percent	Valid Percent	Cumulative Percent
\$496	< 70%	152	63.60	63.60	63.60
\$992	70%-89%	80	33.50	33.50	97.10
\$1488	90% or >	7	2.90	2.90	100.00
Total		239	100.00	100.00	

6

**Table 2.
Differences in
Mean
Percentages
Proficient or >
on Benchmark
Exams Between
NSLA Funding
Levels**

Benchmark	2011 NSLA %	Number of Districts	Mean %	Standard Deviation
2011 Literacy % Low-income	< 70%	152	70.29	7.75
	70%-89%	80	64.81	9.23
	90% or >	7	59.64	10.63
	Total	239	68.14	8.83
2011 Math % Low-income	< 70%	152	75.10	8.10
	70%-89%	80	68.71	9.07
	90% or >	7	59.03	6.25
	Total	239	72.49	9.18
2011 Literacy % Population	< 70%	152	76.33	7.43
	70%-89%	80	68.04	9.33
	90% or >	7	61.20	11.07
	Total	239	73.11	9.30
2011 Math % Population	< 70%	152	80.12	7.68
	70%-89%	80	71.73	9.17
	90% or >	7	61.36	8.67
	Total	239	76.76	9.48

Note: Differences in mean percentages proficient or above on state Benchmark tests are shown according to 2011 NSLA funding levels.

7

Differences in Performance

The differences in means are not subjected to statistical analyses because there are too few districts in the highest NSLA funding level (90% or >).

However, visual comparisons of means reveal all measures of student performance in 2011 (% proficient or above) decline as 2011 NSLA funding levels increase.

This inverse relationship between performance and NSLA funding levels holds true for math and literacy, and for low income students and the district populations (or all students).

The correlations between NSLA percentages (2006 & 2011) and measures of student performance shown in Table 3 (shaded in light blue) are negative and moderate in terms of size (the **red print** indicates that they are statistically significant at $p < 0.05$).

Moderate negative correlations indicate that decreases in performance are associated with increases in NSLA percentages, and the correlations between NSLA% and cohort changes in low-income students' performance between 2006 and 2011 are not significant.

Table 3. Correlations Between Student Performance and NSLA % for 2006 and 2011

		2006 Lit Low Income	2006 Math Low Income	2006 Lit Pop.	2006 Math Pop.	2011 Literacy Low Income	2011 Math Low Income	2011 Lit. Pop.	2011 Math Pop.	Lit. *** Change 2006 to 2011	Math *** Change 2006 to 2011	NSLA 2006	NSLA 2011
2006 Literacy Low Income	Correlation Significant												
2006 Math Low Income	Correlation Significant	.634**											
2006 Literacy Population	Correlation Significant	.912**	.806**										
2006 Math Population	Correlation Significant	.806**	.890**	.905**									
2011 Literacy Low Income	Correlation Significant	.699**	.640**	.759**	.738**								
2011 Math Low Income	Correlation Significant	.624**	.710**	.746**	.786**	.835**							
2011 Literacy Population	Correlation Significant	.773**	.691**	.836**	.811**	.950**	.836**						
2011 Math Population	Correlation Significant	.703**	.731**	.812**	.835**	.827**	.961**	.893**					
Literacy Change 2006 to 2011	Correlation Significant	-.330**	-.326**	-.389**	-.284**	-.153*	-.001	.113	.007	-.284**	-.153*	.081	.915
Math Change 2006 to 2011	Correlation Significant	-.361**	-.459**	-.361**	-.484**	-.128*	.039	-.118	.014	.049	.070	.826	.549**
NSLA 2006	Correlation Significant	-.512**	-.435**	-.569**	-.539**	-.353**	-.410**	-.516**	-.531**	.075	.047	.252	.476
NSLA 2011	Correlation Significant	-.528**	-.404**	-.567**	-.522**	-.385**	-.432**	-.551**	-.557**	.052	.014	.920**	.000

Note: * indicates correlations are significant at p <0.05; ** indicates correlations are significant at p <0.01. ***Cohort change between 2006 and 2011 for low-income students. Cells shaded in light blue show correlations between NSLA percentages and performance outcomes.

Test of Linear Relationships

To examine any change in the nature of the relationship between NSLA funding percentages and student performance between 2006 and 2011, OLS regression procedures were used.

