



Valuing Teachers

For some time, we have recognized that the academic achievement of schoolchildren in this country threatens, to borrow President Barack Obama's words, "the U.S.'s role as an engine of scientific discovery" and ultimately its success in the global economy. The low achievement of American students, as reflected in the Program for International Student Assessment (PISA) (see "Teaching Math to the Talented," *features*, Winter 2011), will prevent them from accessing good, high-paying jobs. And, as demonstrated in another article in *Education Next* (see "Education and Economic Growth," *research*, Spring 2008), lower achievement means slower growth in the economy. From studying the historical relationship, we can estimate that closing just half of the performance gap with Finland, one of the top international performers in terms of student achievement, could add more than \$50 trillion to our gross domestic product between 2010 and 2090. By way of comparison, the drop in economic output over the course of the last recession is believed to be less than \$3 trillion. Thus the achievement gap between the U.S. and the world's top-performing countries can be said to be causing the equivalent of a permanent recession.

According to the president in this year's State of the Union address, this is "our generation's *Sputnik* moment," the time when we realize the urgent need to step up the performance of our education system. Only today, unlike in the 1950s, we

have a clear idea of what it takes to improve achievement. The quality of the teachers in our schools is paramount: no other measured aspect of schools is nearly as important in determining student achievement. The initiatives we have emphasized in policy discussions—class-size reduction, curriculum revamping, reorganization of school schedule, investment in technology—all fall far short of the impact that good teachers can have in the classroom. Moreover, many of these interventions can be very costly.

How much is a good teacher worth?

By
ERIC A. HANUSHEK

Indeed, the magnitude of variation in the quality of teachers, even within each school, is startling. Teachers who work in a given school, and therefore teach students with similar demographic characteristics, can be responsible for increases in math and reading levels that range from a low of one-half year to a high of one and a half years of learning each academic year.

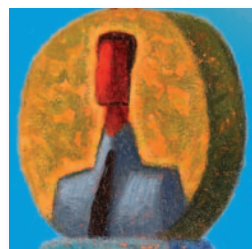
But while most parents are able to distinguish a good teacher from a bad one, few have any idea what difference it makes in the lives of their children. And researchers do not help, tending to talk in terms of standard deviations of achievement and effect sizes, phrases that simply have no meaning outside of the rarefied world of research. Here, I translate the researchers' shorthand into concepts that might be more readily understood: the impact of teachers on the earnings of individuals and on the future of the economy as a whole.

Measuring Teachers' Impact

Many of us have had at some point in our lives a wonderful teacher, one whose value, in retrospect, seems inestimable. We do not pretend here to know how to calculate the life-transforming effects that such teachers can have with particular students. But we can calculate more prosaic economic values related to effective teaching, by drawing on a research literature that provides surprisingly precise estimates of the impact of student achievement levels on their lifetime earnings and by combining this with estimated impacts of more-effective teachers on student achievement.

Let's start with the researcher's point of view. With a normal distribution of performance (the classic bell curve), a standard deviation is simply a more precise measure of how spread out the distribution is. Somebody who is one standard deviation above average would be at the 84th percentile of the distribution. If we then turn to the labor market, a student with achievement (as measured by test performance in high school) that is one standard deviation above average can later in life expect to take in 10 to 15 percent higher earnings per year.

That estimate may be deemed conservative for two reasons. First, it does not account for increases in years of education that may result from having a higher level of performance early on. Also, the estimate is based on information from people's wages and salaries early in their careers, before they have reached their full earnings potential. Other calculations that take into account earnings throughout entire careers estimate 20 percent increases over the course of a lifetime.



A good, but not great, teacher increases each student's lifetime earnings by \$10,600. Given a class of 20 students, she will raise their aggregate earnings by \$212,000.

Does 10 to 15 percent amount to much? For the average American entering the labor force, the value of lifetime earnings for full-time work is currently \$1.16 million. Thus, an increase in the level of achievement in high school of a standard deviation yields an average increase of between \$110,000 and \$230,000 in lifetime earnings.

How do increases in teacher effectiveness relate to this? Obviously, teacher quality is not the only factor that affects student achievement. The student's own motivations and support from family and peers play crucial roles as well. But

researchers have worked hard to isolate the impact of teachers from these other influences. Rigorous studies consistently show that the impact of a more-effective teacher is substantial. A high-performing teacher, one at the 84th percentile of all teachers, when compared with just an average teacher, produces students whose level of achievement is at least 0.2 standard deviations higher by the end of the school year. In fact, the impact of having such a teacher could plausibly be as large as 0.3 standard deviations.

