MANAGEMENT ANALYSIS & PLANNING, INC.

Expert Report

Moore, et al vs. The State of Alaska

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Opinions of James R. Smith
Moore, et al. vs. The State of Alaska

Opinion: Additional funding is unlikely to produce improved student outcomes in Alaska Schools.

Introduction

This section of the report addresses the following questions[1]:

- What is the relationship between district funding and student achievement?
- What is the relationship between demographic factors and student achievement?
- What is the correlation between funding levels and achievement, percent poverty, percent minority, and drop-out rate?
- Do the lowest performing school districts receive the least educational resources?

Data for these analyses come from the Alaska State Department of Education and the National Center for Education Statistics. Given the inevitable limitations of data availability and quality, we use multiple measures for key variables such as funding and student achievement to ensure that the results are not sensitive to the idiosyncrasies of the particular measures used. We examine data on districts as well as schools, since some information is only available for one or the other. For instance, financial data is only available at the district level, but districts may distribute funding unevenly across schools. Therefore district-level funding is only an approximation of the resources actually available at a school. On the other hand, if we limit ourselves to district-level analyses, we may loose sight of variation across schools within a districts. In order to provide a thorough analysis, we examine both district-level and school-level data, and use multiple measures for key variables where practical.

What is the relationship between district spending and student achievement?

Figure 1 shows expenditure and achievement levels[2] for each district in Alaska, and Figure 2[3] shows the same at the school level. There is substantial variation in performance for any given level of expenditure, suggesting that the returns to spending depend heavily on factors such as district demographics, district structure and management, and use of resources. Districts in the upper left quadrant get above-average

[1] The data analysis in this report was conducted by Naomi Calvo under the direction of James R. Smith.
[2] Percent of students proficient in language arts from the Alaska Department of Education 2003 AYP calculations.
[3] School level expenditure data are not collected by the state. Therefore, total expenditures are used in Figure 2.

performance with below-average expenditures. The districts in the bottom right quadrant receive substantially more funding but have lower than average performance levels. Table 1 lists districts with efficient returns to spending.

Figure 1: District Instructional Expenditures Per Pupil and Test Scores For Non-Correspondence Students, FY2003

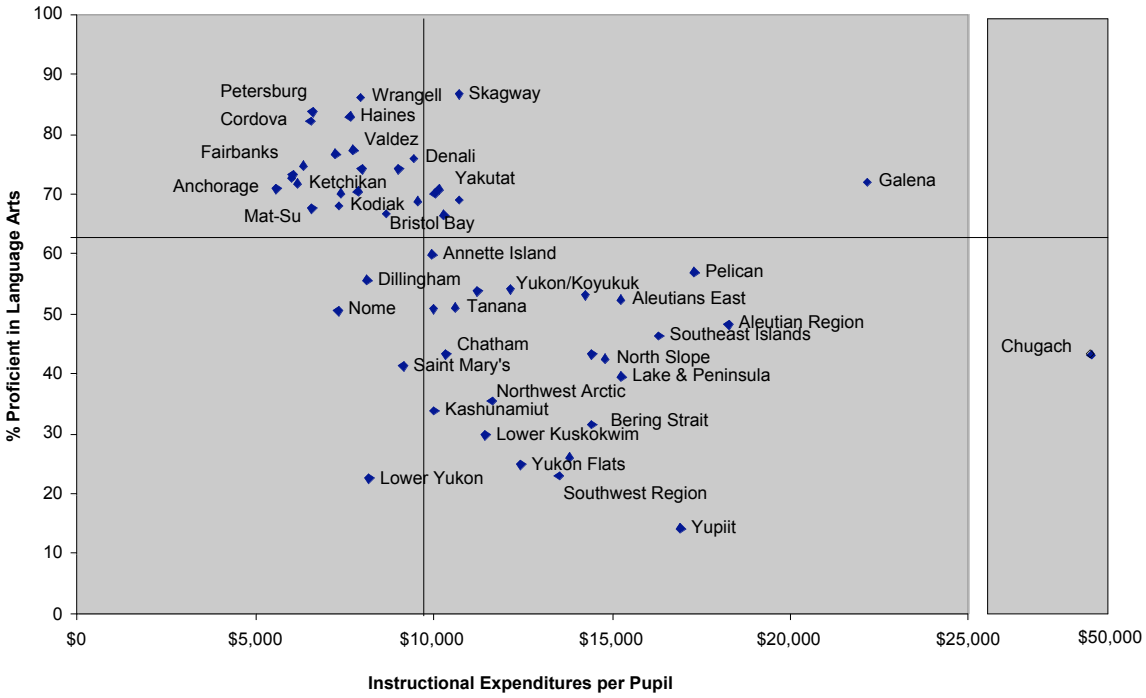


Figure 2: School Achievement by District Total Expenditures per Pupil (Non-Correspondence Schools Only), FY 2003

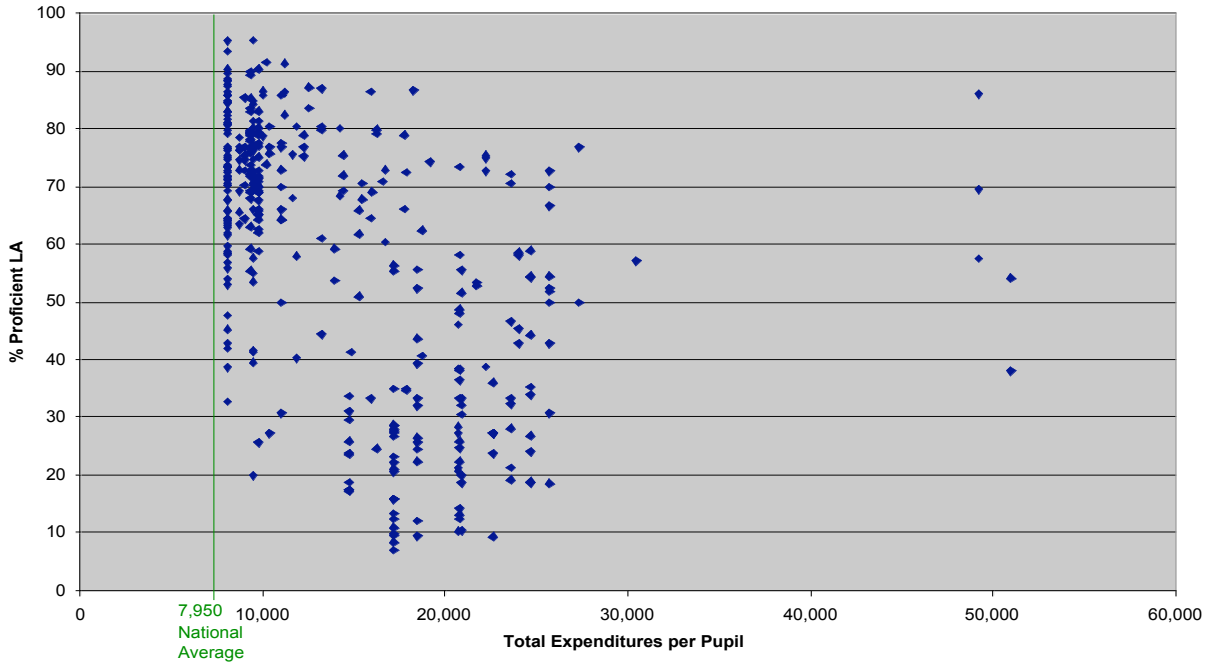


Table 1: Districts with above average test scores and below average instructional expenditures per pupil, FY 2003

District Name	Instruct-ional PPE[4]	% Proficient LA	% Proficient Math	ADM	% Low Income	% Minority	% SPED	% LEP
Petersburg	$6,588	84	77	626	32	25	13	3
Cordova	$6,522	82	79	464	29	35	7	6
Fairbanks	$6,325	75	67	14,875	27	30	13	3
Juneau	$6,032	73	68	5,463	14	37	13	21
Kenai	$5,992	73	66	9,267	32	17	14	3
Ketchikan	$6,160	72	67	2,382	20	37	12	2
Anchorage	$5,578	71	64	48,907	23	41	15	17

Note: Percent proficient scores are from the state AYP calculations. Correspondence students have been removed from all figures. Because instructional expenditures are not reported separately for correspondence students, the total dollar amount designated for correspondence students has been subtracted from instructional expenditures, resulting in an artificially low estimate. ADM= Average Daily Membership. SPED = Special Education. LEP = Limited English Proficient. Data source: Alaska State Department of Education and the National Center for Education Statistics.

