

*For Want of a Modem and a Comfortable Chair: A Research Note**

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A significant body of work concludes that money matters little, if at all, when it comes to educational achievement (Hanushek 1989, 1994a, 1994b). Others have challenged that view (Hedges, Laine, and Greenwald 1994), and have sought to demonstrate that in some circumstances, and for some things, money does matter. That debate seems to have settled around the idea that if spending money is to make a difference we need to identify those areas in which it might be spent most effectively.

Despite an emphasis on examining potential sources of performance variation, very little systematic work has been done with regard to the possible impact of infrastructure on educational achievement. Utilizing state-level data from a June 1996 GAO report which profiles the condition of American public school facilities by state, this study sought to answer the question of whether infrastructure matters, whether between state variations in the condition of school facilities are related to interstate variations in performance.

A factor analysis using oblique rotation identifies three factors which summarize facilities variables in the GAO report: Factor 1—Insufficient technological capabilities, Factor 2—Unsatisfactory environmental conditions, and Factor 3—Inadequate building structures. These three factors are then examined in a series of OLS and SWLS regression (Meier and Keiser 1996) equations designed to test hypotheses about the relationship between public school facilities and systemwide performance. In all equations the dependent variable (SEI95) is a standardized measure of each state's educational performance. SEI95 is calculated by taking the state mean SAT or ACT score—*only* if the test was taken by at least 29% of eligible test takers¹—and expressing it as a percentage of the highest possible score on each exam. Where dual state scores exist, the average of SAT and ACT means represents that state's score.

All models in the study also contain a single control variable—SEI88 (calculated in the same manner as SEI95). This control is essentially a seven-year lagged version of the dependent variable and accomplishes two

*Copies of the full study are available from the author at University of Wisconsin-Milwaukee, Department of Political Science, P.O. Box 413, Milwaukee, WI 53201.

¹The U.S. Department of Education has established such a threshold in its determination of what it considers a valid measure of state performance.

important goals: (1) it sets a high threshold for any other variables to attain statistical significance, and (2) acts as a blanket control for sources of unspecified variation in performance between states.

It is hypothesized that all three substantive factor variables will be negatively related to state performance as measured by SEI95. The expectation for the control SEI88 is a strong and positive association.

Table 1 summarizes both OLS and SWLS regression results obtained in the study. In all equations, as expected, the SEI88 control is strongly and positively related to the dependent variable.

The separate OLS models 1, 2, 3, and 4 indicate that Factor 1-Insufficient technology, and Factor 2-Unsatisfactory environment, do indeed have a detrimental effect on state public school performance. Factor 3-Inadequate building structures is not found to be significantly related to performance.² It might reasonably be concluded that state policymakers ought to target funds and policies to improve school technology and to those features of school facilities which are related to environmental conditions—ventilation, acoustics, space flexibility, etc., rather than simply to generic facilities improvements.

Since policy analysts may rightly be more interested in what it is the high performers are doing different from the average or low-performing cases, the study analyzed the high performing cases via SWLS regression. The SWLS models of Table 1—models 5, 6, 7, and 8—focus on the high performers by downweighting the influence of the average or low performing cases on the regression line. In doing so, SWLS allows us to see how the slopes for the variables change as the regression line becomes progressively more influenced by the high performing cases. What is most immediately apparent from the SWLS models is the consistent, negative, and significant relationship between insufficient technology and educational performance *even among the high performing states*. Apparently disparities in technological capabilities do exist among high performing states. Some high performance states have greater aggregate capabilities than other high performers. Yet, higher than average states that do not necessarily have the very highest levels of technology are still able to achieve relative success when compared to other states. Some high performers may have insufficiencies similar to those which exist in average or low performing states, but they are doing a better job of utilizing the technology they do have. Merely spending money to improve school technology without also spending to increase effective application—by hiring teachers and technicians

²While the coefficient for Factor 3 in the initial multivariate OLS and SWLS Models 1 and 5 is significant and positive, that coefficient becomes nonsignificant in the equations of Models 4 and 8. Both Factors 1 and 2 are significant and negative in both multivariate and bivariate OLS and SWLS equations.

