

HIGHLY SUCCESSFUL SCHOOLS: WHAT DO THEY DO DIFFERENTLY AND AT WHAT COST?

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Abstract

An underlying premise of many resource adequacy studies is that reaching a specified set of educational outcomes is directly dependent on the level of resources. This article analyzes resource allocation practices among successful schools, low-performing schools, and average public schools in California. We find that differences in traditional resource measures are not able to explain the sharp differences in student achievement among these schools. While unmeasured differences in student characteristics in these schools may explain part of the difference in achievement, the schools also differ dramatically in their effectiveness even though they have very similar expenditure levels. The conclusion is not that resources do not matter. They do, but only when used wisely. This article also delves into what successful schools are doing that might explain their success.

1. INTRODUCTION

For the past thirty years, successful schools have been a focus of education research. They have increased our understanding of effective school practice and provided estimates of adequate spending levels for achieving student learning goals. Successful schools have intuitive appeal: look at the schools that are doing well and learn from them. However, there are drawbacks to this methodology. Identifying “successful” schools is not easy, and if we do not do it well we will attribute success or failure to schools when other factors, such as differences in student populations, are driving achievement differences. Moreover, even if we accurately identify successful schools, their success may be based on characteristics that are difficult or costly to replicate. Learning from successful schools is not a straightforward proposition. In this article, we start by revisiting the assumption that successful schools exist in California. We then go one step further by investigating the extent to which successful schools can be used to determine spending levels, to learn how to allocate resources, and to help identify unique and successful instructional practices.

Researchers have looked to successful schools for two purposes: to estimate the amount of resources needed so that schools can provide adequate educational opportunities for students, and to identify best practices for schools and classrooms. As states have been held responsible for providing adequate education systems, policy makers have sought estimates of the resources necessary to achieve their goals. Unfortunately there is not a perfect way to estimate these costs. One reason for this difficulty is that it is often not possible to establish causal links between resources and student learning because students who receive a given resource differ in important ways from students who do not receive it; therefore the researcher can never be sure whether differences in learning are driven by resources or by initial student differences. A second reason for the difficulty in estimating the expenditures needed to provide an adequate education is that dollars may matter when used in some ways but not in others; money alone can never guarantee adequacy.

In the face of these difficulties, a number of methods have been used to estimate resources needed for an adequate education system. The regression-based cost function method uses data on spending and student outcomes to estimate costs, but this method is plagued by the two concerns above: the difficulty in estimating causal effects and the likelihood that the current use of dollars is not the ideal use; it thus overestimates the actual resources needed for adequacy. A second common approach, the professional judgment approach, draws on the expertise of educators to design adequate schools and then estimate the cost of implementing those schooling models. A third approach, the evidence-based model, also creates prototype schools but draws more on the extant research literature on the effects of educational programs to design

the prototypes. These methods, while appealing in that they create models for schooling that illustrate what a given amount of money can buy, are only as convincing as the professionals and the evidence that they draw on. Critics of these methods point to possible lack of knowledge and perverse incentives on the part of the professionals and to the weakness of the research base for designing ideal or adequate schools.

The successful schools approach for estimating adequate educational spending levels is appealing in its apparent simplicity. What could be a better source of information for the resources needed to produce a given set of educational results than the resources found in districts or schools already achieving them? Used primarily by Augenblick and Myers (1997), the approach has been used to determine adequate spending levels in thirteen states.¹ The criteria used to identify successful schools are fundamental to the soundness of this approach. For example, in California, a simple definition of “success” might be those schools scoring at or above 800 points on the state’s academic performance index (API). Yet these schools, on average, are far less likely to serve students in poverty than the average school in the state. The level of resources producing success in these schools may not be sufficient for all schools in the state. Baker (2006) notes that there are instances in these analyses wherein “arbitrary recommendations for marginal cost adjustments are attached to successful schools estimates after the fact.” Perhaps even more important in assessing the contribution of this approach to estimating resources needs is the extent to which resource adequacy in one school generalizes to other schools. Hanushek (2005) notes that it is incorrect to believe we can extrapolate spending levels to underperforming schools in order for them to achieve those high academic standards. The factors that make schools successful might be unobservable to the researcher or, even if observable, might be difficult or costly to reproduce—for example, highly effective leadership or unusually strong effort on the part of teachers. While at current salaries and with current recruitment and development programs, states can staff some of their schools with highly effective leaders, staffing all schools with equally skilled leaders is unlikely to be costless. In fact, we may not have the knowledge or technology to create such a system even with substantial expenditure. Successful school estimates of resource needs are credible only to the extent that they are able to consider the costs of replication.

Successful schools have been a source of information, not only on resource needs but also on best practices. The effective schools movement launched by

1. The states that have used the successful schools approach to determine adequate spending levels are: Mississippi, Ohio, New Hampshire, Illinois, Louisiana, Vermont, New York, Washington, Maryland, Kansas, Missouri, Tennessee, and Colorado. In the last five states in the list, the successful schools approach has been used in conjunction with the professional judgment panel approach.