[4] Instructional Expenditures are the total amount spent on instruction from operating revenues and special funds, calculated by summing the following categories from the district budget audits: 100 Instruction, 200 Spec Ed Instruction, 220 Spec Ed Support, 300 Support Students, 350 Support Instruction, Title I Instruction, Title I Support, Title V Instruction, Title V Support, Other Special Rev Funds Instruction, Other Special Rev Funds Support, Spec Ed Title VI-B, and Spec Ed Title I Migrant Ed.

Another way to look at the relationship between spending and achievement is to compare average achievement levels across different levels of spending. Table 2 displays the average percent of students scoring proficient or above in language arts and math for each expenditure quartile.[5] The schools in the top quartile, which are the highest spending, show significantly lower average test scores than schools in the other quartiles. On average, only 40 percent of students in the top quartile score proficient in language arts, compared to 72 percent in the lowest spending districts.[6] Table 2 also breaks out the percent of Alaska Natives for each expenditure quartile, as well as the percent scoring proficient or above in language arts. We can see that top funded schools tend to have high percentages of Alaska Natives students: 84 percent, compared to only 16 percent in schools in the bottom quartile. There is also an inverse relationship between Alaska Native achievement and spending: the average percent proficient in the top funded schools is only 34%, but in the bottom quartile it is 54 percent.[7]

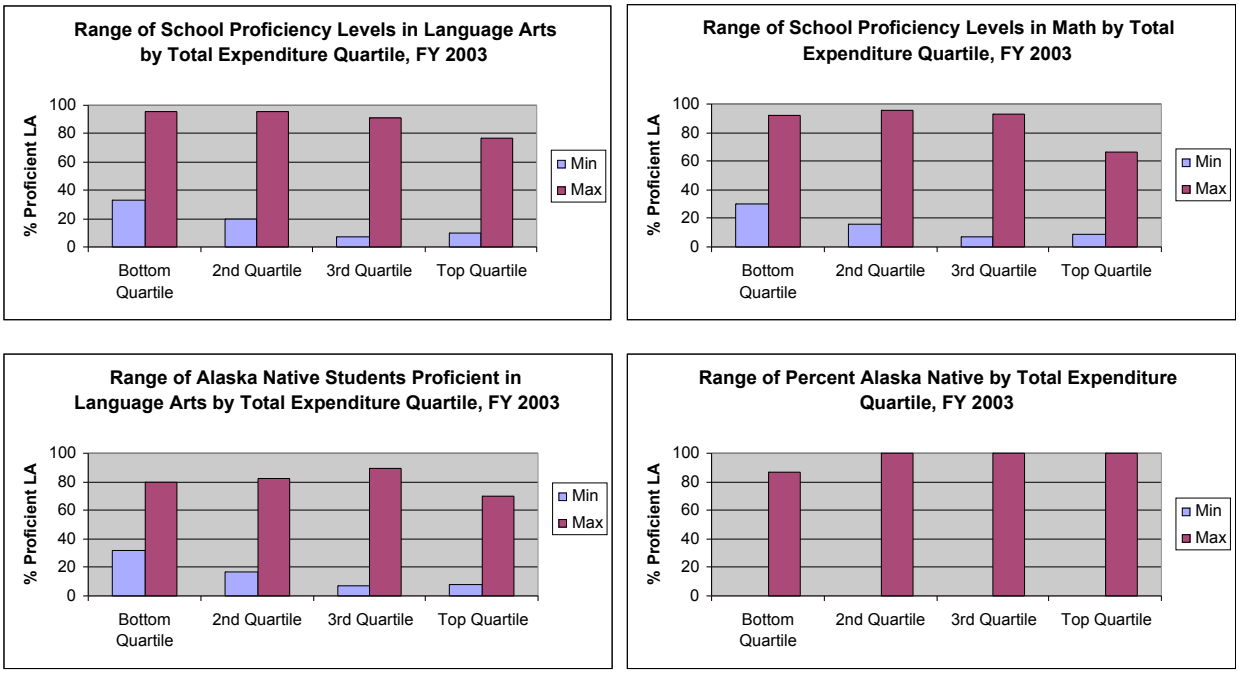
Table 2 also shows substantial variation in student performance within each spending quartile. For instance, in the bottom quartile (the lowest spending schools), the percent proficient in language arts varies from 33 percent to 95 percent. The other quartiles exhibit similarly large ranges, displayed graphically in Figure 3. This degree of variation suggests that factors beyond funding are driving student success.

[5] Total expenditures per pupil are shown here. The results are substantively the same when using instructional expenditures per pupil and non-correspondence student total expenditures per pupil.
[6] The difference between the top quartile and each of the other quartiles for percent proficient in language arts and in math is statistically significant at the $p<.05$ level.
[7] The difference between the top quartile and each of the other quartiles for percent proficient in language arts for Alaska Natives is statistically significant at the $p<.05$ level.

Table 2: School Average Achievement Scores at Different Levels of Expenditure, FY 2003

Total Expenditure Per Pupil Quartiles	# of Schools	Mean	Std. Dev	Min	Max
Bottom Quartile (lowest spending)					
% Proficient LA	97	71.7	12.4	32.9	95.4
% Proficient Math	97	65.6	13.3	30.4	92.4
Alaska Native % Proficient LA	69	53.9	11.3	32.3	79.3
% Alaska Native	99	16.2	14.0	0.0	86.5
Second Quartile (25-50th)					
% Proficient LA	102	71.9	12.8	20.0	95.4
% Proficient Math	103	65.4	13.4	16.0	95.4
Alaska Native % Proficient LA	55	58.7	11.2	16.7	82.4
% Alaska Native	107	15.5	16.1	0.0	100.0
Third Quartile (50-75th)					
% Proficient LA	99	47.8	25.5	7.1	91.4
% Proficient Math	101	45.6	22.2	7.0	92.9
Alaska Native % Proficient LA	78	37.2	20.5	7.0	89.3
% Alaska Native	115	70.2	35.6	0.0	100.0
Top Quartile (highest spending)					
% Proficient LA	78	40.3	18.4	9.4	76.9
% Proficient Math	74	36.4	15.7	9.2	66.1
Alaska Native % Proficient LA	51	33.9	15.7	7.7	69.7
% Alaska Native	98	84.1	28.1	0.0	100.0

Figure 3: Variation in School Achievement Characteristics Across Expenditure Quartiles



If there were a simple, clear-cut association between funding and student achievement, we would expect to see that higher-spending districts exhibit higher levels of student achievement. But Figures 1-2 and Table 2 depict the opposite pattern: on average, districts with higher per pupil expenditures have lower achievement levels. This relationship can be quantified with a correlation coefficient. The correlation between total expenditures per pupil and the percent of students proficient in language arts is -0.57. Why do we see this pattern? One possible explanation is that the lower-performing districts have harder-to-teach students, and the state is targeting additional funding to districts with greater needs. Figure 4 shows the relationship between funding and achievement for districts with different levels of poverty. At each level of poverty we see the same pattern repeated: higher-spending districts tend to exhibit lower test scores. On average, as the poverty rate increases, funding also increases but test scores drop. Another possibility is that small districts require disproportionately high per pupil revenues because of diseconomies of scale, and that these small rural districts also have concentrations of hard to teach students. Figure 5 show the relationship between spending and achievement by district size. The largest districts have the lowest expenditure levels and the highest performance levels. In small and medium size districts, there is again an inverse relationship between spending and achievement: higher expenditures are associated with lower performance.

