



The Unavoidable: Tomorrow's Teacher Compensation

A POLICY ANALYSIS FROM THE HOOVER EDUCATION SUCCESS INITIATIVE
by Eric A. Hanushek



The Unavoidable

TOMORROW'S TEACHER COMPENSATION

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The results of the 2019 National Assessment of Educational Progress (NAEP) underscore the serious (and frustrating) achievement problems facing the United States. They represent real problems that affect not only the children of this generation but also the future economies of all states. **These are not problems that can be put off.** The burden on the United States will increase over time, any solutions will necessarily take time, and delay will exacerbate the problems.

Education strongly affects the future economic returns that individuals see. It also dictates where the US economy will go in the future. Unfortunately, students in the United States are not competitive with students from much of the developed world. Moreover, there are unacceptably large gaps in achievement across racial and income groups, indicating limited future economic and social mobility. Not dealing effectively with these problems will cause increasing economic displacement as new technologies continue to replace workers with automation.

Addressing these issues is the challenge facing each of the states, which have the primary responsibility for educating our youth. Each of the states has a different history, a different set of capacities, and a different set of demands. Nonetheless, there are many commonalities to the challenges facing each state.

This discussion links existing research to policy issues that are relevant to significant numbers of states. The linkage here tends to be more generic than the pros and cons of any specific legislation, allowing for local and state accommodations. Examples are provided below, but these are not meant to be exhaustive.

This initiative is funded by the Koret Foundation. The executive committee establishing policy priorities is composed of Chester Finn Jr., Eric A. Hanushek, Paul Peterson, and Margaret E. Raymond. Background papers feeding into this paper were presented at a workshop by Maria D. Fitzpatrick, Steven Rivkin, and Marguerite Roza in Washington, DC, in September 2019. Commenters on those papers were Chad Aldeman, Seth Gershenson, Michael Hansen, and Kate Walsh. A draft of this white paper was discussed with the HESI Practitioner Council at a symposium at Stanford in November 2019. These individuals, while not responsible for the contents of this paper, were very helpful in framing the work and in honing the arguments and recommendations.



Perhaps no current policy issue is as topical and as critical as what states and school districts do to expand and support the number of higher-quality personnel in schools. There is broad consensus that quality teachers and leaders are the crucial ingredients to solving both the overall performance problems of schools and the inequities in outcomes that exist. While families have powerful impacts on student outcomes, the prime lever for *change* is the school—and there the teachers and the school leaders are the key.

Many approaches have been suggested for improving the quality of teachers. Some have focused on regulatory solutions including certification requirements, subject specialties, and professional development. But research shows that these elements of regulatory mandates, at least as commonly applied, are not systematically related to teacher effectiveness and cannot reliably drive improved outcomes. Sometimes they work to improve student learning but often they do not. Importantly, these approaches frequently involve putting barriers on entry into teaching or leadership positions and making it more costly for individuals to enter a teaching career.

A different approach is to consider what it would take to attract greater numbers of talented educators to schools—and then retain them. Here one of the first considerations is the compensation package offered. **It is impossible to avoid making compensation decisions, because personnel is by far the largest budget component.** Just as important, the incentives produced by various compensation schemes are known to be some of the most powerful ways to shape schools.

This essay links current consensus findings from research to a range of possible policy initiatives to deploy better the existing compensation dollars in order to attract and to retain greater talent. It builds upon three analytical papers commissioned specifically for this project (and which can be found on the Hoover Educational Success Initiative website).¹ And it suggests a range of policies—from low difficulty to higher degrees of difficulty—that many states might wish to consider.

The Relevant Policy Context

Before getting into detailed recommendations, it is important to understand the overall financial and compensation picture for American schools.² The data obviously differ significantly across states, but the issues and challenges are remarkably uniform.

The first fact is that *teacher salaries are below what the average teacher could earn in a job outside of teaching.* In recent estimates, after allowing for differences in experience

and cognitive skills, teachers are paid 22 percent less than they would be if they were in jobs in the US economy outside of teaching.³ All such comparisons are, of course, controversial and depend upon how such comparisons are made, but it is difficult in the end to argue that highly effective teachers are not underpaid.⁴ Moreover, even if there were no differential in pay compared to other occupations, attempts to improve the overall quality of the teaching force would still call for improvements in salaries, because compensation provides the best leverage available to accomplish that goal.

