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Aligning School Finance with Academic Standards:

A Weighted Student Formula Based on a Survey of Practitioners

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IREPP

STANFORD UNIVERSITY

Getting Down to Facts

A research project designed to provide California's policymakers and other education stakeholders with comprehensive information about the state's school finance and governance systems, and lay the groundwork for a conversation about needed reforms. The project was made possible by grants from the Bill & Melinda Gates Foundation, the William and Flora Hewlett Foundation, the James Irvine Foundation, and the Stuart Foundation.

This summary was prepared by IREPP.

For the full text of the author's research report and the other studies in this project, see: **www.irepp.net**

For background on California's school finance system see: **www.californiaschoolfinance.org**

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This study uses budget simulations completed by teachers, principals, and district superintendents to answer a central question: What resources do California schools need to ensure that more students meet the academic standards set by the state? Answering this question requires addressing several intermediate questions:

1. How would education professionals design an effective school and use extra resources if they were available?
2. What student performance outcomes do professionals predict based on changes in student characteristics and school-level resources?
3. What are estimated costs for each school district, factoring in district-level expenditures, and how do they vary?
4. Based on the above information, what is the estimated level of total spending needed for California's public schools to meet the state's goal of an 800 on the Academic Performance Index (API) or related targets for the percent of students scoring proficient or above on the California Standards Tests (CSTs)?

This is one of three studies in the Getting Down to Facts *project that estimate the costs for California school districts to meet the achievement goals set for them by the state.*

Study Methods

This study uses a method for estimating education costs that was inspired by professional judgment panels. Using online budget simulations, it asks 567 randomly selected California public school teachers, principals, and superintendents how they would allocate resources within a given budget and what student performance outcomes they would expect.

Each participant is presented with a description of a hypothetical school, including the characteristics of its students, along with a budget for that school and the costs of various school resources. Participants then select the quantities of each resource they believe would maximize the academic achievement of the school's students. After making these choices, participants predict the academic achievement of the school. Their focus is on the state's Academic Performance Index (API) for the school as a whole, the percent of students proficient on the 8th grade California Standards Test in math for middle schools, and the graduation rate for high schools. Participants complete multiple simulations with different budget amounts.

The budget simulations incorporate certain efficiencies not currently found in the existing school finance system. For example, the assumption is that school leaders have the authority to allocate resources as they deem most appropriate (i.e., they are not constrained by allocation rules associated with categorical funding). The participants are also asked to assume that they can hire certified teachers at the given price.

The description of each participant's hypothetical school is taken from his or her actual school. The schools for the study are selected from a random stratified sample, and then participants are selected based on their association with the schools. When a school is chosen, its principal is invited to participate. School principals are then asked to volunteer teachers. Superintendents, randomly selected to participate, did the simulation for one school in their districts.

Figure 1 • **Estimated Resource Choices for the Average Elementary School with 583 Students**

Resource	Unit of Measure	$4,000/ Student	$6,000/ Student
Teachers			
Kindergarten	FTE	4.5	5.2
Grades 1–3	FTE	13.1	14.1
Grades 4 and 5	FTE	6.6	7.8
Specialty		1.3	2.2
Administration			
Principals	FTE	1.2	1.2
Assistant principals	FTE	0.2	0.5
Clerical office staff	FTE	2.1	2.7
Support Staff			
Instructional aides	FTE	1.3	6.0
Counselors	FTE	0.4	0.7
Nurses	FTE	0.3	0.6
Librarians	FTE	0.4	0.9
Security officers	FTE	0.1	0.2
Technology support staff	FTE	0.4	1.0
Community liaisons	FTE	0.3	0.6
Professional Development			
Academic coaches	FTE	0.2	1.4
Collaborative time	Hours/year/teacher	40.5	59.0
Student Programs			
Preschool	Students	0.4	1.6
After-school tutoring	Teacher hours/week	18.1	40.8
Summer school	Students	60.2	119.8
Longer school year	Days/year	-0.3	4.3
Longer school day	Hours/day	0.0	0.3
Full-day kindergarten	1=yes 0=no	0.5	0.6
Computers for instruction	Computers	65.5	151.5
Other	$ thousands	-14.5	52.5
Class Size			
Kindergarten		21.4	18.7
Grades 1–3		22.2	20.7
Grades 4 and 5		29.3	24.8

The descriptions, budgets, and costs vary among the participants, revealing how a large group of professionals view the relationship between school budgets and student achievement. Participants work independently and do not know how their responses affect the overall results of the study. The 568 simulations included 190 elementary schools, 189 middle schools, and 189 high schools.

From these individual estimates, the author calculates the average predictions based on specific budget levels for elementary, middle, and high schools separately. In addition, he calculates a confidence interval for the budget estimates for each type of school and at each budget level.