Figure 4: The Relationship between District Funding and Achievement by Poverty Level, FY 2003

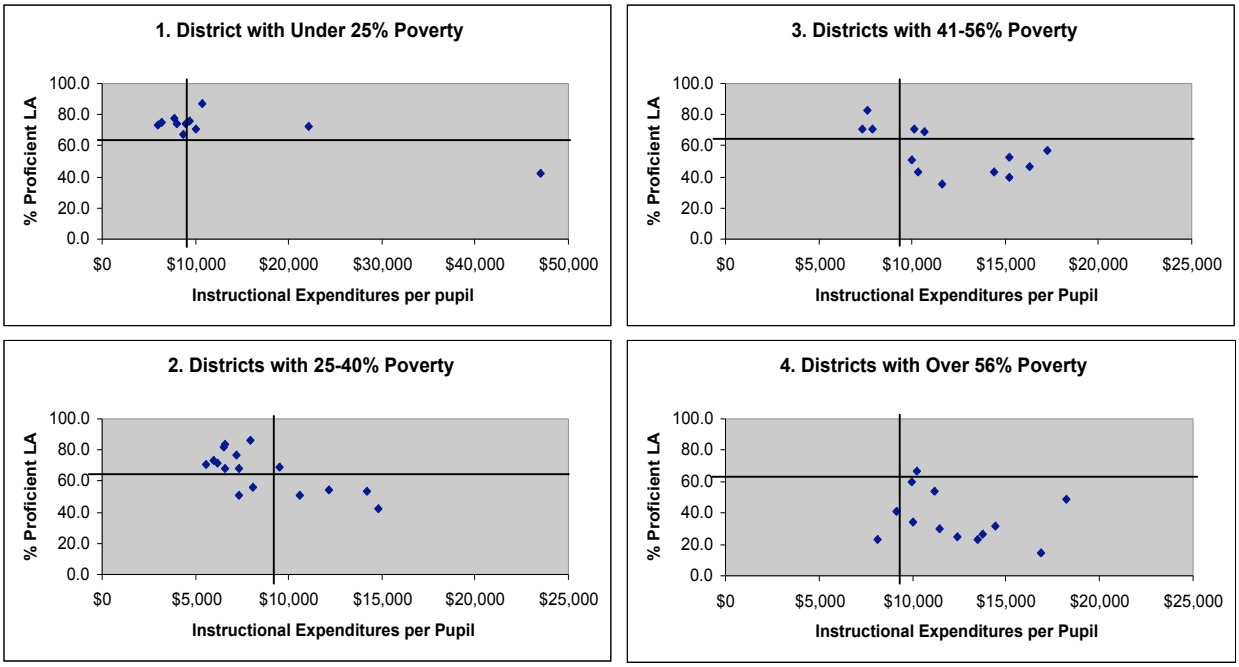
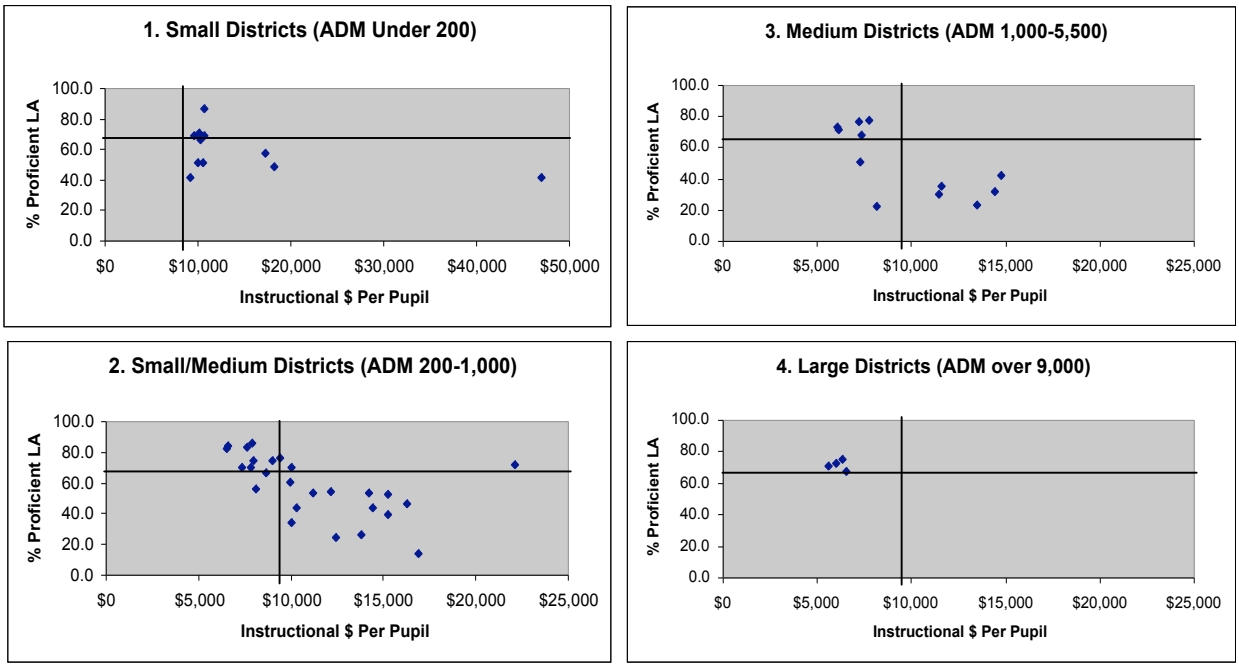


Figure 5: The Relationship between District Funding and Student Achievement by District Size, FY 2003



In order to more systematically analyze the association between spending and achievement, taking into account both district demographic characteristics and size simultaneously, we can use regression analysis. There are several ways to measure district funding and student achievement, so in order to ensure that the regression results are not sensitive to the measures used we repeated the analyses using multiple measures. The funding measures are total expenditures per pupil and instructional expenditures per pupil. The achievement measures are the percent of students scoring proficient or above on the grade 3, 6, and 8 benchmark exams, and the grade 4 CAT percentile ranks in reading and math at the school level. Data are for the years 2001-2003. Controls are included for enrollment, district type (City Borough vs. REAA), race, percent of students from low-income families, percent receiving special education services, percent limited English proficient (LEP), and year. In addition, the analyses were repeated using a measure for whether the district was on/off the road system as a further control. The results can be summarized as follows.

What is the relationship between funding and achievement?

The regression results indicate that there is no relationship between per pupil spending and test scores, when controlling for the factors described above.[8] This suggests that we would not expect additional funding to increase test scores.

What is the relationship between demographic factors and student achievement?

- District size: The relationship between district enrollment and student test scores is effectively zero, when controlling for the other demographic factors.[9] School size also does not appear to be a significant variable in the school-level regressions.
- Race:
    - Percent Alaska Native: On average, districts with higher percentages of Alaska Native students have lower test scores. A 10 percentage-point increase in the percent of Alaska Native students is associated with a 2.7 to 3.5 percentage point drop in the percent of students scoring proficient or above on the benchmark exams, controlling for the other factors (this relationship is statistically significant at conventional levels, $p<.05$). A similar relationship is seen at the school level. Figure 5 shows the correspondence between the percent of students in a school who are Alaska Natives and the percent proficient in language arts. The trend line

[8] As noted above, analyses were done using every combination of expenditure and achievement variables. In none of the specifications is there a positive statistically significant relationship between per pupil expenditures and test scores. In fact, the relationship is negative in a number of cases, but the point estimates are so small (-0.0002 to -0.0009) as to be effectively zero. When the demographic controls are omitted from the regression, there is a stronger negative relationship between spending and test scores (about -0.003, significant at the $p<.01$ level).