Ron Edmonds (1982) uses high-performing schools to identify the common characteristics that could be the source of their success. This literature has found that successful schools have strong instructional leadership (Davis and Thomas 1989; Purkey and Smith 1983; Terry 1996); frequent monitoring of student progress (Levine and Lezotte 1990; Newmann and Associates 1996); shared goals and professional community (Davis and Thomas 1989; Darling-Hammond 1996); parental involvement (Fullan and Stiegelbaur 1991; Levine and Lezotte 1990; Purkey and Smith 1983); and a positive and academically focused school climate (Hoy and Hannum 1997; Rosenholtz 1985). The most recent body of research on school effectiveness (e.g., Ellis et al. 2007; Williams et al. 2005; Oberman et al. 2005) finds similar results. The successful schools approach has also provided insights into common practices in high-performing schools serving high-poverty student populations. The Center for Public Education synthesized relevant studies and found five consistently identified practices: (1) increased instructional time; (2) ongoing diagnostic assessment; (3) parents as partners in learning; (4) professional development to improve student achievement; and (5) collaboration among teachers and staff.

The effective schools literature is not exempt from limitations, either. The practices identified as associated with high academic performance do not guarantee success. It is not uncommon, for example, to find low-performing schools with similar strategies. The differences between the way average-performing and high-performing schools implement successful strategies may be the intensity, the coherence, and the willingness to stay focused over time (Oberman et al. 2005). Moreover, some studies are more convincing than others. As when estimating resource needs, the method of selecting effective schools is essential. In some studies, schools are selected as highly successful when they have proven to be successful for only one or two years, not taking into account the capacity to sustain high performance over an extended period of time. Finally, while the effective schools literature provides rich information on practices at the school level, it often suffers from small sample sizes, no systematic analysis of resource allocation practices, and lack of analysis of what goes on in “noneffective” schools.

In this study, we address some of the limitations of this literature. We analyze all regular public schools in California, assessing the relationship between spending levels and success as measured by student test scores and studying the resource allocation practices across all these schools. We then extend the qualitative component of the research to both successful and low-performing schools in order to directly isolate differences instead of identifying practices in the high-performing schools that may or may not be practiced in other schools. Probably the most significant improvement that we make on the methodologies used in prior studies is in the identification of successful

schools. We start by following the approach of Klitgaard and Hall (1975), using four years of data to address the issue of statistical noise in school performance measures. We extend this by accounting for the performance of subgroups of students (e.g., students eligible for free or reduced price lunch, English learners, Hispanic students, and African American students).

Our goal is threefold. First, we ask whether some schools are in fact more successful than others over extended periods of time. Second, given that these schools exist, we aim to understand how spending and resource allocation practices differ between successful schools and other public schools. Finally, we aim to identify instructional practices that are common to successful schools. California, like other states across the nation, has set challenging goals for students but is far from reaching these goals, especially for students living in poverty. Successful schools provide insights into best practices that can be used in multiple ways to improve the education system. But how and what to learn from successful schools is not always clear. In this article we intend to clarify the benefits and potential pitfalls of drawing lessons from these schools.

2. DATA AND METHODOLOGIES

Data

We combine several publicly available databases to create a profile for all public elementary and secondary schools in California. The California Basic Educational Data System (CBEDS) provides information on schools' enrollment by grade and ethnicity, grade span, and school type (elementary, middle, or high). The Personnel Assignment Information Form (PAIF) gives information on all certified personnel in California, including the major functions (assignments) in a school or district and the relative amount of time spent on each assignment. We obtain the number of part-time and full-time classified staff at each school from the CBEDS School Information Form (SIF) and take financial information from the Standardized Account Code Structure (SACS).² The SACS provides annual revenue and expenditure figures for all school districts in California. California Work Opportunities and Responsibility to Kids (CalWORKs) gives the number of students that received or were eligible for free and reduced price meals, and the Language Census provides the number of English learners (ELs) in each school, along with the primary language of each EL. We collect all of these variables for each year for the period 2002–2005.

The California Standardized Testing and Reporting (STAR) Program provides academic performance measures. We use available school-by-grade-by-subgroup-level test scores from 2002 to 2005 to assess school performance

2. A classified employee is an employee of a school district in a position not requiring certification. The numbers of classified staff do not include preschool, adult education, or regional occupation program classified employees.

(student-level test scores are not publicly available). These data are available for all students taking the test, as well as for subgroups when ten or more students have valid test scores. The primary outcome measures are the California Standards Tests (CST) English language arts (ELA) and mathematics scale scores. High school students take the math test corresponding to the math course they are enrolled in (for example, geometry or algebra), so there is no consistent CST mathematics test that can be compared among all high schools. Given this limitation, we use the California High School Exit Exam (CAHSEE) tests in English language arts and mathematics, in addition to the CST ELA results for high schools.³

Methodology for Selecting High- and Low-Performing Schools

The first step for selecting high-performing schools is to define high performance. We define success as schools that consistently exhibit an unusually high academic achievement level given the student population they serve. Once we have identified these schools, we analyze their resource profiles in order to understand the role that resources play in their unexpectedly high academic achievement level.