Table 1. Determinants of State Educational Performance (Standardized Coefficients, T-Scores)

Independent variables	OLS Models					SWLS Models		
	Model 1 ^a	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
SEI88	.9064 ^{****} (19.56)	.8670 ^{****} (17.53)	.9067 ^{****} (18.53)	.8864 ^{****} (17.99)	.9150 ^{****} (22.68)	.8796 ^{****} (26.75)	.8828 ^{****} (23.52)	.8738 ^{****} (27.40)
Factor 1: Insuff. Technology	-.3042 ^{**} (-2.36)	-.1975 [*] (-1.66)			-.2670 ^{***} (-2.85)	-.2731 ^{****} (-3.34)		
Factor 2: Unsat. Environments	-.3407 ^{****} (-2.54)		-.2309 ^{**} (-1.96)		-.3024 ^{***} (-2.55)			
Factor 3: Inadeq. Buildings	.4277 ^{****} (3.40)			.0958 (.805)	.3093 ^{***} (2.75)			.0517 (.566)
R ² (Adj, R ²)	.919 (.908)	.879 (.873)	.881 (.876)	.873 (.868)	.946 (.941)	.939 (.936)	.924 (.921)	.942 (.939)
F Value (Sig. F)	81.46 (.0001)	170.08 (.0001)	174.19 (.0001)	161.82 (.0001)	196.83 (.0001)	359.29 (.0001)	286.19 (.001)	382.86 (.0001)
N	50	50	50	50	50	50	50	50

* $p < .10$; ** $p < .05$; *** $p < .01$; **** $p < .001$.

^aMichigan and South Dakota are dummied out

who understand how to use it—may not accomplish the intended goal of heightened systemwide performance.

The SWLS relationship between unsatisfactory school environments and state performance is also seen to be negative, though not as consistently significant as the technology dimension. Again, SWLS analysis reveals that inadequate building features, separate and distinct from environmental features, are not significantly related to educational performance in the high performing states.

The results of this study indicate that one of the areas in which more money might wisely and effectively be spent by state, local, and even federal education policymakers, is in efforts to improve the environmental conditions and technological capabilities of their public school facilities. Among all states, and even just among the highest performing states, the condition of public school facilities clearly does matter. Improving school facilities will certainly require spending money. But, it should be clear that in the pursuit of educational excellence spending money to improve school technology and its effective use, and to improve school learning environments, is money well spent.

REFERENCES

- American College Testing Program. 1995. *1995 ACT Composite Averages by State*. Iowa City, IA: ACT.
- Hanushek, Eric A. 1989. "The Impact of Differential Expenditures on School Performance." *Educational Researcher* 18:45-65.
- Hanushek, Eric A. 1994a. *Making Schools Work: Improving Performance and Controlling Costs*. Washington, DC: Brookings Institution.
- Hanushek, Eric A. 1994b. "Money Might Matter Somewhere: A Response to Hedges, Laine, and Greenwald." *Educational Researcher* 23:5-10.
- Hedges, Larry, Richard Laine, and Rob Greenwald. 1994. "Does Money Matter? A Meta-analysis of Studies of the Effects of Differential School Inputs on Student Outcomes." *Educational Researcher* 23:5-14.
- Meier, Kenneth J., and Lael R. Keiser. 1996. "Public Administration as a Science of the Artificial: A Methodology for Prescription." *Public Administration Review* 56:459-65.
- National Center for Education Statistics. 1996. *Digest of Education Statistics 1996*. Washington, DC: U.S. Department of Education, Office of Education Research and Improvement.
- U.S. General Accounting Office. June 1996. *School Facilities: Profiles of School Condition by State*. Washington, DC: GAO Health Education and Human Services Division.