The simulations and resulting estimates exclude a wide variety of school district costs, such as district administration, transportation, maintenance and operations, and special education. The author uses actual expenditure data from 2003–04 to arrive at costs for a school district with average revenue per pupil, adjusting for external factors such as student characteristics.

The study then combines the school-level budget estimates (aggregated by school district) with the estimated district expenditures to arrive at a total projected cost for California.

Summary of Key Findings

Elementary, middle, and high school educators differ in staffing ratios, but they would use additional resources similarly

In the simulations, budget scenarios and student characteristics varied widely. The average resource choices presented here are based on two different school-level budgets: $4,000 per pupil, approximately average for the state in 2003–04, and $6,000 per pupil, a 50% increase. These school-level resources represent more than 60% of district expenditures.

Elementary educators would spend a resource increase disproportionately on support staff and would lengthen instructional time

The first column of Figure 1 shows how elementary school participants would spend current resources. When given 50% more resources (last column), participants would generally make increases across all areas of school operation. They would increase the number of teachers by about 15% in order to reduce class sizes, most notably in grades 4 and 5. They would also provide extra administrative support, spending about 27% more.

Increases in other areas are more substantial in proportion, though each represents a smaller part of the total budget than teacher costs. Those include a tripling of support staff and an increase in academic

coaches from a fifth of one full-time-equivalent (FTE) person to 1.4 FTE. The cumulative results also increase the collaborative time teachers spend working together on curriculum, assessment, and pedagogy from 40.5 to 59.0 hours per year.

With a larger budget, hours of instruction also increase: the school day is lengthened by 18 minutes and the school year by four days. Student programs—including preschool, summer school, and after-school tutoring—also receive substantially more resources.

Middle school educators would increase resources across the board, but they would put special emphasis on teacher collaboration and increased instructional time

For the school with the baseline resources, middle school practitioners specified larger class sizes and more administrators than their elementary counterparts. With an expansion of the budget by 50%, the data in Figure 2 show increases for resources in all areas, but with some notable differences from the elementary patterns. In particular, the teaching staff increases by 27%, reflecting educators' reduction of core class sizes from 27 to 22 students, non-core classes from 32.4 to 23.8 students, and P.E. classes from 44.4 to 30.6 students. Middle school respondents averaged a 20% increase in administrative support, but their baseline allocation in that area was much higher in terms of FTE per pupil than their elementary counterparts.

The larger budget produces notable percentage increases for professional development, with the number of academic coaches doubling and collaborative time for teachers nearly tripling. The after-school tutoring program also nearly triples in size, and the school year is lengthened.

Figure 2 • **Estimated Resource Choices for the Average Middle School with 950 Students**

Resource	Unit of Measure	$4,000/ Student	$6,000/ Student
Teachers			
Core	FTE	28.1	34.6
Non-core	FTE	5.9	8.0
P.E.	FTE	4.3	6.2
Administration			
Principals	FTE	1.2	1.3
Assistant principals	FTE	1.5	1.9
Clerical office staff	FTE	4.1	5.0
Support Staff			
Instructional aides	FTE	5.8	7.7
Counselors	FTE	2.0	2.8
Nurses	FTE	0.6	0.9
Librarians	FTE	1.0	1.3
Security officers	FTE	1.3	1.7
Technology support staff	FTE	0.9	1.5
Community liaisons	FTE	0.8	1.2
Professional Development			
Academic coaches	FTE	1.5	3.1
Collaborative time	Hours/year/teacher	44.7	122.1
Student Programs			
After-school tutoring	Teacher hours/week	55.6	133.1
Summer school	Students	204.5	271.2
Longer school year	Days/year	0.6	4.9
Longer school day	Hours/day	0.0	0.6
Computers for instruction	Computers	149.5	322.2
Other	$ thousands	18.7	74.0
Class Size			
Core		27.0	22.0
Non-core		32.4	23.8
P.E.		44.4	30.6

High school educators would specify smaller classes and more staff, and they would use increases largely for support staff, professional development, and student support programs

High school educators' average expenditure choices at the lower budget level varied in some notable ways from their middle school counterparts. (See Figure 3 on page 4.) They allocated more for teachers, thus creating smaller class sizes in both core and P.E. classes. They called for almost 21% more administrative staff per pupil and about twice as many counselors and security officers, as was the case with the middle school group. The 50% increase in budget resulted in less dramatic changes in teaching staffs than at middle schools, increasing teachers by about 27 percent. With more money to spend, participants emphasized support staff, professional development, and student programs.