Teacher salaries have also been stagnant. Entry salaries for teachers in 2016 were identical (in real terms) to those in 2000; average salaries for all teachers actually declined slightly over that period. While teacher salaries were more competitive in the past, they have been allowed to slip just as wider job opportunities for women have opened up, thus increasing the competition for skilled people.⁵

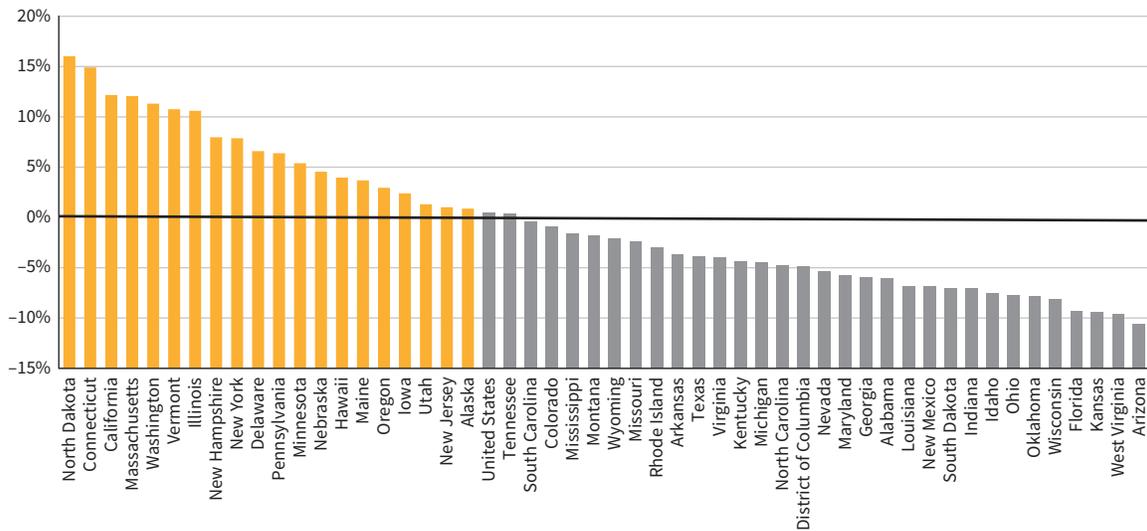
While salaries have remained stagnant, the number of staff working in K–12 schools has not. Pupil-teacher ratios, while rising somewhat since the low point in 2008, remain lower in 2016 than in 1990 (17.4 versus 16.2). Over the same period, the pupil-staff ratio has declined even more, going from 9.2 to 7.8, with the largest staff increases in school district administration. Even so, the settlement of the recent teachers' strike in Chicago included reductions in class size and the hiring of ancillary staff, while there were clear losses to some teachers in terms of their own benefits. *Expansion of personnel and stagnant wages are not independent of each other, both competing for the same bites at the apple.* With limited budgets, the broad increases in both teachers and staff have undoubtedly worked to hold down any salary increases, while the substantial increases in budgets over the past half century have gone to increases in numbers of teachers and staff.

Existing research indicates that this is not the best way to use the funds available. While the effect of class size on achievement has been a contentious area of research, the debate has largely focused on whether smaller class size produces a consistent boost in achievement—not over whether this is the best use of funds.⁶ *Small increases in the pupil-teacher ratio or the pupil-staff ratio can release substantial funds that might go toward the compensation enhancements discussed below.*

The picture of school expenditures is more complicated. Current expenditure per student increased in real terms by 35 percent from 1990 to 2016, although the 2016 expenditure per pupil of \$13,139 is virtually identical to the 2010 spending. All states have had real growth in spending since 1990, but that is not true of the recent 2010–16



Figure 1. Growth in Real Per-Pupil Spending, 2010–16



Source: Author calculations from US Department of Education (2019).

period. Twenty-two states are spending as much or more per pupil in 2016 than they did in 2010, while the remainder have seen declines. Figure 1 shows the pattern of real spending change across states between 2010 and 2016.

For the century before 2008, per-pupil expenditures rose steadily, regardless of any other pressures on public budgets, but this may no longer be the norm. The financial patterns of the last decade suggest that it may not be possible to count on ever-increasing funding to support new programs in schools. Instead it appears increasingly necessary to trade ineffective old programs for any new programs.