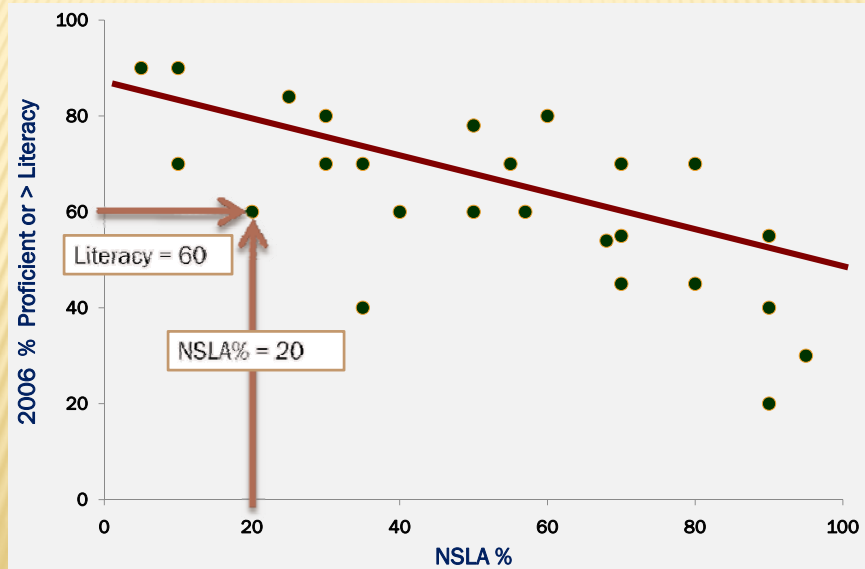
The regression formula in the charts draws a line through data points (239 green dots) that represent the intersection of NSLA percentages and student performance.

The line drawn by regression represents the predicted levels of student performance based on the assumption that there is a linear relationship between NSLA percentages and student achievement.

The assumption underlying the policy to provide categorical funding according NSLA % is that additional funding leads to increased achievement (i.e., there is a linear relationship between funding and performance).

Chart A shows a hypothetical scatter plot of dots that represent the intersection of NSLA% and % proficient or > for each school district. The red regression line slants downward indicating that student achievement is declining as the NSLA% is increased (i. e., negative or inverse relationship).

Chart A. Illustration of Negative Relationship Between NSLA % & % Proficient or > in Literacy



11

Charts Based on Regression Analyses

The linear relationship between NSLA percentages and student performance (% proficient or > in literacy) in 2011 is shown in Chart 1.

The slope (or slant) of the regression line indicates the negative relationship between NSLA percentage and student performance.

Although Chart 1 is based on literacy performance among district populations of students, the same pattern of relationship is exhibited for math and for low income students in literacy and math.

The vertical blue (70% NSLA) and light red (90% NSLA) lines indicate the current NSLA funding levels, and they provide a reference for visualizing how many districts are performing at each NSLA level.

Chart 2 shows the data points representing the intersection of NSLA % of the same 239 districts and their population literacy performance in 2006. A test of the slopes of the regression lines in Charts 1 & 2 reveals no statistical difference, indicating no change in the relationship between NSLA funding percentages and student performance.

12

Chart 1. Linear Relationship Between NSLA % and % Proficient or > in Literacy (District Population)

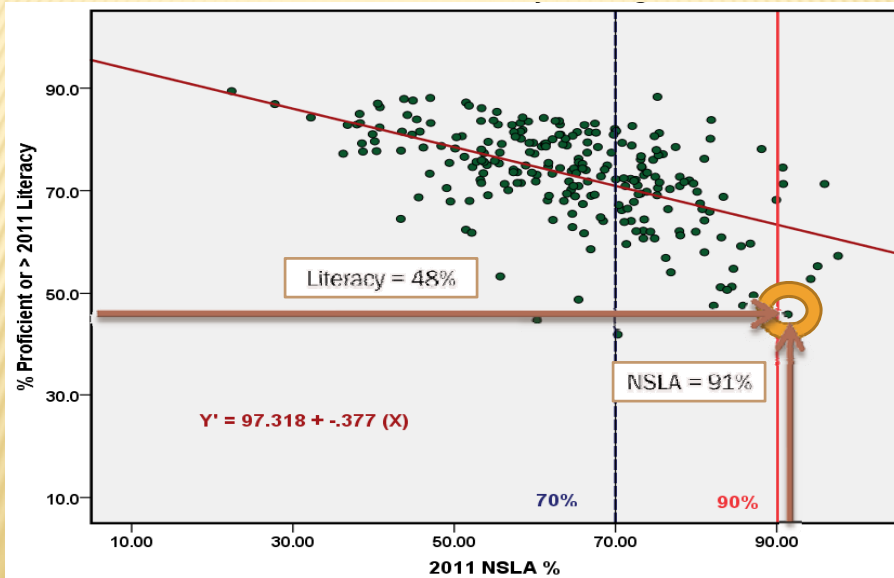


Chart 2. Linear Relationship Between 2006 NSLA % and % Proficient or > in Literacy (District Population)