Those impacts attenuate somewhat over time, however. The literature, though less than definitive, suggests that perhaps 70 percent of the gains achieved that year are retained in the long run by the student. The persistence of achievement gains is important, because the more sustained that these increases are, the greater the positive impact teachers will have on the lifetime skills and therefore the earnings of students. Put together, this evidence suggests that a teacher in the top 16 percent of effectiveness will have a positive impact (as compared to an average teacher) on longer-term student achievement that is 70 percent of the immediate gain, which as noted is at least 0.2 standard deviations. That lower bound of the estimated effect is what we will use as we calculate the economic worth of a teacher by combining a teacher's impact on achievement with the associated labor market returns.

Let's start with some conservative estimates of the impact on an individual student. Take a good but not great teacher, one at the 69th percentile of all teachers rather than at the 50th percentile (that is, a teacher who is half a standard deviation above the average). She produces an increase of \$10,600 on each student's lifetime earnings. Even a modestly better than average teacher (60th percentile) raises individual earnings by \$5,300, compared to what would otherwise be expected.

While those numbers are not trivial, they burgeon dramatically once we recognize that every student in the class can expect such increases in earnings. Consider, for example, a teacher with a class of 20 students. Under such circumstances, the teacher at the 60th percentile will—each year—raise students' aggregate earnings by a total of \$106,000. The impact of one at the 69th percentile (as compared to the average) is \$212,000, and one at the 84th percentile will shift earnings up by more than \$400,000.

But there is also symmetry to these calculations. A very low performing teacher (at the 16th percentile of effectiveness) will have a negative impact of \$400,000 compared to an average teacher.

Moreover, the economic value of an effective teacher grows with larger classes, as do the economic losses of an ineffective teacher. Figure 1 illustrates the aggregate impact on students'

lifetime earnings for higher- and lower-performing teachers. As we will discuss below, these results are all very large compared with, for instance, the \$52,000 annual salary U.S. teachers were paid on average in 2008.

An Alternate Thought Experiment

We can also approach this valuation calculation from the perspective of the impact of teacher effectiveness on the U.S. economy as a whole, rather than just on the future earnings of students. As noted above, student achievement, which provides a direct measure of later quality of the labor force, is strongly related to economic growth. Improving achievement leads to a better prepared workforce and to greater growth, and this growth translates into higher levels of national income.

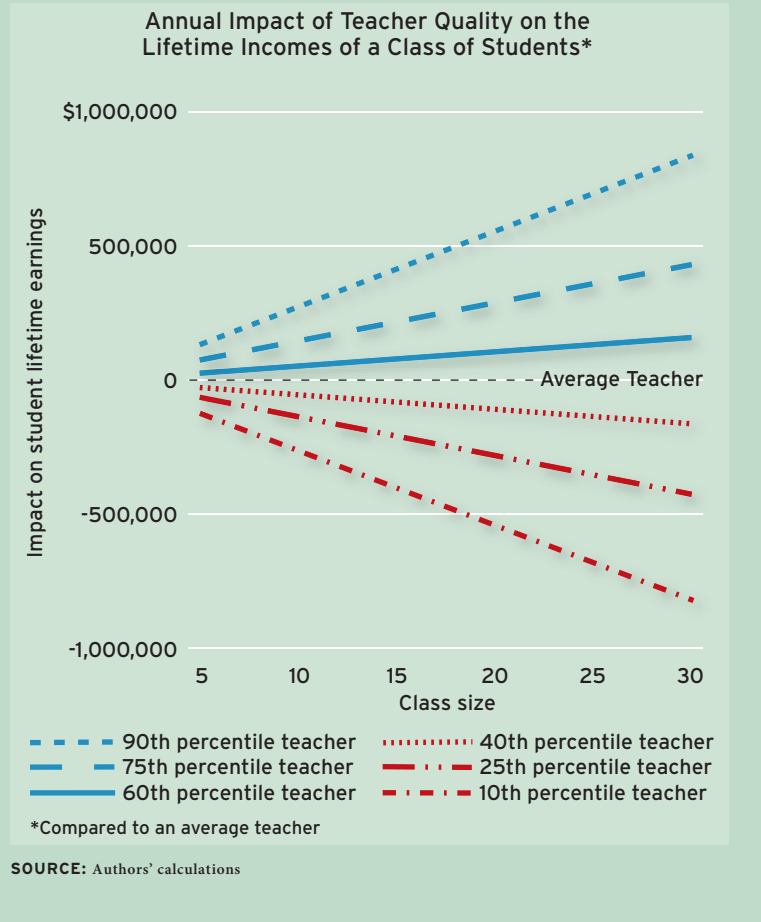
Starting again with the estimates of the difference in effectiveness of teachers, it is possible to calculate the long-term economic impact of policies that would focus attention on the lowest-quality teachers from U.S. classrooms. Let us propose the following thought experiment: What would happen if the very lowest performing teachers could be replaced by just average teachers? Based on the estimates of variation in teacher quality identified above, Figure 2 shows the overall achievement impact through a cycle of K–12 instruction. Assuming the upper-bound estimate of teachers’ impact, U.S. achievement could reach that in Canada and Finland if we replaced with average teachers the least effective 5 to 7 percent of teachers, respectively. Assuming the lower-bound estimate of teachers’ impact, U.S. achievement could reach that in Canada and Finland if we replaced with average teachers the least effective 8 to 12 percent of teachers, respectively.