One of the primary reasons for a potential slowdown in funds for schools is that the financial pressures of pension costs and retiree health costs are rising and are being passed along to districts in one form or another. Some districts now see close to 10 percent of their expenditures going to pension obligations. While these vary by state, pressures to deal with pension fund shortfalls hit both state and local spending. Moreover, in many states, *the full impact of health and pension obligations to retirees has yet to be fully dealt with*. The current unfunded liability of teacher pensions for the United States as a whole is estimated at over \$1 trillion.⁷

States currently differ in the institutional structure of teacher pension funds and in their overall financial situations. In some states teacher pension funds are separate from other public employment, while in others they are not. But regardless of the explicit structure, the status of overall public pension funds, being an important

fiscal element everywhere, will clearly interact with the money available for school operations. Recent analysis suggests that for the nation as a whole, required contributions will grow to 14 percent of total state and local government revenues over the next thirty years.⁸

On the other side of the financial picture is student performance. NAEP regularly provides a picture of changes over time and of relative performance of states. The October 2019 release of the 2019 NAEP scores again provided new information about *stagnant eighth-grade math scores with falling reading scores*. NAEP provides somewhat conflicting views of performance over a longer time with eighth-grade math and reading scores generally rising between 1990 and 2010 but with twelfth-grade (age seventeen) scores essentially constant since the 1970s. The story from the Programme for International Student Assessment (PISA) shows achievement of American fifteen-year-olds remaining stagnant, falling in the middle of the pack among other developed nations, where notably “hungrier” nations like Vietnam and Poland are passing us up. The December 2019 release of PISA 2018 scores showed no improvement, thus providing a continuing reminder of the challenge facing the United States, particularly in mathematics.

One especially important perspective on student performance comes from comparisons of student performance from different socioeconomic status (SES) groups. *For fifty years, there has been no change in the achievement of students from low-SES families compared to those from high-SES families.*⁹ This gap has defied previous efforts nationally and in the states to improve the outcomes for poor and disadvantaged students. It suggests that social mobility in the future will be commensurately low.

Finally, an overriding issue is the importance of these measures of student performance and the urgency of putting schools on an improvement path. Most people recognize that the common achievement tests measure skills that are important for the individual when in the labor market.¹⁰ In fact the economic rewards for high achievement as measured by standard tests are greater in the United States than in virtually all developed countries.¹¹ But that means that *America also punishes lack of these measured cognitive skills more than virtually all developed countries.*

Perhaps a larger issue is the impact of this persistently low performance on the overall economy. Past research demonstrates that the rate of economic growth of nations, and of states, is highly dependent on the skills of the labor force.¹² And the relevant skills can be reasonably well measured by scores on the standard math and reading tests that we see in NAEP, PISA, or the separate state accountability assessments. In simplest



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This background information highlights the importance of quality schools. **While this might not have been in doubt, the important message from existing research is that the economic impact of schools is larger than most people recognize.** Schools do have many purposes beyond their economic impact, but the economic motivations by themselves are sufficient to call for concerted efforts to improve school outcomes.

Policy-Relevant Conclusions from Research

Research provides some strong conclusions related to improving school quality. This section discusses a set of important research findings and the next translates these into practical policy ideas.

There is one overarching conclusion of research: if the goal is to boost student achievement, there is no substitute for adopting policies relentlessly focused on student achievement. After years of justifying specific programs and policies on the basis of their putative positive impact on achievement, we have found that many programs, initiatives, interventions, and reforms simply do not deliver the promised gains. For example, policies requiring given amounts of professional development for teachers have not shown any consistent improvements in student learning.¹³ Similarly, general class size–reduction programs have not yielded the projected gains.¹⁴

This result points to a superior course where programs explicitly provide incentives for higher achievement. Such policies are not always feasible, but the corollary is that there at least needs to be regular evaluations of whether any policy that purportedly delivers higher achievement does in fact do so.

The second conclusion from research is that if you want to both improve overall achievement and reduce achievement gaps, it is very unlikely that a single policy will accomplish this. Specifically, when there are two distinct policy goals, it is very unlikely that one policy can lead to the best outcomes in the two areas. A combination of policies and practices will be required.

The third conclusion is that personnel quality—teachers and principals—is the most important element of a quality school.¹⁵ Personnel is not only the largest portion of the school budget but also the part of school spending that is most directly related to student outcomes. Therefore, compensation policies are central to the efficient use of school revenues and to the incentives faced by the most important school input.