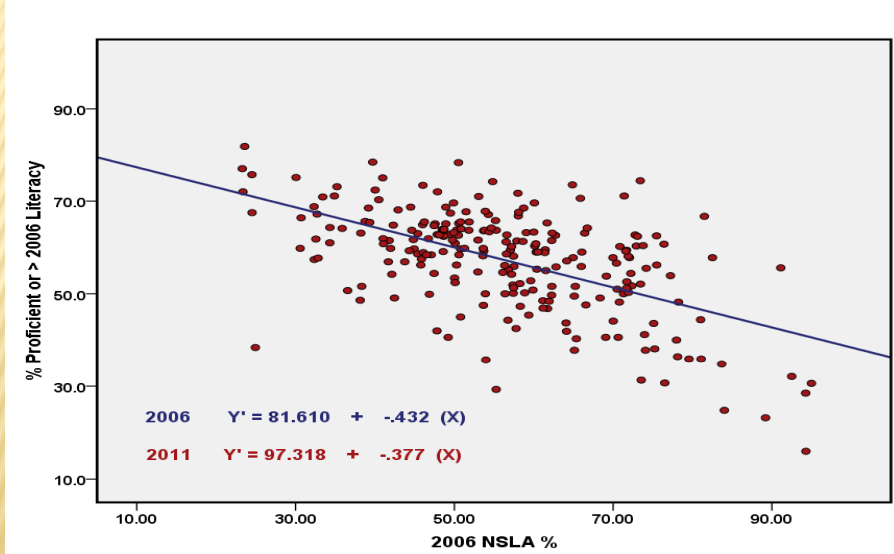
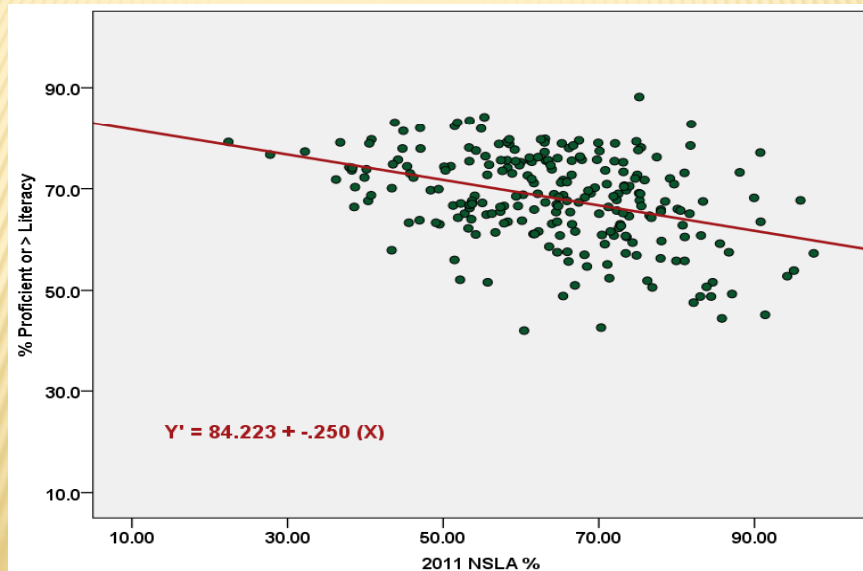
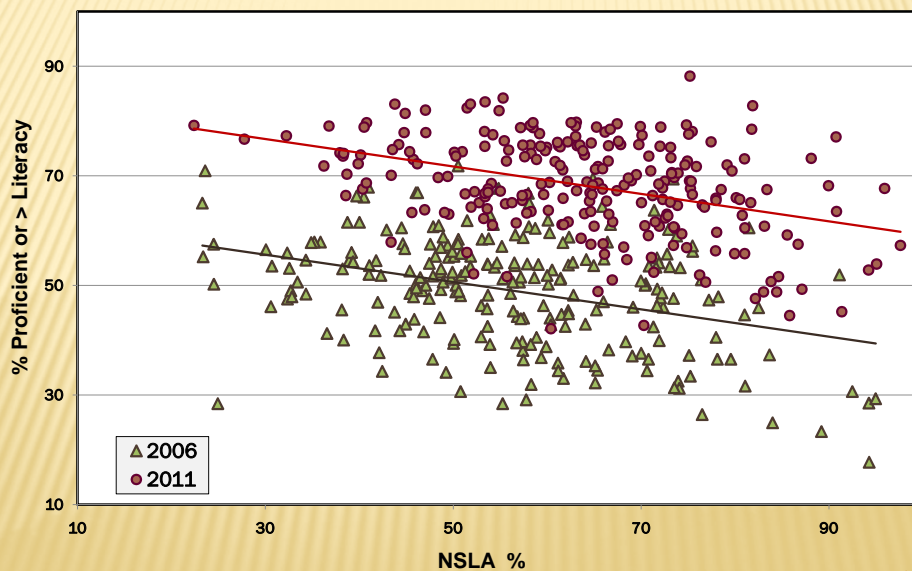