Our methodology builds on the study of Klitgaard and Hall (1975). We regress student test scores on student background characteristics, capturing a residual for each school. We do this for multiple years and for multiple subgroups of students. If the same school shows high residuals across multiple residual distributions, it provides strong evidence of unusually high performance. We term these schools “successful” or “beating the odds” schools. If other schools show particularly low residuals across multiple residual distributions, we term these schools “low performing.”⁴

We use four years of test scores to select elementary and middle schools, and three years in the case of high schools.⁵ The control variables include the percentage of students that receive free or reduced price lunch (FRPL), the percentage of ELs in the school, the percentage of ELs that speak Spanish, the percentage of students with disabilities, and parental education. For high

3. Beginning in 2005–6, students must pass the CAHSEE to earn a high school diploma. In addition, this test is used to calculate the API for state accountability purposes and adequate yearly progress (AYP) to meet federal No Child Left Behind (NCLB) requirements.
4. As mentioned above, test score results for the following categories of students were considered in this analysis as dependent variables: all students, students that receive free or reduced price lunch, English learners, Hispanic students, and African American students. The only restriction was that the school needed to have at least ten students in that subgroup in order for the group to be considered.
5. Given that CST scale scores are not vertically equated, scale scores were standardized for each grade using the corresponding statewide CST score distribution. Standardized grade averages were then weighted by the relative enrollment in each grade to obtain a school-level average academic performance measure.

schools, we do not include parental education in the regressions due to missing values. Successful elementary and middle schools are those that in four years perform at least 0.75 standard deviations higher than the residual mean in ELA and mathematics overall and subgroups based on FRPL, ELs, Hispanic students, and African American students. In the case of high schools, we find no school performing at that level, so we relax the requirement so that residuals just have to be positive in all three years. These criteria generate sixty-one elementary schools, seven middle schools, and thirty-five high schools, excluding charter and magnet schools. We refer to these schools as beating the odds (BTO) schools, or schools that are performing higher than expected, throughout the report. We define low-performing (LP) schools as those that perform worse than what is predicted (i.e., those that have a negative error term in all four years) given the student population they serve; we identify seventy-six elementary schools, thirty-two middle schools, and five high schools.

Methodology for Estimating Spending Levels

School-level expenditure information is not available statewide in California, so we estimate the level of spending that successful and low-performing schools incur in their operations. Our estimate of total expenditure includes personnel expenditures, pupil support, and noncertified personnel, as well as per pupil district-level expenditures. First, we estimate teacher and administrator wage equations for all public schools in California.⁶ We apply the coefficients from these regressions to the average educational attainment and experience level of teachers and administrators in each school, information that is available statewide. In other words, we obtain the average teacher and administrator salary at each school using the education and experience profile of its staff members. Finally, we multiply these school-level average wages by the total full-time equivalents (FTEs) of teachers and administrators at each school. In order to complete the picture of personnel expenditures, it is also necessary to consider what schools spend on pupil support and noncertified personnel. Unfortunately, it is not possible to estimate reliable wage equations for these types of staff because of data constraints. So we simply use state-level average salaries for these types of personnel. We then multiply these estimates by the total number (FTEs) of support staff (e.g., counselors, psychologists, librarians)

6. We estimate by weighted least squares the following wage equation:

$$\bar{W} = \alpha_0 + \alpha_1 \bar{edu} + \alpha_2 \bar{exp} + \alpha_3 \bar{exp}^2 + \alpha_4 rwi + \varepsilon$$

where the dependent variable is an average teacher (or administrator) salary, which depends on educational attainment, a nonlinear function of teaching experience, and a relative wage index. This index is based on the average teacher salary in thirty different California regions (see Rose and Sengupta 2007).

and noncertified staff (e.g., paraprofessionals) in each school and add this to the total teachers and administrators' expenditures to obtain the *total personnel* per pupil spending level.

Then, using SACS, we obtain at the district level: (1) per pupil central office administration spending (this includes board and superintendent spending and other general administration); (2) per pupil nonpersonnel spending (including textbooks and core curricula materials and supplies); (3) per pupil plant expenditures; and (4) per pupil spending on other services (this includes travel and conferences, memberships, and professional consulting services). Finally, we add this spending to the *total personnel* per pupil spending to estimate the *total per pupil spending* in California.

Methodology for the Analysis of Resource Allocation Patterns

Using the profile information constructed for every school, we explore how personnel resources (e.g., teachers, support personnel, administrators) in BTO and LP schools differ from each other and from other public schools in the state. In this analysis we regress the resource level for each school on whether the school is a BTO or LP school and a matrix of student demographic variables that includes percent poverty, percent ELs, percent Hispanic, and percent African American.