Educators predict that increased student poverty strongly hinders school performance, while resource increases have a modest positive effect

The predictions that participating educators make about student

Figure 3 • **Estimated Resource Choices for the Average High School with 1,789 Students**

Resource	Unit of Measure	$4,000/ Student	$6,000/ Student
Teachers			
Core	FTE	43.6	52.4
Non-core	FTE	26.3	34.3
P.E.	FTE	4.5	5.7
Administration			
Principals	FTE	2.0	2.1
Assistant principals	FTE	2.2	3.2
Clerical office staff	FTE	7.3	11.4
Support Staff			
Instructional aides	FTE	5.2	13.8
Counselors	FTE	4.0	5.6
Nurses	FTE	0.7	1.1
Librarians	FTE	1.2	1.9
Security officers	FTE	2.2	3.9
Technology support staff	FTE	1.7	2.6
Community liaisons	FTE	0.6	1.7
Professional Development			
Academic coaches	FTE	1.5	4.1
Collaborative time	Hours/year/teacher	42.5	100.1
Student Programs			
After-school tutoring	Teacher hours/week	63.2	153.9
Summer school	Students	346.1	598.9
Longer school year	Days/year	2.4	4.4
Longer school day	Hours/day	0.4	0.8
Computers for instruction	Computers	328.4	606.1
Other	$ thousands	39.5	205.7
Class Size			
Core		24.2	20.2
Non-core		33.4	25.7
P.E.		38.9	30.6

achievement lead to two important conclusions:

1. Student poverty, as measured by the percentage of students participating in a school's subsidized lunch program, has a strong negative effect on student achievement.
2. A larger budget can be used to increase student achievement, but the effect is modest.

The average elementary school—with 573 students and a budget of $4,000 per student—illustrates these points. If none of the students is classified as poor, the average prediction of simulation participants is that the school will achieve an API of 843. If all students are poor, the average prediction is an API of 698. An increase in the school's budget of $1,000 per pupil increases the predicted API by just 13 points. At the highest budget in the simulations—$7,600 per pupil—the average API predicted score rises to 745, well short of the 800 goal.

Participants in the middle and high school simulations make similar predictions. These participants are also told the average achievement of students in their school's feeder schools, and that information has an important effect on their predictions. Even so, participants believed that very high budgets would be necessary for schools serving low-income neighborhoods to meet the state's achievement standards.

Participants' predictions vary substantially, creating a wide "confidence interval," especially as budgets get further from the current budget level

The author produces estimates for budgets required to meet state academic standards based on average predictions of simulation participants and incorporating formulas for the relationship between funding, student characteristics, and student outcomes. However, because predictions of individual participants vary considerably, a different set of participants would not produce exactly the same average prediction.

To represent this uncertainty, the study presents a confidence interval for each of the estimates. Figure 4 on page 5 shows this for the elementary school estimates and reveals that the confidence interval is quite wide, especially as the budget estimate gets further from current spending levels.

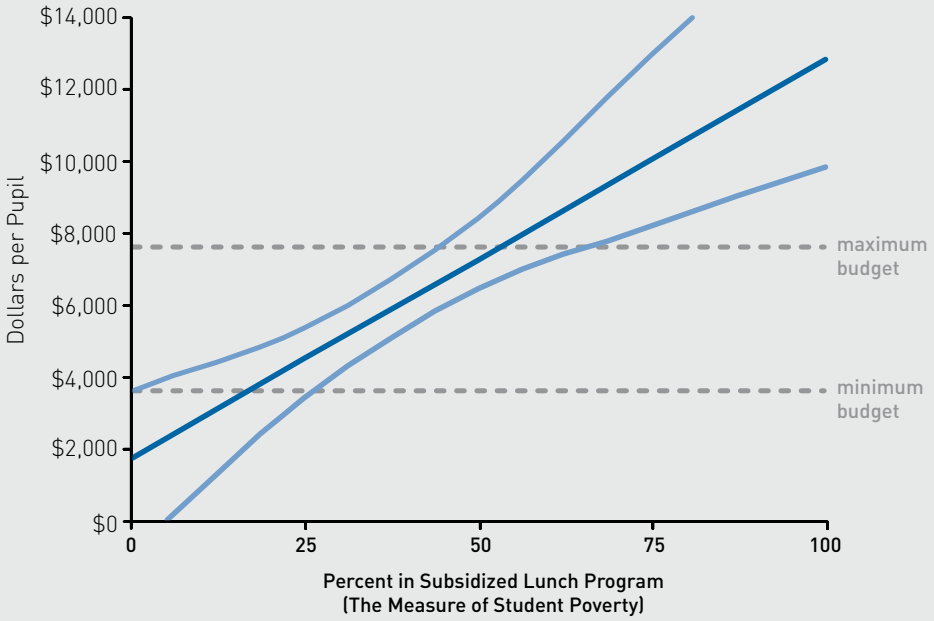
For the average elementary school in which 52% of students participate in the subsidized lunch program (the measure of student poverty), the estimated budget is $7,430 per pupil. However, the 90% confidence interval runs from $6,403 to $8,368 per pupil. It is also notable that the budget estimates for reaching an API of 800 exceed the maximum budget in the simulation in some cases and fall short of the minimum budget in others. The estimates from the middle and high school simulations have the same general characteristics. (The author does similar analyses for other variables, including the percent of English learners, but student poverty shows the greatest and most consistent effect.)