Chart 3. Linear Relationship Between 2011 NSLA % and % Proficient or > in Literacy (Low Income)



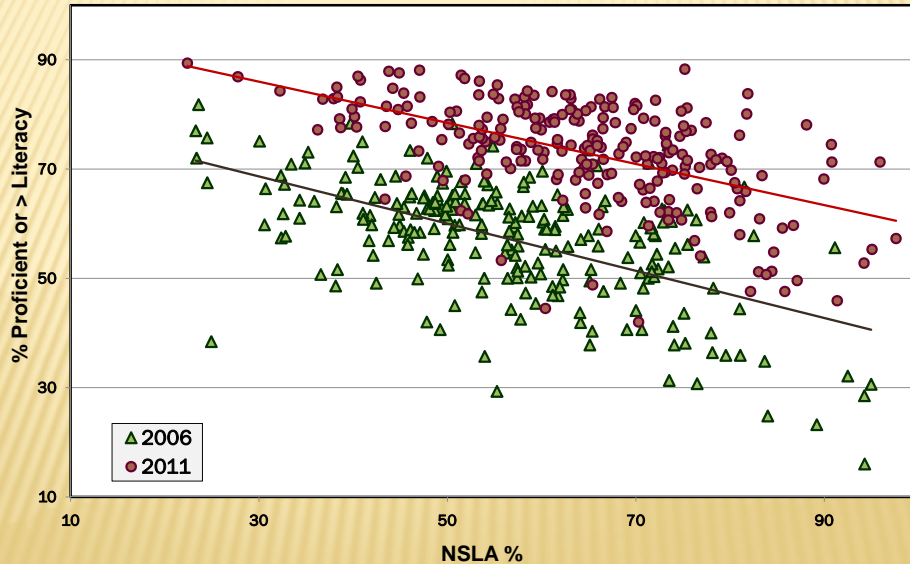
15

Chart 4. Linear Relationship Between 2006 & 2011 NSLA % and % Proficient or > (Low Income)



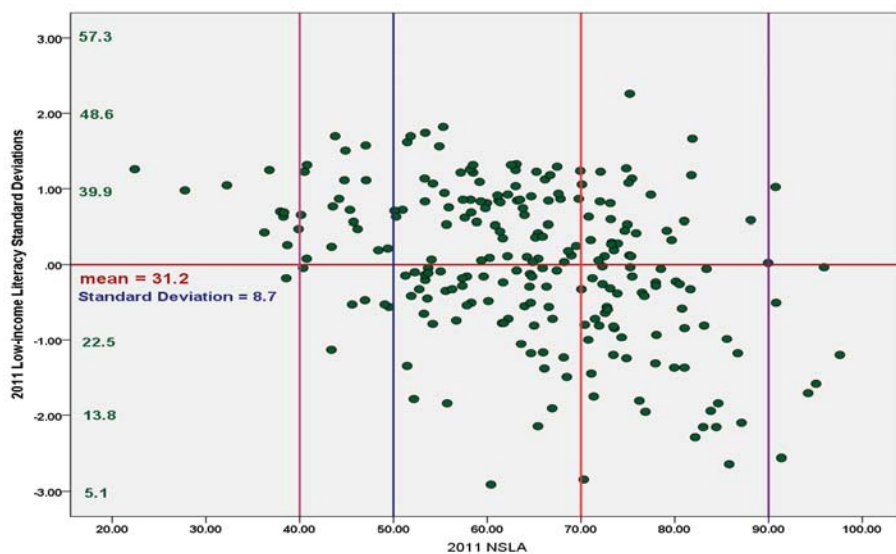
16

Chart 5. Linear Relationship Between 2006 & 2011 NSLA % and % Proficient or > (District Population)



17

Chart D. Linear Relationship Between 2011 NSLA % and Low Income Literacy in Standard Deviations



Differences in Performance

Differences in mean % proficient or > in literacy and math among **low income students** are shown for 2006 and 2011 in Table 4.