Methodology for Qualitative Research Component

To supplement the state administrative data on all schools, we conduct telephone interviews with a sample of BTO and LP schools to understand what the leaders of these schools believe to be the source of their academic results. We purposefully select BTO schools serving high-need students, as measured by parental education, percentage of students receiving free or reduced price lunch, and racial diversity of the school. We also verify that schools were not selective (i.e., schools do not pretest or select students for enrollment, and students are not dismissed due to low academic performance). We also select "comparison" schools with a similar mix of student characteristics but performing at a lower level. We use propensity score matching to select among the sample of low-performing schools.⁷ The final sample of interviewed schools includes eighteen BTO schools and five comparison schools.⁸ We draw on the effective school literature to design the interview protocols. The one-hour

7. Schools are matched to BTO schools based on student and family characteristics.

8. The original sample of comparison schools included ten schools; unfortunately, only five schools agreed to participate in the study.

interviews include twenty-five open-ended questions covering the following topics:⁹

- Background information about the school and the principal
- School strategies for success (including probes—when relevant—about curriculum, instruction, professional development, teacher collaboration, use of data, district support, and parental involvement)
- Challenges to increasing academic achievement
- School leadership
- Funding level
- Hiring and firing practices
- Additional support staff
- Professional development
- District support
- Feasibility of reaching an API of 800 points by 2013

These topics are covered for both BTO and LP schools, although there are slight differences in how the questions are phrased. For example, BTO schools are asked to describe the primary school strategies for success, while LP schools are asked to describe the strategies implemented that have affected the performance of the school. Another variation in the interviews is that schools with an API below 800 points are asked about the feasibility of reaching that goal and what kind of changes (including resources) would be required to get closer to 800 points. Schools with an API above 800 are asked whether they had sufficient resources to continue at that level.

3. RESULTS

Selected Successful Schools and Low-Performing Schools

There is a lot of instability in test score results. For example, 365 elementary schools beat the odds if we look only in 2002; for each year from 2003 to 2005 about 280–300 elementary schools beat the odds. However, only 61 elementary schools beat the odds every year during that time period. Middle and high schools look similar. When we define success as success over multiple years, there are not many successful schools in the state. Only about one hundred schools in California, out of eight thousand regular public schools, are actually performing consistently higher than expected during this time period.

Figure 1 shows the *average* residual across all years and subjects for elementary schools across poverty levels. As observed, BTO schools tend to perform about 1.6 standard deviations above LP schools. In order to get this

9. The telephone interview protocols used in this study can be obtained from Pérez et al. (2007).

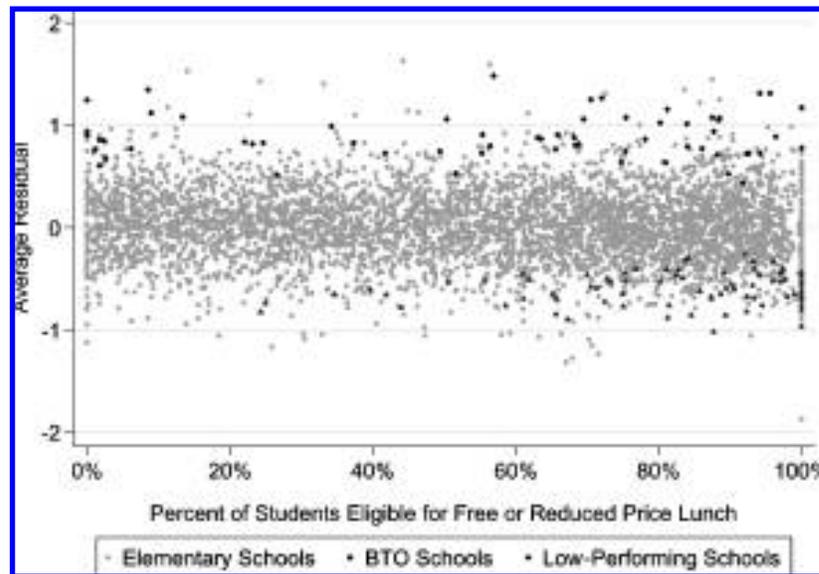


Figure 1. Distribution of the Average Residual across Poverty Level for BTO Schools and Low-Performing Schools, 2002–5

into perspective, consider that the state mean scale score of the ELA CST was equal to 333.7 points—with a standard deviation equal to 67.1 points—in second grade during the school year 2004–5.¹⁰ Therefore this average performance gap between BTO and LP schools translates to about 107 scale scores. This performance gap is very similar in other grades.