Here the estimated value almost loses any meaning. Closing the achievement gap with Finland would, according to historical experience, have astounding benefits, increasing the annual growth rate of the United States by 1 percent of GDP. Accumulated over the lifetime of somebody born today, this improvement in achievement would amount to nothing less than an increase in total U.S. economic output of \$112 trillion in present value. (That was not a typo—\$112 trillion, not billion.)

Admittedly, these estimates are subject to some uncertainty. So if you think those that are given here are too high, even though they are based on the best of contemporary research, then just cut them in half. You will still have effects on growth of one-half of 1 percent per year, which produces impacts of \$56 trillion over the lifetime of today’s child. In other words, to

Effective Teachers Raise Students’ Earnings (Figure 1)

The economic value of an effective teacher grows with larger classes, and the economic costs of having an ineffective teacher are substantial.



make the very large effects disappear, you have to make either the very strong assumption that student learning has little effect on the U.S. economy or the equally strong assumption that teachers have little impact on students.

What Would It Take?

The majority of our teachers are hardworking and effective. The previous estimates point clearly to the key imperative of eliminating the drag of the bottom teachers. Here we can offer several alternatives.

One approach might be better recruitment so that ineffective or poor teachers do not make it into our schools. Or, relatedly, we could improve the training in schools of education so that the average teaching recruit is better than the typical recruit of today. Unfortunately, we have

relatively few successful experiences with either approach as compared to considerable wishful thinking, particularly among school personnel.

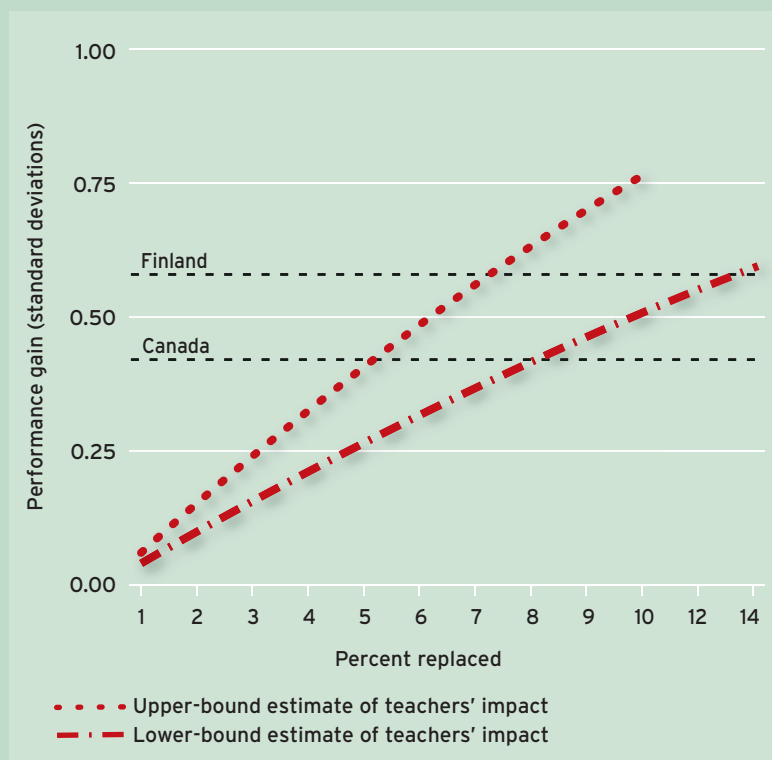
An alternative might be to change a poor teacher into an average teacher. This approach is in fact today's dominant strategy. Schools hope that through mentoring of incoming teachers, professional development, or completion of further