[9] The coefficient on ADM across specifications is about -0.0003, and while this is statistically significant the magnitude is so small as to be effectively zero: each additional student is associated with a drop of 0.0003 percentage points in the percent of students scoring proficient or above on the reading benchmark exams.

clearly shows a negative relationship: schools with higher percentages of Alaska Natives tend to have lower test scores.

- There was not a statistically significant relationship between the percent of Asian, Black, or Hispanic students and achievement scores.

- Income: Schools with higher percentages of economically disadvantaged students tend to have lower test scores (see Figure 6). The school level regressions show a negative, statistically significant relationship between the percent of economically disadvantaged youth and performance. Specifically, one percentage-point increase in EDY is associated with a percentile rank drop of about 0.08 in CAT grade 4 reading. The associated drop in math scores is around 0.14. District regressions show a similar pattern. A ten percentage point increase in the percent of students from low-income homes is associated with a 2 percentage point decline in the percent of students scoring proficient or above on grade 3 and 6 benchmark exams when controlling for the other demographic factors ($p<.05$).

- Special education: At the school level, the percent of special education students corresponds with lower test scores. On average, a one percentage point increase in the percent of students receiving special education services is associated with a decrease of about 0.28 in percentile rank for reading and 0.36 for math grade 4 CAT scores ($p<.05$). At the district level, in most specifications the percentage of students receiving special education services exhibits no relationship with test scores when controlling for the other factors. However, these results are sensitive to the year and specification used, suggesting that districts differ in how they identify students with special education needs. The percent special education varies from 2 percent to almost 30 percent across districts.

- Limited English Proficient: On average, districts with higher percentages of LEP students have lower test scores. A 10 percentage-point increase in the percent of LEP students is associated with a 1.7 to 2.3 percentage point drop in the percent of students scoring proficient or above on the benchmark exams, controlling for the other factors ($p<.05$). At the school level, the point estimates vary in significance but all are negative and around -0.14 for reading percentile rank and -0.3 for math.

- District Funding Type: In most specifications, the type of district (City Borough versus REAA) appears to be unrelated to student achievement. The exception is for regressions using grade 8 benchmark proficiency levels. The percent of students scoring proficient or above on the grade 8 benchmark exam is about 6 percentage points lower in REAA districts than in CB districts, controlling for the demographic factors ($p<.05$).

Figures 6 and 7 show race and poverty both appear to play a role in student performance. However, in both instances there is striking variation in achievement across schools. Some schools with high Alaska Native populations and high levels of poverty are doing well. The regression results indicate that this is not due to funding. Taken together, these results suggest that while demographic factors can play a large role in student outcomes, some schools have found ways to mitigate demographic destiny; suggesting that, within funding ranges found in Alaska, how resources are deployed is more important than the level of funding. Additional funding does not appear to be indicated.

Figure 6: School Achievement by Percent Alaska Native Students

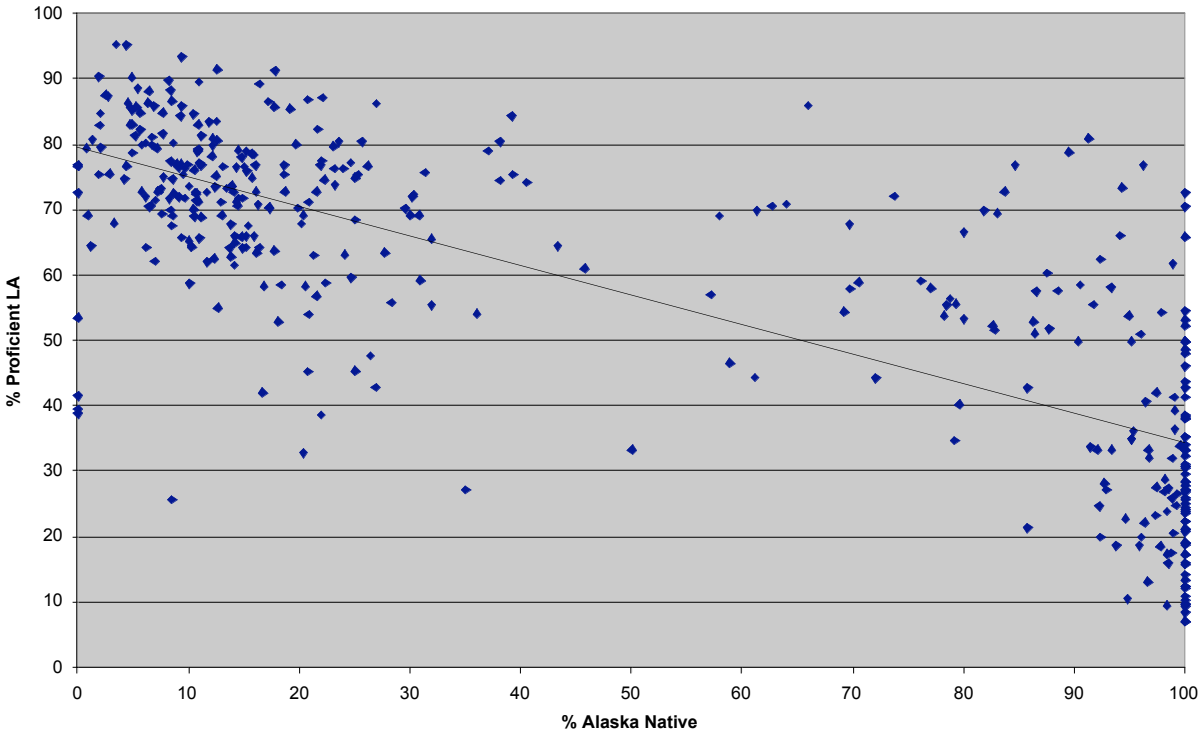
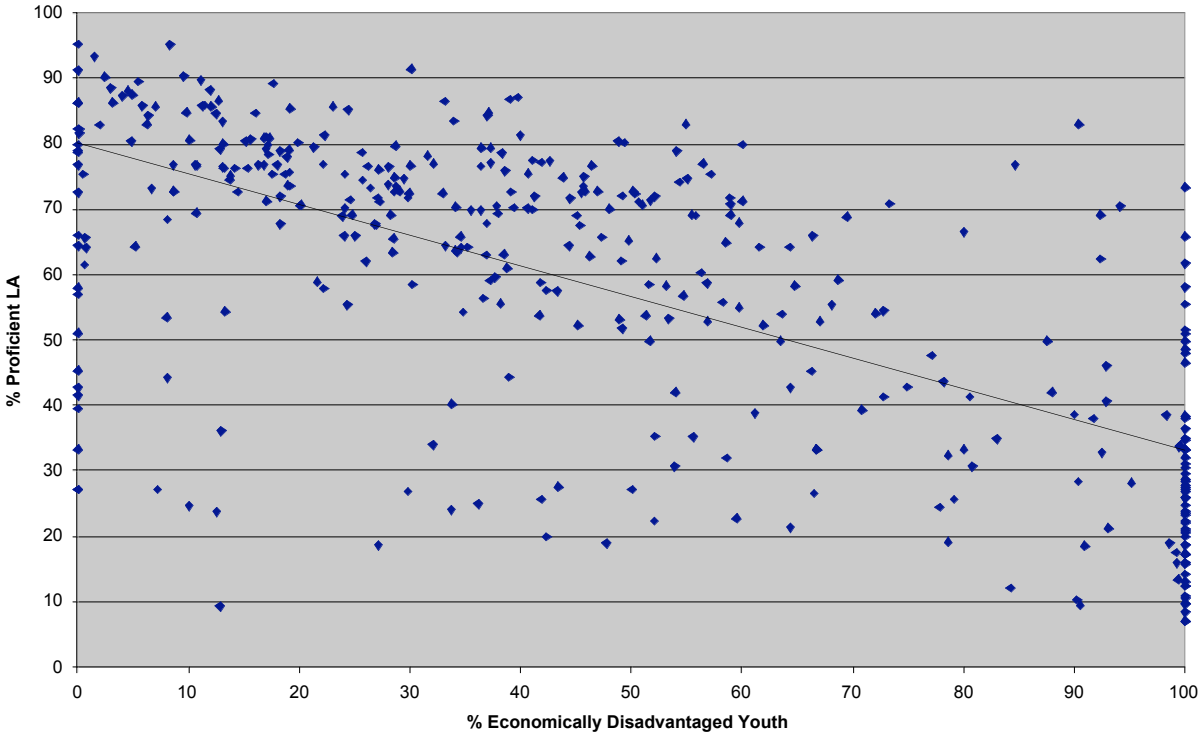