While BTO schools serve a range of student populations, low-performing schools are clustered among schools serving high proportions of students in poverty. Figure 1 shows this clearly. No schools serving a low percentage of students in poverty are consistently low performing, while a substantial number of high-poverty schools are low performing in all four years. Table 1 gives the demographic characteristics and school sizes for each group of schools. We see that the poverty level is very high in LP schools—81 percent in elementary schools. These low-performing schools also tend to be larger than BTO schools and other public schools in the state and tend to serve higher proportions of nonwhite students, especially African American students.

Spending Level Estimates

The wage equations' results indicate that average teacher salary increases with higher levels of teacher education and experience, and the marginal effect

10. Given that CST scale scores are not vertically equated, it is necessary to analyze the average and standard deviations within grade.

Table 1. Characteristics of School Groups

	Elementary	Middle	High	Total
Beating the odds (BTO) schools				
	N = 60	N = 7	N = 34	N = 101
% poverty	57.9 (33.0)	51.3 (27.5)	54.2 (13.1)	56.2 (27.4)
% ELs	33.7 (23.9)	23.0 (26.2)	22.5 (8.7)	29.2 (20.8)
% Hispanic	49.4 (34.1)	45.4 (32.1)	63.4 (14.7)	53.9 (29.5)
% African American	5.3 (7.9)	3.8 (5.0)	12.4 (13.0)	7.6 (10.3)
Enrollment	552 (264)	663 (224)	2,656 (774)	1,268 (1,109)
Low-performing (LP) schools				
	N = 76	N = 32	N = 5	N = 113
% poverty	81.0 (18.7)	71.0 (21.5)	60.2 (9.1)	77.2 (20.0)
% ELs	42.4 (15.4)	33.2 (16.3)	28 (12.2)	39.1 (16.1)
% Hispanic	54.8 (18.3)	54.5 (24.5)	54.1 (22.7)	54.7 (20.2)
% African American	21.9 (10.3)	24.1 (18.6)	33.3 (17.9)	23 (13.6)
Enrollment	777 (311)	1,545 (835)	3,252 (1,184)	1,104 (801)
Other public schools				
	N = 5,200	N = 1,178	N = 934	N = 7,312
% poverty	54.0 (30.4)	49.3 (27.5)	35.7 (24.5)	50.9 (29.9)
% ELs	28.7 (22.8)	19.5 (16.3)	14 (13.8)	25.4 (21.6)
% Hispanic	44.6 (30.2)	43 (28.1)	36.2 (25.9)	43.3 (29.5)
% African American	7.1 (11.0)	7.6 (10.8)	7.3 (10.5)	7.2 (10.9)
Enrollment	570 (269)	940 (473)	1,714 (1,077)	776 (618)

Note: Standard deviations in parentheses.

of experience decreases as teacher experience increases. For administrators, wages are tied to education but not as clearly to experience (see appendix table 1). Using these estimates, we find that BTO schools spend slightly less than LP schools per student (\$7,799 vs. \$8,021), as shown in table 2. However, table 1 showed substantial differences in the student populations served by BTO and LP schools. If we look only at high-poverty schools, BTO schools spend slightly more per pupil than high-poverty LP schools (\$8,458 vs. \$8,192).

Resource Allocation Results

While the differences in total spending do not appear dramatic, there are differences in staffing and the qualifications of school personnel across school types. As shown in Table 3, BTO elementary schools have more experienced administrators (eighteen vs. thirteen years in the district) and fewer teachers

Table 2. Estimating per Pupil Spending by School Type

	Total per Pupil Spending	Total Personnel per Pupil Spending	Central Office per Pupil Spending	Plant per Pupil Spending	Other Services per Pupil Spending	Non-personnel per Pupil Spending
Overall						
Beating the odds (n = 103)	7,799	5,554	371	751	699	425
Low performing (n = 113)	8,021	5,603	366	782	802	468
Below median poverty (0%–71%)						
Beating the odds (n = 72)	7,648	5,429	377	739	688	414
Low performing (n = 37)	7,743	5,391	376	766	779	431
Above median poverty (<71%–100%)						
Beating the odds (n = 31)	8,458	6,097	345	801	747	469
Low performing (n = 76)	8,192	5,728	375	804	880	499

Source: California Department of Education, SACS, and CBEDS data, 2004–5.

per administrator than other public schools in the state (seventeen vs. twenty-two). They also have a significantly lower percentage of both probationary or temporary teachers and teachers with tenure when compared with other public schools. Lower-performing schools tend to have less experienced teachers (eleven vs. thirteen years on average) and less experienced administrators (seventeen vs. twenty years in education) than do other schools in the state. They also have substantially more temporary or probationary teachers (26 vs. 20 percent) and a lower proportion of teachers with full credentials (93 vs. 97 percent).

Table 4 gives similar results for middle and high schools. We see few differences between BTO schools and other schools, though the BTO schools do again have fewer probationary or temporary teachers (20 vs. 27 percent) and LP schools have teachers and administrators with less experience and lower educational attainment than other schools and a far lower percentage of teachers with tenure (37 vs. 66 percent).¹¹ These results are consistent with previous research in California (Betts, Rueben, and Danenberg 2000).