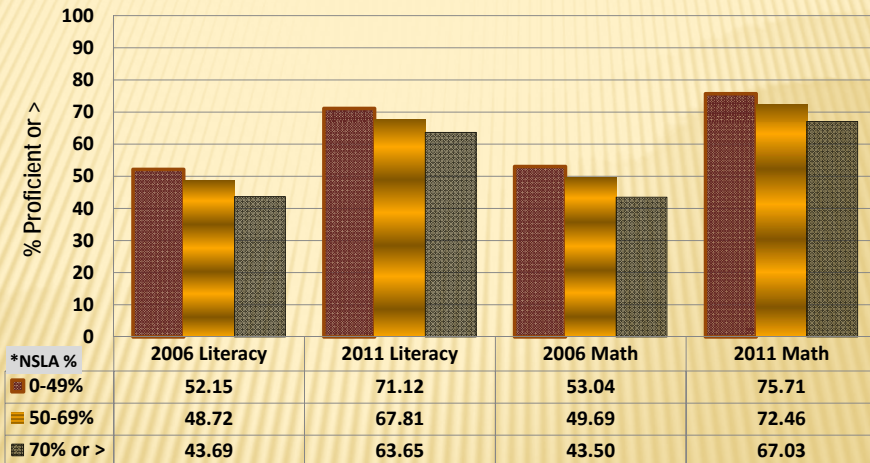
Because there were only 5 districts with a NSLA rate of 90% or > in 2006, 3 new comparison groups were formed: Group 1 (0 to 49%), Group 2 (50% to 69%), and Group 3 (70% or >). The first cutoff occurs at 1/3 of the districts, whereas 70% represents the cutoff for doubling per pupil funding.

The only comparison in Table 4 that was statistically insignificant ($p < 0.05$) was the difference between Group 1 (**0-49% NSLA**) and Group 2 (**50%-69% NSLA**) in 2006 literacy.

Using the same groups, Table 5 shows all of these comparisons in the district populations (or all students) are statistically significant.

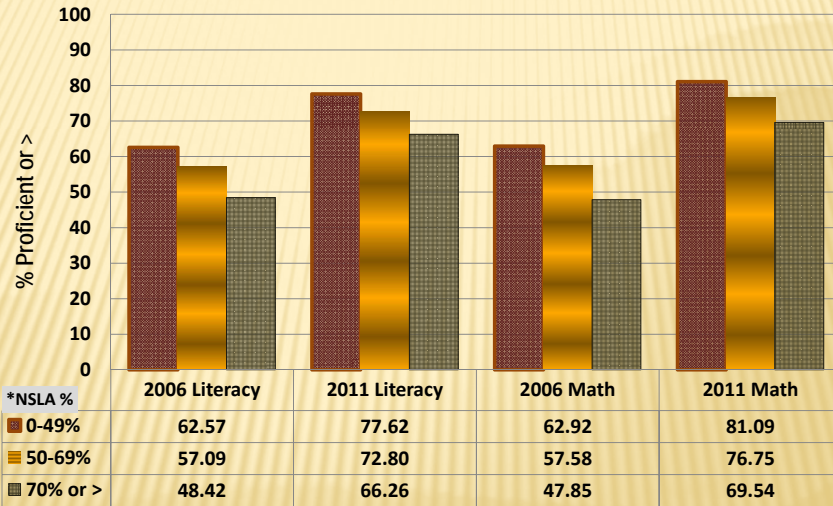
The differences in Tables 4 and 5 indicate that the average % proficient or > declines as NSLA funding levels are increased. This pattern of results is observed for low income students as well as for district populations.

Table 4. % Proficient or > for District Low Income in 2006 & 2011



Note: The only comparison in the table that was not statistically significant ($p < 0.05$) was between Group 1 (%NSLA 0 to 49) and Group 2 (%NSLA 50 to 69) in 2006 literacy. *NSLA and performance are matched in terms of year.

Table 5. % Proficient or > for District Populations in 2006 & 2011



Note: All of the comparisons in Table 5 are statistically significant ($p < 0.05$).
*NSLA and performance are matched in terms of year.

21

Changes in Performance from 2006 to 2011

Table 6 shows that none of the comparisons of mean changes in performance from 2006 to 2011 in the same 2006 NSLA groups (or cohorts) are statistically significant.

In other words, there are no noteworthy differences in cohort changes in performance within NSLA funding levels among low income students from 2006 to 2011.