Figure 7: School Achievement by Percent Economically Disadvantaged



The school-level data gives us an opportunity to examine the impact of school remoteness on performance. How does performance compare across cities, towns, and rural areas? Do Alaska Native students tend to do better in urban or in rural areas? Table 3 compares school achievement levels by locale. Average performance in cities and towns (around 71% proficient in language arts) is higher than in rural areas (47%). This is also true for Alaska Native students. The average performance among Alaska Natives attending school in cities or towns is around 55 percent proficient, compared to just 37 percent proficient in rural schools. Again, there is a high level of variation within locales, however. For instance, the percent of Alaska Native students scoring proficient in language arts in rural schools varies from 7 percent to 90 percent. This suggests that there are rural schools with high percentages of Alaska Native students that are meeting high standards using existing levels of resources.

Table 3: The Relationship between School Locale, Percent Alaska Native, and Student Achievement, FY 2003

	# of Schools	Mean	Std. Dev	Min	Max
Mid-Size City					
% Alaska Native	80	12.6	6.9	0.0	31.8
Alaska Native % Proficient LA	54	53.2	11.5	32.3	76.9
Schoolwide % Proficient LA	79	71.6	13.4	32.9	95.4
Large Town					
% Alaska Native	24	18.0	8.5	0.9	31.9
Alaska Native % Proficient LA	20	53.5	9.1	39.8	74.1
Schoolwide % Proficient LA	23	72.1	6.9	55.5	83.0
Small Town					
% Alaska Native	79	24.5	25.8	0.0	100.0
Alaska Native % Proficient LA	47	56.8	11.4	25.5	79.4
Schoolwide % Proficient LA	75	70.2	13.8	25.7	95.4
Rural					
% Alaska Native	244	70.0	38.1	0.0	100.0
Alaska Native % Proficient LA	140	37.0	20.1	6.8	89.3
Schoolwide % Proficient LA	208	47.2	24.1	7.1	91.5
Overall					
% Alaska Native	435	48.2	40.2	0.0	100.0
Alaska Native % Proficient LA	266	45.3	18.7	6.8	89.3
Schoolwide % Proficient LA	391	58.2	22.9	7.1	95.4

Note: Locale type designations are from the National Center for Education Statistics.

What is the correlation between funding levels and achievement, percent poverty, percent minority, and drop-out rate?

The Plaintiff Second Amended Complaint states that:

> 72. Further, there is a significant statistical correlation between funding and a cluster of factors. Those school districts with the lowest grade-six reading scores, the highest percentage of students qualifying for free or reduced-cost lunches, the highest percentage of minority students, and the highest student drop-out rate all received the lowest state and local instructional revenue for the education of their students in FY 2001.

The data do not support this conclusion. In fact, they show the opposite. Table 4 shows the correlations between funding and a variety of factors for 2001-2003.[10] For FY 2001, the correlation between funding and grade-six reading scores is -0.61, meaning that districts with low reading scores tend to receive *more* funding than those with high

[10] Correlation is a measure of association between two factors, with a range of -1 to 1. A positive correlation means that when one factor goes up, the other also tends to go up. A negative correlation means that when one factor goes up, the other factor is likely to go down. In the social sciences, a correlation of 0.4 is considered moderately strong; a correlation of about 0.7 or above would be generally considered high.

reading scores. The correlation between funding and the percentage of students qualifying for free or reduced-price lunch is 0.52, indicating that districts with high proportions of disadvantaged students on average receive *more* funding. Similarly, the correlation between funding and the percentage of Alaska Native students is 0.67: districts with higher percentages of Alaska Native students tend to spend more, not less. There is a negative but smaller correlation between funding and the percent of other minorities. The correlation between funding and the student drop-out rate is almost zero (-0.03), suggesting no association between funding levels and the drop-out rate. The correlations are similar for FY 2002 and FY 2003.

Table 4: **The Correlation Between District Funding, Achievement, and Demographic Factors, 2001-2003**

	2001		2002		2003	
	Total PPE	Instruction PPE	Total PPE	Instruction PPE	Total PPE	Instruction PPE
Total Exp per pupil	1.00		1.00		1.00	
Instructional Exp per pupil	0.95	1.00	0.94	1.00	0.94	1.00
% Proficient or above, G3 Reading	-0.63	-0.63	-0.51	-0.50	-0.52	-0.40
% Proficient or above, G6 Reading	-0.61	-0.59	-0.64	-0.64	-0.61	-0.52
% Proficient or above, G8 Reading	-0.70	-0.63	-0.62	-0.51	-0.66	-0.58
% Alaska Native & American Indian	0.67	0.59	0.63	0.54	0.66	0.54
% Asian	-0.25	-0.21	-0.28	-0.26	-0.32	-0.29
% Black	-0.36	-0.28	-0.40	-0.32	-0.42	-0.33
% Hispanic	-0.35	-0.34	-0.31	-0.30	-0.35	-0.35
% White	-0.67	-0.58	-0.61	-0.52	-0.62	-0.50
% Eligible free/reduced lunch	0.52	0.52	0.11	0.10	0.57	0.57
% LEP	0.37	0.37	0.31	0.28	0.26	0.25
% Special Ed	0.30	0.28	0.16	0.11	0.17	0.14
% Dropouts	-0.03	-0.06	-0.02	-0.02	0.13	0.10

Do the lowest performing school districts receive the least educational resources?

The Plaintiff Second Amended Complaint further states that:

> 71. Although [the ten] lowest performing school districts have students with the greatest educational needs, these school districts receive the least educational resources. In FY 2001, the ten lowest performing school districts received, on average, 17.55 percent less state instructional funds per pupil than the ten highest performing districts. When total state and local instructional expenditure per pupil is compared, the difference between the top ten and bottom ten is 36.36 percent of the total funding.

We find no evidence to support this conclusion. Table 5 displays per pupil funding levels for the ten lowest performing districts and the ten highest performing districts, along with the statewide average. The ten lowest performing districts received, on average, 77 percent *more* state operating funds per pupil than the ten highest performing districts. When total revenues per pupil are compared, the lowest performing districts receive more than twice as much as the highest performing districts. Low performing districts receive an especially high share of federal and Title I funding, suggesting that resources are being targeted to low performing districts. Figure 7 graphs Title I funding by district poverty rates, showing that districts with greater poverty levels receive additional Title I funds.