The final option is a clearer evaluation and retention strategy for teachers. Today, obtaining an entry job into teaching is virtually tantamount to an indefinite contract that stays in force regardless of actual effectiveness in the classroom. Yet the calculations above show the enormous value to individuals and society of "deselecting" the least effective teachers.

Is such a policy change feasible? If we contemplate asking 5 to 10 percent of teachers to find a job at which they are more effective so they can be replaced by teachers of average productivity, states and school districts would have to change their employment practices. They would need recruitment, pay, and retention policies that allow for the identification and compensation of teachers on the basis of their effectiveness with students. At a minimum, the current dysfunctional teacher-evaluation systems would need to be overhauled so that effectiveness in the classroom is clearly identified. This is not an impossible task. The teachers who are excellent would have to be paid much more, both to compensate for the new riskiness of the profession and to increase the chances of retaining these individuals in teaching. Those who are ineffective would have to be identified and replaced. Both steps would be politically challenging in a heavily unionized environment such as the one in place today.

Measuring Up (Figure 2)

The U.S. could reach the achievement levels attained by such countries as Canada and Finland by replacing the lowest-performing teachers with average teachers.



Note: As derived from studies of teacher effectiveness, the lower bound assumes that a teacher at the 16th percentile of the distribution will obtain learning gains that are 0.2 standard deviations less than the average teacher obtains. The upper bound corresponds to 0.3 standard deviations less.

SOURCE: Authors' calculations

graduate schooling, ineffective teachers can be transformed into acceptable (average) teachers. Again, however, the existing evidence is not very reassuring. While such efforts undoubtedly help some teachers, there is no substantial evidence that certification, in-service training, master's degrees, or mentoring programs systematically make a difference in whether teachers are in fact effective at driving student achievement.

Salary Politics

The above discussion also highlights the difficulties in recruiting high-quality teachers, due in part to the difficulties of paying them well. Collective bargaining mechanisms do not provide incentives for the best people to enter or remain in the profession and likely hold the average pay down: given the uniform salary structure, increases in salary are bound to be unrelated to increases in effectiveness, making large pay raises politically problematic. This is likely one of the main reasons that teacher salaries now lag those in other professions. In the 1940s, the salaries of male teachers were slightly above the average pay for all male college graduates, and female teachers had higher salaries than 70 percent of other female college graduates. Today, despite the collective bargaining process, the salaries of male teachers are at the 30th percentile of the distribution of all college graduates, and women who teach are at the 40th percentile of their college-educated peers.

Teachers' salaries today are based on credentials and years of experience, factors that are at best weakly related



Unless we can replace the current system with one that better links teacher recruitment, compensation, and retention to effectiveness, we should expect both our schools and our economy to underperform relative to their potential.

to productivity. In a competitive marketplace, a firm must compensate employees according to their productivity or risk bankruptcy. Yet no school district goes out of business if it retains ineffective teachers and pays them as much as effective ones. Salaries become political footballs, and it is often awkward for politicians to explain why a large pay increase goes equally to ineffective and effective teachers.

The challenge of implementing reform of the teaching profession remains considerable. Most of the benefits of implementing the “thought experiment” explored here would be fully realized only many decades later, while the costs of economic, and especially political, reform must be paid at the beginning. These costs would be steep, as they would likely negatively affect some of the most vocal constituents in education policy: current teachers.

The magnitude of the above valuations of teacher effectiveness, however, suggest that we should be willing to consider more radical reforms than have been commonplace in recent decades. Salaries several times higher than those paid teachers today would be economically justified if teachers were compensated according to their effectiveness. But unless we can replace the current system with one that better links teacher recruitment, compensation, and retention to effectiveness, we should expect both our schools and our economy to underperform relative to their potential. The cost to the nation at a time of intensifying international competition is high indeed.

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