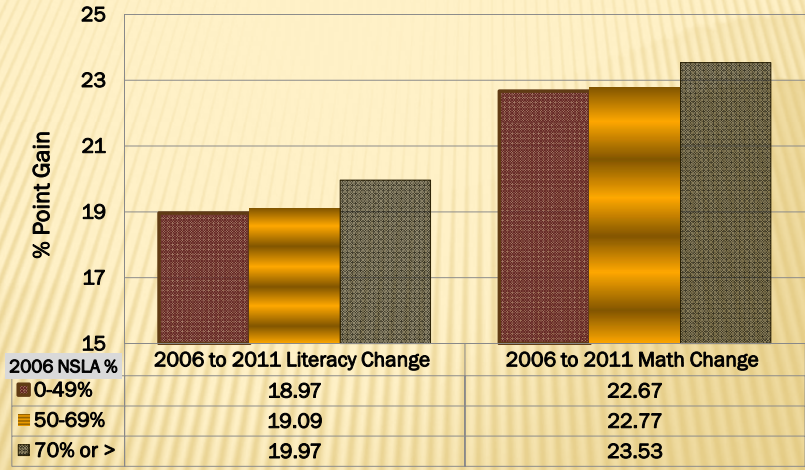
In contrast, Table 7 shows that there are statistically significant differences between Group 1 (**NSLA < 50%**) and Group 3 (**NSLA 70% or >**) for both literacy and math among the district populations (or all students).

Furthermore, the mean percentage change in performance shows that there were greater changes in the NSLA % level where funding is appreciably increased (**70% or > NSLA**).

Table 8 shows a summary of the percentage change in student performance between 2006 and 2011.

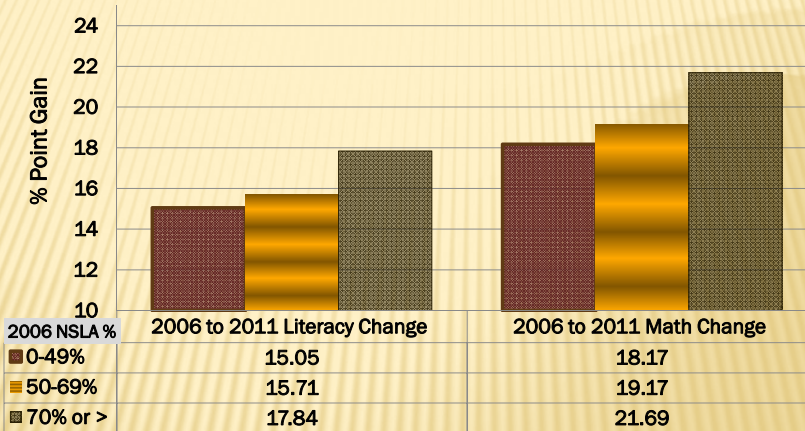
22

Table 6. Change in % Proficient or > Between 2006 & 2011 Low Income



Note: None of the comparisons of changes in % proficient or > between 2006 and 2011 are statistically significant ($p < 0.05$) for low income students. Groups are based on 2006 NSLA for cohort analyses.

Table 7. Change in % Proficient or > Between 2006 & 2011 District Populations



Note: There are statistically significant differences between Group 1 (NSLA < 50%) and Group 3 (NSLA 70% or >) for both literacy and math. There are greater changes in the NSLA group where funding is appreciably increased (70% or > NSLA). Groups are based on 2006 NSLA % for cohort analyses.

Table 8. Changes in % Proficient or > from 2006 to 2011 and Gaps Between District Population and Low Income

Statistics	Change from 2006 to 2011			
	Literacy Low Income	Literacy Pop.	Math Low Income	Math Pop.
Mean	19.12	15.87	22.76	19.30
Median	19.00	15.80	22.90	18.60
Standard Deviation	6.33	6.01	7.45	8.77
Minimum	4.40	2.40	-3.20	-2.60
Maximum	59.40	58.50	48.20	53.10
20 th Percentile	13.40	10.80	16.20	13.86
40 th Percentile	17.50	13.70	20.60	17.40
60 th Percentile	20.50	17.04	24.90	20.40
80 th Percentile	24.40	20.42	28.90	25.20

25

Grade-Level Differences in Performance

To examine whether these differences and changes in student performance hold true for grade-level performance in different years, data used from the recent efficiency study were analyzed for 4th grade and 8th grade in 2007 and 2010.

The results of these grade-level comparisons mirrored the findings of district-level achievement just discussed. In both 4th and 8th grades, performance declined as NSLA funding levels increased.