Figure 7: Federal Title I Funding and District Poverty, FY 2003

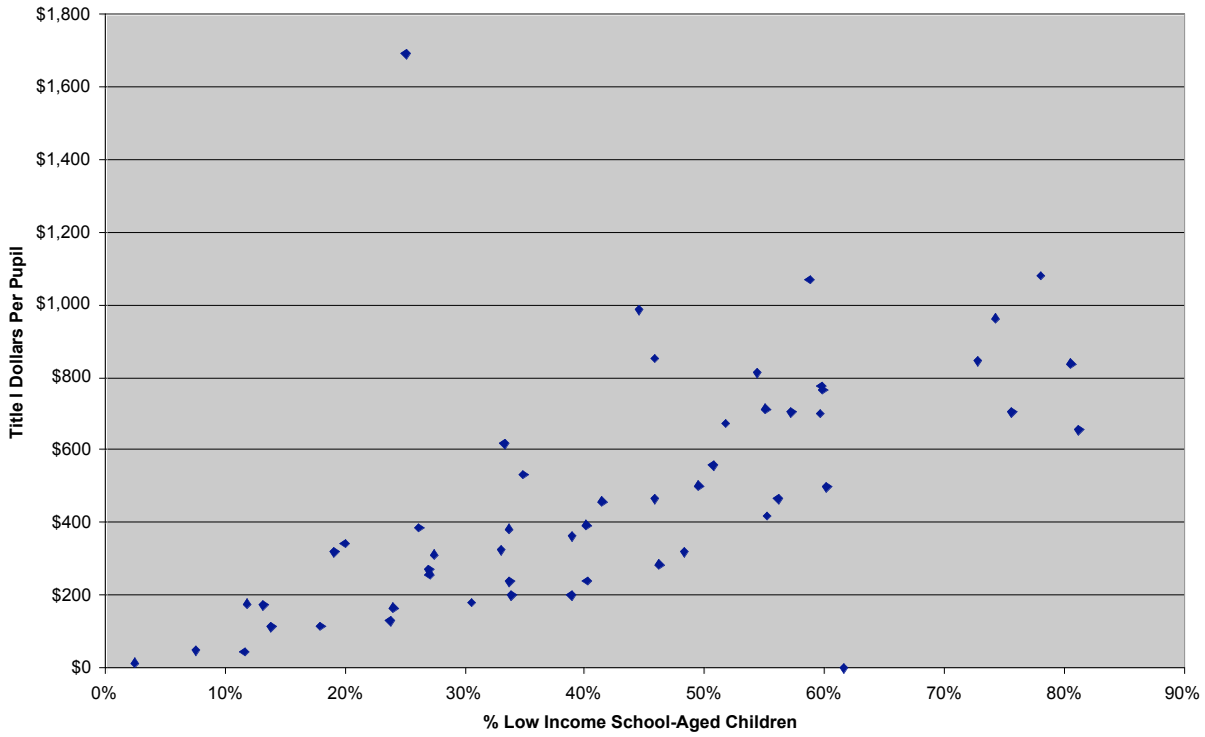


Table 5: **Comparison of Funding in Low Performing vs. High Performing Districts, FY2003**

Per Pupil Funding	10 Lowest Performing Districts	10 Highest Performing Districts	Statewide Average	% Difference Lowest/Highest	% Difference Lowest/State
State Operating Revenue	$9,236	$5,228	$5,166	77%	79%
Local Operating Revenue	$269	$1,517	$2,267	-82%	-88%
Federal Operating Revenue	$4,137	$150	$763	2651%	442%
Other Operating Revenue	$755	$295	$174	156%	334%
Special Fund Revenue	$3,299	$1,263	$1,210	161%	173%
Total Revenue	$17,695	$8,453	$9,581	109%	85%
Instructional Expenditures	$11,706	$5,883	$6,746	99%	74%
Total Expenditures	$18,143	$8,728	$10,046	108%	81%
Title I Expenditures	$826	$175	$271	372%	205%

Notes: Performance ranks are based on the percent scoring proficient or above on the grade 6 reading benchmark exam.[11] The ten lowest-performing districts are: Yupiit, Lower Yukon, Kashunamiut, Southwest Region, Lower Kuskokwim, Northwest Arctic, Yukon Flats, Bering Strait, Kuspuk, and Saint Mary's. The ten highest-performing districts are Cordova, Haines, Petersburg, Copper River, Denali, Wrangell, Unalaska, Sitka, Galena, and Delta/Greely. Funding figures are weighted by district enrollment.

Analysis of Alaska school district data yields no evidence to support the notion that additional funding will lead to improved test scores. School districts with high percentages of disadvantaged students tend to have relatively low test scores and relatively high levels of funding. The lowest performing districts receive substantially more funds than the highest performing districts. Based on this analysis and given the current funding levels (which are already higher than most states),[12] additional funding is unlikely to be the most efficient or effective lever for improving schools. It is not our opinion that spending can never produce superior outcomes. [13] In fact, it is likely to do just that in efficient schools, especially when resources are demonstrably insufficient. However, the weight of evidence suggests that, Alaska schools are not by any reasonable measure under funded, and are probably inefficient—suggesting that they may not be well managed.

As the data analyses above amply demonstrate, there is little relationship between the level of spending and student achievement. See for example, Hanushek (1997). This is not an uniquely Alaskan problem. In deed, this pattern is consistent in varying degrees across the states. How can this be? There are at least three likely explanations. First, the

[11] Different measures of achievement result in slight variations in the list of districts at the top and bottom of the performance distribution, but the results are similar.

[12] According to the NCES Digest of Education Statistics 2003, Alaska ranks fourth in the nation in terms of total and current per pupil expenditures (Table 168).

[13] The debate between Greenwald, Hedges and Laine(1996) and Hanushek (1996) is illustrative. The former demonstrated that funding is associated with improved performance in some case. Hanushek concedes that point, but provides compelling evidence that, on average additional funding does not produce improved outcomes.

process of converting resources into student outcomes is ill defined and remains more art than science. Second, schooling tends to be an inefficient enterprise. Third, schooling is a weak lever, relative to student background characteristics, for changing student outcomes. We will address each likely explanation below. In the following discussion we have not attempted to include an exhaustive review of the related literature, but most of the citations include such a review that can be consulted if additional documentation is desired.

The technology of instruction is ill defined

First, and perhaps foremost, the state of knowledge about instruction is not sufficiently well developed to reliably predict the outcome of any particular intervention. In short, there is insufficient evidence that any particular level or combination of resources will produce any predictable outcome measured in student achievement.

How much does it take to enable a student from economically disadvantaged circumstances to achieve state specified learning standards in mathematics, science, or language arts? What should high school class sizes be? What are the characteristics of an effective teacher--one who produces superior student outcomes?

Frankly, no one knows the answers to crucial questions such as these and anyone who claims to know with certainty is usually an unabashed advocate for more money for schools and has little respect for policy analysis or research.

Alaska Schools tend to be inefficient

All things being equal, in an efficient enterprise one would expect for additional inputs to produce improved outcomes. In efficient schools, one would expect to see improved student outcomes associated with added revenues. As we described in the discussion of regression analysis, when important variables are accounted for, on average funding in Alaska schools is not statistically related to changes in student test scores.

What are likely sources of inefficiency? Probably because Alaska schools, and public schools generally, are public sector monopolies, facing little real competition, they have little incentive to operate efficiently[14]. Clearly some Alaska schools are more efficient than others, as illustrated by the high performing outliers displayed in Figures 6 and 7. Perhaps even more compelling is the range of performance among schools with similar spending levels. For example, among the districts in the highest spending quartile, the percent of students proficient in language arts ranges from 9.4% to 76.9%.

[14] This should not be construed as an argument for public school vouchers; it is merely a statement of a condition that exists.

Across the nation the improved efficiency through introduced technology observed in the private sector largely has not been realized in public schools. In fact, in many instances, additional technology in public schools has increased costs (for equipment, software and technology support personnel) without apparent associated increases in student outcomes. In other words, in some instances technology has tended to decrease efficiency in public schools[15].