11. Note that the relationship between teacher and administrative staff characteristics and academic achievement may also run in the opposite direction: low academic performance may affect staff morale, and therefore better teachers and administrators may leave LP schools over time. The extent to which resources explain the performance gap between BTO and LP schools is analyzed below.

Table 3. Elementary School Personnel Resource Profile

Variable/Resource Category	Variable Description	BTO Schools	LP Schools	Other Public	
Resource Levels					
Staff per pupil	Certified staff per 100 pupils	5.60	5.50	5.59	
	Teachers per 100 pupils	5.19	5.01	5.15	
	Administrators per 100 pupils	0.34	0.27	0.28	
	Pupil support staff per 100 pupils	0.08	0.21	0.15	
	Classified staff per 100 pupils	2.87	2.08	2.86	
	Paraprofessionals per 100 pupils	1.51	0.90	1.31	
	Clerical office staff per 100 pupils	0.55	0.47	0.50	
	Other classified staff per 100 pupils	0.82	0.71	1.06	
Education and experience	Teachers: average total years of education ^a	17.23	17.12	17.26	
	Teachers: percent with bachelor's degree or less	70.30%	79.80%	70.50%	
	Teachers: percent with master's or doctorate	29.70%	20.20%	29.50%	
	Teachers: average total years of experience in education	12.84	11.00***	12.96	
	Teachers: average total years of experience in district	11.26	9.24***	10.82	
	Administrators: average total years of education ^a	18.24	17.89***	18.34	
	Administrators: percent with bachelor's degree or less	14.70%	27.5%***	15.30%	
	Administrators: percent with master's or doctorate	85.40%	71.9%**	84.80%	
Resource Ratios	Administrators: average total years of experience in education	22.72**	17.47*	20.28	
	Administrators: average total years of experience in district	18.13***	12.87	13.85	
	Class sizes	Average class size: kindergarten self-contained classrooms	19.49***	20.4	21.58
		Average class size: grades 1–3 self-contained classrooms	19.73	19.82	20.13
Average class size: grades 4–5 self-contained classrooms		29.31	29.76	30.38	
Experience: education	Teachers: total years of experience per total years of education	0.74	0.64***	0.75	
	Administrators: total years of experience per total years of education	1.25	0.97	1.10	
	Pupil support staff: total years of experience per total years of education	0.87	0.79	0.81	

Table 3. Continued

Variable/Resource Category	Variable Description	BTO Schools	LP Schools	Other Public
Distribution of staff across major assignments	Share of total staff who are teachers	92.70%	91.6%*	92.90%
	Share of total staff who are administrators	6.0%**	4.90%	4.80%
	Share of total staff who are pupil support staff	1.4%*	3.5%***	2.30%
Support capacity	Teachers per administrator	17.08***	20.83	21.8
	Teachers per pupil support staff	19.9	28.52	29.49
	Administrators per pupil support staff	0.94	1.57	1.39
	Paraprofessionals per teacher	0.28	0.18**	0.24
	Share of teaching staff providing mentoring support	0.3%***	1.50%	1.10%
	Share of teaching staff providing instructional support	1.80%	2.70%	2.70%
	Administrators + clerical office staff per principal	3.62	4.75***	3.11
Teacher status and characteristics	Share of total teachers designated as probationary or temporary	15.4%**	25.8%**	20.00%
	Share of total teachers with tenure	52.0%***	62.10%	71.00%
	Share of total teachers with full credentials	95.30%	93.3%***	96.60%

^aAs CBEDS includes only the discrete educational attainment level of staff, we create a continuous education variable in the following way: less than bachelor's degree = 12 years of education; bachelor's degree = 16 years of education; bachelor's degree plus 30 or more semester hours = 17 years of education; master's degree = 18 years of education; master's degree plus 30 or more semester hours = 19 years of education; doctorate = 21 years of education.
 *significant at 10%; **significant at 5%; ***significant at 1%.

While these differences are suggestive, the measured resource differences explain very little of the achievement differences across schools. To assess this we ran regressions of student achievement on resources and student characteristics (see appendix table 2). We then used the regression coefficients to estimate the contribution of resource differences to the achievement differences across school type. The results suggest that our ability to explain differences in achievement between BTO and the rest of public schools in California through differences in teaching experience, educational level, and class size is extremely limited. In the case of mathematics, for example, differences in resources between these schools actually predict a higher average test score for other public schools instead of BTO schools. Differences in resources are able to explain only a very small portion of the academic performance difference between BTO and other public schools. Differences in student characteristics explain none of the higher academic level, which is not surprising given that the BTO schools serve a range of students (as shown in figure 1).