The analysis provides school-level costs per pupil that vary substantially due to factors such as student poverty

The school-level budget equations are the first step in estimating the cost to each district of meeting the state's achievement standards. The equations determine a projected cost for every school, and the author then aggregates these costs to the district level. The resulting estimated per-pupil costs to reach a school-wide API of 800 vary widely across California school districts. When districts were ordered by cost per pupil, the bottom 5% had school-level costs of less than $2,579 per pupil. For the top 5%, the cost per pupil was at least $11,963.

Because these estimates span from less than the lowest-given budget in the simulation to more than the highest-given, the author does not believe that these very high and low estimates are accurate enough to provide useful information. Instead, he cuts off the budgets to match the highest and lowest in the simulation and gives the estimates for these truncated ranges. The results are that about half the schools have predicted APIs of 800 or more. For middle and high schools, the median predicted API is 797. For elementary schools, it is 796. However, many schools have predicted APIs considerably below 800. For elementary schools, 20% have APIs between 736 and 761. For middle and high schools, the equivalent ranges are 750 to 776 and 758 to 783, respectively.

Figure 4 • **Estimate and Confidence Interval for Elementary School Budget Required to Meet State Achievement Standard of 800 API**



The dashed lines in this figure represent the minimum and maximum budgets provided in the simulations.

The dark line in the chart represents the average for the relationship between the Budget and Poverty variables in the author's formula, which predicts how each affects performance.

The light blue lines are the boundaries of a 90% confidence interval for the Budget variable. To be precise about this interval, consider a particular level of the Poverty variable and the predictions of all educational practitioners about the budget necessary for a school with these characteristics to achieve the target API of 800. Now take the average of those budget predictions. With a probability of 90%, that average lies within the confidence interval portrayed here.

Adding district costs to the simulated budgets yields total cost estimates

As noted above, these school budget estimates exclude a wide variety of school district costs, including district administration, transportation, special education, and maintenance and operations. The author uses existing expenditure data to factor in the costs of these activities to the school budget estimates and then adjusts the total for regional differences in employee compensation.

The analysis suggests that a per-pupil funding average, weighted by regional cost differences and student poverty, could fairly account for cost variations

These costs reflect a complex set of variables. However, the author is able to approximate them by using a relatively straightforward formula that sets the average dollars per pupil at $9,533 and considers just two variables: regional salary costs and the percentage of school-age children living in poverty. A district in a region with average salaries that has an average amount of student poverty would need $9,533 to meet the state's achievement standards. If salaries in the district's region were 10% ($5,186) higher than the state average, the district would need an additional $586 per pupil. If student poverty were 10% (1.8 percentage points) higher than average, the district would need an additional $120 per pupil.

The study includes a discussion of how this approach could be used to adjust revenue limit formulas in California. (The full study also provides estimates of revenues needed for each of the 950 school districts that had complete data.)

At least an estimated 40% increase in funding, targeted mostly to low-income schools, is needed to meet current expectations

The study draws on complete data for 950 districts out of the state's 986, based on financial information from 2003–04. The adjusted total cost for these districts to meet the state's goals was $60 billion. In contrast, expenditures in the same districts in 2003–04 totaled $43 billion. In the aggregate, this represents a cost increase of about 40%. The bulk of these additional costs are due to resources needed to boost achievement in schools primarily serving students from low-income families.

Author's Conclusions

The author presents several caveats in regard to the findings of this analysis, based in part on the lack of solid evidence regarding the relationship between resources and student achievement:

- Many factors besides resources affect achievement, thus limiting the predictive power of studies of this kind.
- The simulations ask participants to predict student achievement for hypothetical schools with more resources than any school they have experienced.
- Because California is still in the early stages of its new system of academic standards and accountability, the participants may have underestimated what students will ultimately be able to achieve.

Currently, the essence of California's school finance system is that the Legislature appropriates funds to K–12 education as dictated by Proposition 98 and allocates those funds among school districts in proportion to their enrollment. The author concludes that California's new academic standards require a different approach that starts with the fundamental question of what resources schools need for their students to achieve those standards. The simulations conducted for this study point to two broad conclusions with implications for answering that question. The first conclusion is that student poverty has a strong, negative effect on academic achievement. The second is that school resources have a positive, but modest, effect.

The implication is that if all schools are to achieve the same high standard, as California's current policy dictates, then schools serving low-income neighborhoods need more resources than other schools. Furthermore, because poverty has a large effect on achievement and resources have a modest effect, California's policy implies that the resource differences across schools based on student backgrounds could be very large.

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This study was completed in December 2006.