Perhaps the most obvious source of inefficiency in public schools, including those in Alaska, is the way teachers are paid. The single salary schedule that rewards teachers for their years of experience and additional college classes completed ignores the fact that, with minor exceptions, there is no improvement in student outcomes associated with these teacher characteristics. Hanushek and Rivkin (2000) demonstrate that some teachers do indeed make a significant difference in student performance, but differences in performance are not related to the variables used to pay teachers (experience and education). More important, the pay a teacher receives is unrelated to that teacher's productivity. Teachers in the same cell of a salary schedule receive identical pay even if some produce demonstrably superior student outcomes and some consistently do not. Hanushek (1998) observes,

> [t]he simple premise is that the unresponsiveness of performance to resources largely reflects the fact that very little rests on student performance. Because good and bad teachers or good and bad administrators can expect about the same career progression, pay, and other outcomes, the choice of programs, organization, and behaviors is less dependent on student outcomes than on other things that directly affect the actors in schools.

Another source of apparent inefficiency is the extensive use of aides. Although we did not conduct a systematic review of staffing, the schools we visited seemed to employ more paraprofessionals than indicated by the number of students in attendance[16]. The best available research finds little positive relationship between student outcomes and the use of in-classroom aides. (Grissmer, et al. 2000)

Given this inefficiency, more money is unlikely to improve student achievement, since districts tend to spend additional revenue in the same inefficient ways. Picus and Fazal (1996) summarize their conclusions about school district expenditure patterns as follows:

> …. as their revenues increase, districts continue to spend each additional dollar in roughly the same proportion as the dollars they received previously. The strength of this finding is remarkable. (p 10)

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[15] This may not be the case in Alaska, where distance learning and other technology probably has increased access to a broader curriculum for students in remote schools. Moreover, students may benefit from familiarity with technology that may not be well measured by standardized tests. However, nationally, schools have not demonstrated that the substitution of technology for personnel has led to the dramatic increases in productivity seen in the private sector.

[16] Staffing with aides is a matter of local choice. It is a common practice in most states; however, research suggests that it may not be an efficient choice.

In other words, additional funding for Alaska schools is likely to purchase more of the same resources that will be deployed consistent with current practice, merely paying more for the same things.

Other states that have substantially increased funding have realized higher teacher salaries, smaller pupil teacher ratios (i.e. more teachers hired), but little improvement in student outcomes. Further evidence that new money purchases more of the same, regardless of how effective or ineffective the current system is. See, for example Hanushek (1998) and Hanushek and Rivkin (1997). Clark (2003) studied Kentucky's school reform program (KERA) over ten years and concluded,

> …that KERA resulted in a substantial increase in per-pupil state funding to low income districts, producing a substantial increase in spending per pupil in these districts. Ten years after KERA was first implemented, the poorest districts were, in fact, spending more per pupil on average than the wealthiest districts. The increased spending in the poorest districts funded moderate reductions in class sizes as well as dramatic increases in teacher salaries relative to the wealthier districts. (p 2).

The effect of the increased spending on student achievement was not as apparent. Clark concludes that KERA has had a "mixed" effect on student achievement. ACT scores of black students seemed to have improved modestly, increases in NAEP scores were small and not statistically significant, and there was no apparent reduction in the achievement gap between rich and poor districts.

Downes and Figlio (1999) conducted a review of research literature related to income inequality and school finance reform for the Federal Reserve Bank of New York and concluded that,

> [i]f the goal is to reduce income inequality substantially, state supreme court decisions mandating relatively specific changes in the school finance system are not particularly effective policy instruments. Even the most optimistic estimates of the impact of court mandated school finance reforms on the distribution of student performance indicate that these distributional effects are relatively small. (p107)

Greene and Forster (2004) created an index of educational efficiency that takes into account sixteen social factors that previous research indicates affect student "teachability" (i.e. portion of low income, LEP and other difficult to teach students in the state), level of expenditures per pupil, and student outcomes. Alaska ranks fifth from the bottom on this index. Forty six states are more efficient. Even adjusting the index for differences in cost of living leaves Alaska in 47th place.

Some schools, motivated by the desire to improve student performance, but faced with budgets that were fixed in the short run have been able to achieve impressive results by reallocating existing resources. Odden and Archibald(2000) document that it is possible for schools to adopt ostensibly costly new strategies (e.g. lower class size, implement whole school reforms), and "improve performance, sometimes dramatically,

using mostly their current resources." (p9). Odden and Archibald speculate that the schools they studied may not be able to sustain improving effectiveness over time without additional resources:

> [b]ut if they cannot, then at least they can say they improved performance with the dollars they had, and then make a strong case for why they need more dollars, and how they would spend them. (p9)

There is no reason to expect that additional resources added to the existing system of schools in Alaska will yield improved student outcomes. At the very least, it should be incumbent on the Alaska school districts to demonstrate that they are spending current resources efficiently.

Schooling is a relatively weak lever compared to background factors

Contrary to what might be popular opinion, there is little evidence that schooling is able to fully compensate for student background characteristics. The negative relationship between poverty and student achievement in Alaska is well illustrated in Figure 7 above. Beginning with the Coleman Report (1966), researchers have consistently demonstrated that, on average, much more of the differences in student achievement is explained by student background characteristics than by schooling variables. Richard Rothstein summarizes research efforts since Coleman, "Nonetheless, scholarly efforts over four decades have consistently confirmed Coleman's core finding: no analyst has been able to attribute less than two-thirds of the variation in achievement among schools to the family characteristics of their students." (p14) Hoxby (2001) found that school input variables accounted for just 2.8% of 12th graders' math scores, and just 3.9% of 33-year-olds' income. This should not be surprising when one considers that children spend only approximately 14,040 hours[17] in kindergarten through 12th grade their first 18 years compared to as many as 91,980[18] waking hours out of school.

This is not to say that schools do not make a difference. Children do learn to read and write, learn history, science, etc. but to different performance levels. It is to say however, students' family background variables such as parent education, and family income explain much more of the *differences* in student outcomes than school input variables such as per pupil spending, class size, teachers' salaries, and teachers' credentials.

Armor (2003) summarizes the research on school effects as follows:

> (1) Schools increase the *absolute* (as opposed to relative) level of knowledge for nearly all children, ….;

[17] 13 years x180 days x 6 hours

[18] 18 x 365 days x 14 (assumes average of 10 hours sleep per day)

> (2) Where SES [socioeconomic status] is properly measured, nearly a universal finding is that students from lower SES families have lower achievement in school, starting at the earliest grades;
>
> (3) The impact of SES factors on *relative* achievement (normed test scores) are much stronger than school resources;
>
> (4) School resource effects are inconsistent from one study to another, and they are generally small in magnitude;
>
> (5) Whether or not a given school resource raises relative achievement appears to depend partly on study methodology and partly on idiosyncratic characteristics of particular schools or programs. (p 161)

In addition to family background factors, schooling outcomes are conditioned by the culture and other characteristics of the community in which students live. Most schools are unable to overcome the more powerful effects of the community in which they live. For example, Hoxby (2001) found that neighborhood variables (mean household income, percentage of population with high school degree, racial characteristics of population, etc.) accounted for 3.8% of the variation in twelfth-graders' math scores. (p98) (Note that this explains more variation than school input variables at 2.8%.) Neighborhood variables accounted for 6.3% of the variation in 33-year-olds' income.

Catsambis and Beveridge (2001) study neighborhood and school influences on mathematics performance of eighth-grade students and conclude:

> (a) that neighborhoods characterized by concentrated disadvantage and schools characterized by student poverty and absenteeism tend to depress student's achievement in mathematics, and (b) that characteristics of disadvantaged neighborhoods tend to influence mathematics achievement indirectly, by depressing parental practices associated with high mathematics achievement. The social context of these neighborhoods may depress parents' abilities to engage in effective parental practices and may also foster social contexts that are not supportive of academic pursuits for adolescents. (p 24)

In April of 2005, MAP principals James Smith and James Guthrie and attorneys representing the state and plaintiffs, visited 10 Alaskan Bush schools. Our observations and the stories related to us by educators at these schools amply reinforced the research on the effects of family background and neighborhood variables on student achievement[19]. Our visits were of short duration and we made no attempt to verify the accounts of the educators; however, the stories were consistent across districts, and so

[19] Recall that the regressions cited above suggested that a 10 percentage-point increase in Alaska Native students is associated with a 2.7 to 3.5 percentage point drop on student test scores, a 10 percentage point increase in the percent of students from low income families is associated with 2 percentage point in test scores, and a similar increase in LEP students is associated with a 1.7 to 2.3 percentage point declines in test scores.

consistent with the research, that we found them compelling. Several educators described drugs and alcohol as significant problems for older students. Sleeping students were a common sight in most of the schools. Local educators described this as a chronic problem stemming from students staying up late, frequently without adult supervision. They reported that many of the parents played bingo late into the night. The obvious conclusion is that a student who is asleep is not acquiring the knowledge and skills being imparted by the teacher.