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The fourth conclusion is that teacher compensation should be viewed across the entire career and through retirement. Because tenure, retirement vesting, and salary schedules specify how compensation varies with experience, it is useful to consider how any policy affects not only total career compensation but also the timing.

The fifth conclusion is that personnel systems must have reliable evaluations to support overall personnel systems, to provide information to teachers and principals on how to improve, and to guide corrective actions if there is no improvement.¹⁶ And, critically, the evaluation system must also be related to consequences for personnel if it is to be useful in any incentive scheme.

Finally, improving school quality has proved to be very difficult and complicated in our multilayered system of federal, state, and local decision makers and actors. State decision makers are best positioned to establish the goals for schools and to provide overall guidance on spending patterns and operational practices. But local decision makers are better positioned to determine how the goals are to be achieved, i.e., the details of operational implementation. Applied to issues of compensation, this means that fully specifying the details of a statewide salary plan, evaluation protocol, and the like will be very difficult and will quite possibly not lead to the desired overall results.¹⁷ *Individual districts have different histories, different capacities, and different demands, making their input to policy implementation important for success.* The state can specify ranges for elements of plans and can provide guidelines for implementation while allowing individual districts latitude for deciding and bargaining the details. Examples of this interplay between states and localities are plentiful: Tennessee, Texas, and others have shown how the different layers of policy actors can fruitfully work together.

Specific Policies Supported by Research

The prior research leads to some clear recommendations for revised educator compensation policies. They can be independently applied, but the real gains come from broad strategic implementation.



Encourage moving away from existing policies and practices that are known to be unrelated to educator effectiveness.

One of the strongest conclusions from existing research on teacher effectiveness is that many of the markers used to judge effectiveness are in fact not closely related to effectiveness as judged by student learning. The most straightforward example is that possessing a master's degree is unrelated to effectiveness in the classroom. A teacher with an advanced degree is on average no more effective than a teacher with a bachelor's degree.

Moreover, past the first few years of teaching, added experience does not make a teacher more (or less) effective. While there is some disagreement about the exact length of the initial period of teacher development—two, three, or five years—the simple conclusion is that any added gain from more experience levels off rather early in a career.

Both of these findings are important because the typical salary schedule for teachers has large, systematic increases in salary tied to advanced degrees and experience.

As a result, current salary structures tend to be unrelated to performance in the classroom. Redirecting salaries more toward what states and districts genuinely value (performance being just one among others) is an obvious but politically difficult decision. Where done, however, there is evidence of substantial gains in student achievement. This result is seen in Washington, DC, and is emerging in Dallas.¹⁸ These major urban systems have shown significant improvement when salaries are better aligned with classroom effectiveness. A significant number of the largest districts in the nation have introduced some approaches to breaking down the “steps and ladders” system of compensation, but such systems remain the norm.

Introduce compensation policies with clear linkage to educator effectiveness.

A variety of policies under active consideration across states would lock in higher compensation before there was any information about teacher effectiveness. For example, policies of student loan forgiveness or mortgage assistance that are applied without regard to effectiveness are likely to lock individuals into teaching even when that proves to be undesirable from both the individual's and the school's perspectives. Contractual commitments associated with such policies may slow potential early exits, but concern is not so much over all exits but over who exits. Some exits are good for schools; others are bad. *It is much better to direct programs and funds at those who show they are good in the classroom than to provide general aid to anybody who thinks they might want to teach.*

Ignoring differences in teacher quality is a recipe for limited achievement outcomes. The most effective teachers have been shown to have dramatic effects on students' immediate outcomes and future success. Ignoring knowledge about teacher and principal effectiveness thwarts gains that are real and significant.

Shift compensation from retirement payments toward current salary.

The current defined-benefit retirement systems of most states are very expensive and put a large portion of active teachers' compensation into the distant future. This back-loading partly reflects retirement pay that is proportionately larger in teaching than in other occupations and partly reflects the larger pay raises with experience in teaching.¹⁹ This back-loading of compensation yields relatively smaller initial salaries with an obvious depressing impact on the supply of potential teachers. Moreover, retirement systems are blind to teacher effectiveness, so that the various incentives to retire at specific career points apply equally to the best and the worst teachers. As a result, retirement decisions are unrelated to teacher effectiveness.²⁰

Pension and health-care plans for retirees represent contracts that are difficult to change quickly, but beneficial changes to aspects of them are possible in both the short and the long run. Attention to them in terms of the overall compensation package can, according to available research evidence, lead to clear improvements that make both individuals and the schools better off.