Table 4. Middle and High School Personnel Resource Profile

Variable/Resource Category	Variable Description	BTO Schools	LP Schools	Other Public
Resource Levels				
Staff per pupil	Certified staff per 100 pupils	4.63	4.88	5.41
	Teachers per 100 pupils	4.11	4.34	4.86
	Administrators per 100 pupils	0.26	0.28	0.3
	Pupil support staff per 100 pupils	0.27	0.27	0.25
	Classified staff per 100 pupils	2.14	2.37	2.27
	Paraprofessionals per 100 pupils	0.68	0.88	0.76
	Clerical office staff per 100 pupils	0.56	0.63	0.55
	Other classified staff per 100 pupils	0.89	0.86	0.96
Education and experience	Teachers: average total years of education ^a	17.23	17.03***	17.31
	Teachers: percent with bachelor's degree or less	65.00%	78.2%***	66.30%
	Teachers: percent with master's or doctorate	35.00%	21.8%***	33.70%
	Teachers: average total years of experience in education	12.23	10.10***	12.81
	Teachers: average total years of experience in district	10.36	8.50**	10.24
	Administrators: average total years of education ^a	18.33	18	18.21
	Administrators: percent with bachelor's degree or less	20.40%	27.4%*	21.90%
	Administrators: percent with master's or doctorate	79.60%	72.60%	78.10%
	Administrators: average total years of experience in education	18.76	16.16*	18.62
Administrators: average total years of experience in district	14.12	14.68	12.54	
Resource Ratios				
Class sizes	Average case load: core subjects	153.75***	143.77	142.31
	Average case load: electives	190.44	211.27**	183.59
Experience: education	Teachers: total years of experience per total years of education	0.71	0.59***	0.74
	Administrators: total years of experience per total years of education	0.85	0.82	0.88
	Pupil support staff: total years of experience per total years of education	1.02	0.9	1.02

Table 4. Continued

Variable/Resource Category	Variable Description	BTO Schools	LP Schools	Other Public
Distribution across assignments	Share of total staff who are teachers	88.6%*	88.80%	89.70%
	Share of total staff who are administrators	5.50%	5.70%	5.50%
	Share of total staff who are pupil support staff	5.9%***	5.5%*	4.80%
Support capacity	Teachers per administrator	19.04	17.11	17.97
	Teachers per pupil support staff	15.89*	18.01	20.89
	Administrators per pupil support staff	0.99*	1.19	1.28
	Paraprofessionals per teacher	0.17	0.21*	0.16
	Share of teaching staff providing mentoring support	1.30%	0.8%***	1.60%
	Share of teaching staff providing instructional support	0.1%*	0.20%	0.40%
	Administrators + clerical office staff per principal	15.95***	13.00***	9.25
Instructional emphasis	Share of total teachers who teach core subjects ^b	57.80%	66.2%***	59.60%
	Share of total teachers who teach elective subjects ^c	20.3%***	14.1%**	18.90%
	Elective teachers per core teachers	0.36	0.22	0.33
Teacher status and characteristics	Share of total teachers designated as probationary or temporary	20.0%***	28.50%	27.00%
	Share of total teachers with tenure	53.5%**	37.4%***	65.70%
	Share of total teachers with full credentials	88.90%	78.3%***	92.20%

^aAs CBEDS includes only the discrete educational attainment level of staff, we create a continuous education variable in the following way: less than bachelor's degree = 12 years of education; bachelor's degree = 16 years of education; bachelor's degree plus 30 or more semester hours = 17 years of education; master's degree = 18 years of education; master's degree plus 30 or more semester hours = 19 years of education; doctorate = 21 years of education.

^bCore subjects include mathematics, English, history, and social science.

^cElective subjects include humanities, arts, music, physical education, computer education, and foreign language.

*significant at 10%; **significant at 5%; ***significant at 1%.

Given the clearer differences in resources between LP schools and other schools, it is not surprising that when we analyze how resources and student characteristics explain the low academic performance level of LP schools, we see that differences in resources account for some, though still a small portion, of the 1.16 standard deviation difference in math (5.1 percent). When student characteristics are taken into account, our ability to explain the achievement gap increases to 30.9 percent.

In summary, the extremely high academic performance of BTO schools is not explained by resources or student characteristic differences that are

measured in the state administrative data. In the case of LP schools, about a third of their low performance is explained by observable school characteristics. Given our limited ability to explain academic performance using state data, we collected additional data from a subset of schools.

Phone Interview Results¹²

“You’re looking for the recipe for how to get a school to be successful, but I think running a school is an art form. You can give a recipe for making a film but it would not make it the best film in town. You can follow the whole recipe but you miss that other ingredient, which is the artistic part of it.” —BTO school principal

The success of BTO schools as described by their principals cannot be summarized in a simple list. Neither more resources nor the application of a recipe for resource allocation explains the differences we heard in the phone interviews. Yet three factors are cited repeatedly: (1) high-quality teachers and staff; (2) implementation of a standards-based curriculum; and (3) coherence of instruction across classrooms.