Student absenteeism frequently was mentioned as a chronic problem. Students who are absent cannot learn what is taught in school. During our visit to Koyuk School, "Duma" Otten, a parent, member of the district board, and named plaintiff, described some of the conditions affecting student achievement. According to Otten, "about 80% of the kids who miss school are using drugs." It was his opinion that, "family structure is a big problem. Some families will just not make kids go to school." At Wales, the principal reported an incident where students stayed out of school for several weeks to grieve a relative who had gone missing and died on the ice.

Among the Bush schools we visited, student test scores were uniformly low with two notable exceptions—Akiak Memorial School and White Mountain. Educators at both schools attributed their success to support from parents, community and Elders.

Plaintiffs imply that low test scores result from inadequate resources, but any objective assessment of family and community circumstances in the schools that we visited would support at least the strong hypothesis that student behavior, largely, if not entirely, beyond the control of schools contributes significantly to low student performance.

Considering these circumstances, it is unlikely that any additional funding spent on Alaska schools will yield appreciably improved student outcomes.

Opinion: Although schools are a comparatively weak lever, there are still ways to improve efficiency and maximize the effects of schooling. Proper use of existing resources and a solid accountability structure are more likely to accomplish this than additional funding.

As demonstrated above, the differences between high performing schools and schools that are not high performing, tend to have little to do with the amount of money spent. As demonstrated by the data analysis, particularly the ranges of performance among similar schools (Figure 3), there are important differences among schools. Some clearly produce superior student outcomes, even though, few if any have been able to unambiguously eliminate the achievement gap between low income and middle class students. The differences between high performing and low performing schools are more attributable to what educators do with the resources available than the level of resources. All schools employ substantially the same inputs. For example, approximately 80 percent of virtually all school budgets is expended on teacher salaries. Student performance, however, tends to depend more on educator motivation, attitudes and behavior than the

official qualifications of those teachers. There is considerable agreement about what makes some schools more effective than others. None of these necessarily cost more money.

We conducted no formal study of school and district management, but all of the variables we considered in the regressions could explained 70-80% of the differences in student achievement. It seems reasonable to believe that at least a portion of the remaining 20-30% are explained by district and school management practices.

No state government has yet discovered how to ensure that all local educators utilize available resources in ways demonstrated to maximize student outcomes. Fortunately, however, just as competition tends to force private sector enterprises to become more effective (or fail), accountability embodied in Alaska laws and federal No Child Left Behind may encourage local educators to seek out and employ practices that will improve student outcomes. It is likely that as schools begin to suffer consequences for low performance, local decision makers will embrace more effective practices.

Most of the practices that have proven to be more effective do not cost more money. There has been extensive documentation of the characteristics of effective schools since Edmonds seminal paper in 1979.

This research literature typically lists the following attributes of effective schools:

- A clear school mission
- Effective leadership
- High expectations for students and staff
- Positive climate
- Ongoing curriculum improvement
- Maximum use of instructional time
- Frequent monitoring of student progress
- Positive home-school relationships[20]

Illustrative of such research are two recent reports from Kentucky and Alabama. Kannapel and Clements (2005) studied eight high poverty elementary schools which were producing exceptionally high student outcomes. They summarized the characteristics common among these schools:

High expectations. Principals held high expectations for faculty and staff. There was a strong belief that all students could succeed academically and that faculty and staff were capable of making this happen.

Relationships. Respectful relationships were observed among adults, between adults and students, and among students.

Academic, instructional focus. Schools had a strong focus on academics, instruction and student learning.

Student assessment. Each school had a system to regularly and frequently assess students and modify their instruction accordingly.

[20] Taylor, et al (1999)

Leadership and decision making. Leadership styles tended to be collaborative.
Faculty work ethic and morale. Faculty and staff work very hard to meet students' need. They worked with enthusiasm and dedication, and no reports of burnout or overload.
Teacher recruitment and hiring. Careful attention is paid to recruitment, hiring and assignment of teachers.

Alabama researchers studied four schools with concentrations of low income students that produced high level student outcomes and summarized the factors they found at these schools as follows:

Leadership. Administrators and teachers share leadership.
High expectations for students and teachers. "We expect you to work very hard to succeed, and you can expect us to work very hard to make sure that you do."
Constant monitoring of student progress. Student progress was constantly monitored and instructional decisions were data driven.
Professional learning. Educators at these schools seek out opportunities to acquire new knowledge and skills that help students grow.
Parent outreach. Educators enlist the support of parents, and when needed, pressure parents to live up to their responsibilities.
Can do spirit. Educators in these schools never "suffer a loss of faith." Teachers were described by one researcher as "human bulldozers."[21]

Opinion: School facilities have no measurable effect on student achievement

Numerous studies have been conducted in an attempt to measure the effect of school facilities on student achievement. Picus, et al (2005) surveyed research that purported to report such a relationship. They found virtually all such studies to be methodologically flawed, and, in many cases found the reported conclusions to be unsupported by the data reported in the study. Wyoming may be the only state that collects comprehensive, consistent measures of the conditions of all school district facilities as well as extensive student achievement data at multiple grades. Using these data, Picus, et al conducted sophisticated statistical tests to measure any relationship between student achievement and building condition. Not surprising, considering the preceding discussion about school effects, they found none.

Again, during our brief visits to Bush schools we found situations that underscore this lack of relationship. Schools with excellent facilities are producing poor student

[21] *Toward Excellence*: The Journal of The Alabama Best Practices Center: Vol. 3, Numbers 1&2, Winter/Spring 2003
For further elaboration of the characteristics of effective schools, see The California Center for Effective Schools webpage:
http://effectiveschools.education.ucsb.edu/correlates.html.
or, Lezotte, Lawrence W. "Correlates of Effective Schools: The First and Second Generation." Effective Schools Products, Ltd., Okemos, MI, 1991.

outcomes, and schools with what were reported to be among the oldest buildings in Alaska are producing superior student test scores. Chevak, Kivalina, and Wainwright all enjoy modern well maintained facilities, but produce inferior student outcomes. A stark example of this situation is exemplified by a comparison of the schools in Wainwright and White Mountain. Alak School in Wainwright is a modern well equipped school with extensive technology, swimming pool, sauna, dark room, and wood, metal and electrical shops. The science room is equipped with, "more than we need," according to the principal. White Mountain School is comprised of four separate, unconnected buildings, one of which was reported to have been constructed in the 1930s. The elementary school appears crowded and to lack adequate storage. At White Mountain, the Benchmark scores for all grades are 66.7% reading, 73.3% writing, and 86.7% math. Comparable scores at Wainwright are 23%, 32% and 38.5%.

Opinion: The expert reports prepared by Van Mueller and his colleagues are methodologically flawed and their conclusions unsubstantiated.

- These reports do not meet reasonable standards of scientific rigor.
- The methods chosen are not appropriate for the stated research questions.
- The methods were used inappropriately.
- The researchers generalized from inadequate samples.
- Study participants responses may have been biased by a potential interest in litigation for which the study was prepared.
- Conclusions are not supported by the research.
- Photographs are subject to manipulation and are not appropriate evidence to support the reported conclusions.

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