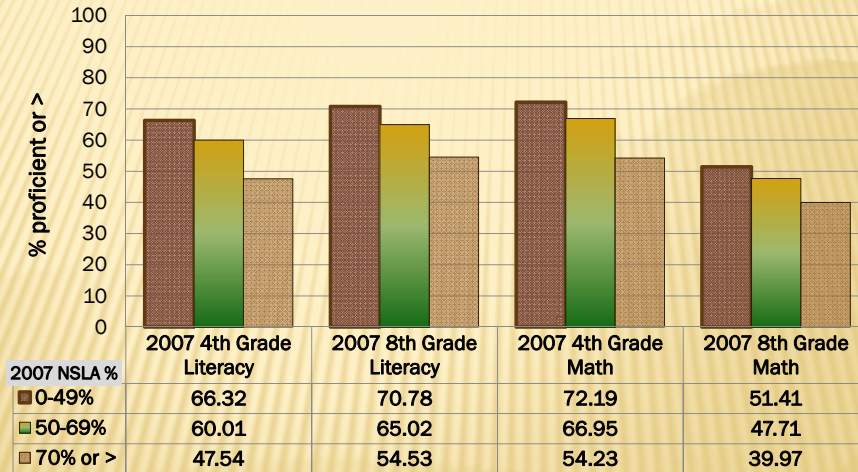
When changes in % proficient or > from 2007 to 2010 were examined, the **statistically** significant differences indicate greater change in districts with higher NSLA funding levels only in 4th grade.

In 4th grade the only statistically **insignificant** comparison was between Group 1 (< 50% NSLA) and Group 2 (50% to 69% NSLA) in literacy.

None of the differences in 8th grade were statistically significant.

26

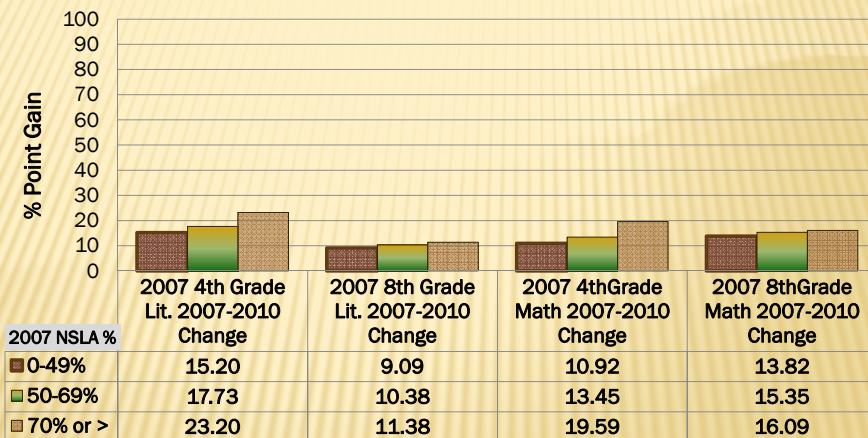
Table 9. % Proficient or > for 4th & 8th Grade District Populations



Note: All of the comparisons in Table 9 are statistically significant ($p < 0.05$). Groups are based on 2007 NSLA %.

27

Table 10. Change in % Proficient or > in 4th and 8th Grade Math & Literacy Between 2007 & 2010 (District Population)



Note: All 4th grade comparisons are significant except between Group 1 (0 – 49% NSLA) and Group 2 (50%-69% NSLA), whereas no 8th grade comparisons are statistically significant ($p < 0.05$). Groups are based on 2007 NSLA % for cohort analyses.

28

Per ADM Expenditure Performance Differences

Table 11 shows the differences in district mean percentages proficient or > according to per ADM 2011 NSLA expenditures. Per ADM expenditure levels were determined by dividing the 239 schools districts into three equal groups.

The per ADM expenditures analyses reveal a pattern of results identical to the findings observed with funding levels in Table 2.

The percentages of low income students and the district population who are proficient or > declines as NSLA expenditures are increased.

The original intent of NSLA funding was primarily to increase the performance of low income students.

Analyses of the differences in district mean percentages proficient or > according to per low income student count 2011 NSLA expenditures gave results nearly identical to those reported in Table 11, and they are not shown in the power point due to time and repetition, but they are in the report.

29

Table 11. Comparison of Mean % Proficient or > According to Per ADM Total 2011 NSLA Expenditures

Note: Differences in mean % proficient or > or mean gap differences are shown in the table according to total 2011 NSLA expenditure groups/ADM.

*The three NSLA groups are equally divided into 1/3 of the 239 school districts.

All differences between means are statistically significant ($p < 0.05$) except the comparison of Group 1 (< 261) and Group 2 (261–362) for low income literacy. Non-significant differences in means are highlighted in light blue.