In describing the high quality of their staff, principals identify factors that support teacher quality. In particular, they highlight the support available to teachers in the school and their own ability to control the teaching staff through hiring and dismissing, either directly or by encouraging them to leave by themselves. For nine of the principals from the BTO schools, high-quality teachers are the driving force behind the school’s success; these principals often placed emphasis on providing their teachers with the training and support needed to be successful. Most of these schools report that they have a high or moderate degree of control over the hiring of teachers, and all of them indicate that they are highly effective in removing teachers and staff that are not meeting expectations.

Four of the principals from the BTO schools cite implementation of a particular curriculum as the primary driving force in their success. Moreover, almost all of the interviewed BTO principals identify this factor as contributing to their success. They tend to focus on effective implementation of their curriculum using curriculum guides, data-driven decisions regarding instruction, and programs and/or interventions that complement the core curriculum. In describing the implementation of this curriculum, most principals return to the importance of high-quality teachers as a key component of their strategy.

Five of the BTO principals cite coherence of instruction as the most important driving force for success. Again, even those principals who do not cite

12. Pérez et al. (2007) give the theoretical framework used to analyze the results of these interviews, as well as the complete results of this analysis.

this first identify coherent instruction as part of their overall plan for academic accomplishment. Some schools place emphasis on having a pacing plan that helps teachers know what they should be teaching. Others mention teacher collaboration and the implementation of a particular curriculum as helping to strengthen the instructional coherence at their school.

4. DISCUSSION AND CONCLUSIONS

Successful schools can serve as a model to other schools. They provide insights into what can work. However, there are severe limitations for using these schools as evidence of what will work or for estimating the cost of providing adequate educational opportunities to students throughout the state.

The lessons we have learned in this study can be summarized as follows:

- As a first step, any successful school analysis has to consider the implications of student characteristics and the risks associated with extrapolating conclusions to the rest of the schools in the state.
- Any selection process of successful schools has to consider a relatively long period of high performance in order to minimize misidentification due to statistical noise. Hopefully it should also include analysis of subpopulations within those schools.
- Differences in resources have a very limited ability to explain the important performance gap between successful schools and other public schools in the state.
- In the case of low-performing schools, differences in resources, such as teacher and administrative staff experience, may explain to a greater extent their extremely low performance with respect to other public schools in the state.
- Successful schools seem to differ from other schools mostly in terms of higher teacher quality (in aspects beyond their formal education and years of experience), higher control over the hiring of teachers, effective implementation of their curriculum using curriculum guides, data-driven decisions regarding instruction, and programs and/or interventions that complement the core curriculum.
- Scaling up these best practices to the rest of the schools in the state may be very costly and possible only in the long term. Nevertheless, if the state intends to reach its ambitious goals in education, it will have to invest and develop new technologies for replicating strong leadership and teaching, coherent curriculum implementation, and data-driven decision making in schools.

In summary, only about one hundred schools, out of eight thousand regular public schools in the state, are consistently outperforming other schools with similar characteristics year after year. This is also an indication that existing adequacy frameworks would benefit from considering more broadly the mix of resources and conditions needed in a school to be truly adequate for success. The state can also further this agenda by collecting more comprehensive information in regard to the broader sets of attributes and performance measures that are needed to better understand the full resource implications of its schools' success.

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APPENDIX

Table A.1. Weighted Least Squares Regression Results for Teachers and Administrators

	Teacher Salary Equation	Administrator Salary Equation
Average education level ^a	5,027*	6,250*
Average experience level	3,742*	613
Average experience squared	-115*	-7
Wage index ^b	27,512*	61,321*
Constant	3,283	12,581
Number of observations	1,027	979
R ²	0.11	0.13

^aAverage educational level is centered at 16 years. This means that the expected salary for a teacher in the Los Angeles Unified School District (LAUSD) with 16 years of education and 10 years of experience will be $(5,027*0) + (3,742*10) - (115*(10)^2) + (27,512*1) + 3,283$.

^bThis index is based on the average teacher salary (for a given level of education and experience) in 30 different California regions. The wage index is centered on LAUSD; it will take the value of 1 when the location is LAUSD.

*significant at 1%.

Table A.2. Regression of Average School-Level Academic Achievement, 2004–5

	Standardized CST Math	Standardized CST ELA
Ln (average years of teaching experience)	0.260 (0.022)*	0.285 (0.018)*
Ln (average years of teacher education)	1.287 (0.305)*	1.239 (0.232)*
Ln (teachers per student)	0.131 (0.047)*	0.346 (0.036)*
Ln (percentage of students eligible for free or reduced price lunch)	-0.684 (0.010)*	-0.655 (0.008)*
Ln (percentage of English learners)	-0.032 (0.008)*	-0.115 (0.007)*
Constant	-4.544 (0.852)*	-3.957 (0.649)*
Observations	6,467	7,395
R ²	0.6213	0.7059

*significant at 1% (p values in parentheses).