Benchmarks	2011 NSLA Expenses/ ADM*	Mean
2011 Literacy % Low Income	< 261	71.45
	261-362	68.44
	> 362	64.74
	Total	68.14
2011 Math % Low Income	< 261	76.26
	261-362	72.91
	> 362	68.47
	Total	72.47
2011 Literacy % Population	< 261	78.13
	261-362	73.82
	> 362	67.63
	Total	73.11
2011 Math % Population	< 261	81.84
	261-362	77.58
	> 362	71.12
	Total	76.76

30

Table 13. Frequencies and Descriptive Statistics of NSLA Program Expenditures

	Coaches	Teacher PD	High Quality Teachers	Before/After School	Pre K	Tutors	Aides	
# of Districts	164	67	122	97	44	77	148	
Districts with No Expenditures	75	172	117	142	195	162	91	
Mean	\$186,743.08	\$43,376.13	\$139,623.80	\$38,033.09	\$152,636.19	\$38,151.16	\$100,349.39	
Standard Deviation	\$337,658.00	\$62,970.54	\$162,243.81	\$71,377.17	\$472,508.42	\$47,492.09	\$206,936.76	
Minimum	\$156	\$182	\$115	\$65	\$381	\$61	\$605	
Maximum	\$2,457,995	\$304,876	\$1,050,231	\$450,206	\$3,105,644	\$208,424	\$2,204,973	
Percentiles	20	\$31,941.99	\$4,017.65	\$30,453.40	\$5,304.76	\$12,214.91	\$4,394.80	\$18,930.76
	40	\$60,842.62	\$12,405.51	\$61,305.59	\$11,099.53	\$34,983.73	\$15,389.13	\$37,479.85
	60	\$105,500.66	\$23,383.02	\$116,754.18	\$22,701.99	\$56,634.87	\$34,484.35	\$69,741.49
	80	\$214,356.69	\$76,898.83	\$219,386.12	\$38,429.10	\$96,896.11	\$60,620.20	\$129,509.86

Note: No expenditures indicates that none were reported.

31

Table 14. Frequencies and Descriptive Statistics of NSLA Program Expenditures

	Student Services	Curriculum Specialist	Parent Education	Summer School	Early Intervention	School Improvement	Other	
# of Districts	175	92	67	75	39	103	159	
Districts with No Expenditures	64	147	172	164	200	136	80	
Mean	\$90,991.16	\$84,538.71	\$13,197.28	\$27,417.31	\$61,538.91	\$156,307.55	\$149,823.67	
Standard Deviation	\$178,311.20	\$81,117.98	\$15,235.65	\$32,028.26	\$88,430.93	\$299,097.13	\$196,500.03	
Minimum	\$137	\$1,217	\$20	\$511	\$70	\$36	\$507	
Maximum	\$1,697,298	\$669,567	\$63,244	\$140,392	\$468,493	\$2,410,294	\$1,247,750	
Percentiles	20	\$25,328.97	\$42,721.85	\$1,277.52	\$3,893.31	\$9,862.82	\$14,131.43	\$33,495.64
	40	\$36,340.01	\$59,381.13	\$4,377.87	\$8,444.35	\$33,163.48	\$36,169.27	\$70,429.28
	60	\$56,894.39	\$81,195.77	\$12,112.32	\$21,014.12	\$50,433.69	\$85,285.71	\$110,663.81
	80	\$103,303.21	\$105,940.82	\$23,112.82	\$54,029.35	\$65,029.27	\$210,255.03	\$206,835.85

Note: No expenditures indicates that none were reported.

32

Discussion and Conclusions

In statistical comparisons of means, correlations, and regression analyses a negative (or inverse) relationship was found between NSLA funding levels and expenditures and student performance measures.

The negative relationships indicate that lower student achievement is associated with higher NSLA funding and expenditure levels.

A formal test of the negative linear relationships observed for 2006 and 2011 in the regression analyses indicated that there was no significant difference.

This finding indicates that the negative relationship between NSLA% and student performance has not changed over the 5 years studied.

Analyses also showed greater achievement gains for district populations between 2006 and 2011 for districts that have higher NSLA funding levels (70% or >) than for districts that are below 50% NSLA.

33

Discussion and Conclusions

According to the original Adequacy Report (Odden & Picus, 2003), the purpose of NSLA funds is to raise achievement for low-income students through the provision of enhanced interventions such as tutoring and student support services.

In the course of this study, BLR researchers made preliminary observations that NSLA funds appear to be spread across many different functions, including matrix (or foundation funded) items.

Discussions with ADE officials indicate that these preliminary observations have validity. It is possible that NSLA funding may be spread so thinly across many different functions (activities, interventions) that any potential benefits are diluted.

Preliminary observations regarding how NSLA funds are used suggest that a more detailed investigation is needed that not only examines the distribution of state NSLA funding, but also include the broader context of all funding (local, state, and federal).

34

Discussion and Conclusions

Without this larger financial context, a complete examination and understanding of the impact of state NSLA funding is not attainable.

A more complete analysis of funding would provide a more comprehensive assessment of the benefits of additional funding for high-priority students.

35

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