Two research findings provide guidance. First, the research evidence suggests that teachers are willing to exchange current salaries for future retirement benefits at very favorable terms for the government.²¹ Second, there is some evidence that, when given a choice between a defined-benefit plan and a defined-contribution plan, those choosing a defined-contribution plan tend to be better teachers.²²

For the longer run, *states should begin to offer alternatives to defined-benefit plans* so as to induce teachers to change. For existing teachers, this could come in the form of voluntary transfer across different plans such that elements of a defined-contribution plan grow in the future. Moreover, while current pension plans cannot be arbitrarily changed, a move to defined-contribution plans for new entrants will improve the system in the long run.

In the short run, while the overall structures of retirement plans are fixed, what goes into them does not have to be. A first set of policies flowing from knowledge of the teacher pension systems suggests that states should refrain from adding more to pension



benefits. A number of common enhancements to pensions at times made by states should be discouraged. For example, limits can be placed on such policies as “pension spiking,” where bonuses and extra pay near retirement set the retirement base for the defined benefit. Any bonuses or extra pay can be made “nonpensionable.” In fact, it is possible to go further by offering current teachers a larger wage if it is not pensionable or a smaller wage if pensionable.

It is also possible to offer end-of-career bonuses or deferred-retirement options to highly effective teachers if they agree to stay beyond normal retirement age. Defined-benefit plans typically make it very costly for teachers to continue past the normal retirement age, but costs of continuing to teach can be offset with targeted bonuses. The key here is that such payments are not offered to all teachers, just to the more effective teachers, making the retirement decision more closely aligned with effectiveness.

Teacher shortages need to be addressed explicitly, not generally.

The shortage of math and science teachers in the schools is a well-known problem, as is the shortage of both foreign-language teachers and special-education teachers. These are particular specialties that have relatively few people competing for school jobs. What is less appreciated is that this issue was discussed over fifty years ago.²³ Raising all salaries in order to keep those in shortage fields means that those in nonshortage fields will be overpaid. But, of course, doing the opposite means that shortages of qualified applicants in specific fields will remain. Shortage areas such as insufficient STEM teachers need to be handled with bonuses or enhanced salaries for STEM teachers.

There are not shortages in terms of total numbers of teachers. There are shortages in terms of quality people in certain specialties. Perhaps more important, there are shortages in terms of highly effective teachers. All teachers are not equally effective in the classroom, and this holds for teachers in traditional shortage areas.

Policies aimed at shortage groups should not turn into general policies for all teachers, as many advocates argue. That defeats the whole purpose and makes improvement in key areas difficult, if not impossible.

Providing differential pay is obviously a hot-button issue in many discussions. However, reformulated versions may not be. For example, if the most effective teachers were offered extra pay to accept larger class sizes (a trade-off that many teachers indicate they are willing to take), the higher pay becomes extra pay for extra work—and more students are taught by the best teachers.

Local districts need flexibility to make appropriate trade-offs.

Districts differ in many ways, and it is hard to have a statewide uniform policy that achieves its purpose well. By moving away from regulations, categorical grants, and other blanket restrictions, local decision makers can make trade-offs that use funds more efficiently. There are two components to this. First, all states include quite heterogeneous districts that make it difficult to apply uniform rules that efficiently lead to better student outcomes. Second, local districts should be encouraged to think broadly about trade-offs that can be made. The idea behind state school accountability systems is that local districts are given flexibility in their operations but are held responsible for student results. To the extent that the state constrains the actions of districts in various dimensions, it is less likely that they will actively work to find the best use of their resources.

Actions to align compensation better with effectiveness and to promote efficient staffing of schools require local bargaining and decisions that reflect local demands. These can be encouraged by state guidelines and state incentives to districts, but they can seldom be successfully mandated at the state level. For example, the prior example of offering extra compensation to the best teachers to take on larger classes may work in some districts, but the efficacy and details cannot easily be determined at the state level. On the other side, such things as strict state staffing rules or finance related to class sizes could inhibit development of such local policies.

Tennessee's experiences when it responded to Race to the Top and other federal programs provide a good example. The state provided districts with information about evidence-based policies but then gave districts considerable flexibility in determining the exact evaluation-compensation packages to employ. Districts responded with innovative compensation plans and the results show up in NAEP scores.

An essential element of local flexibility is a continuation of state oversight and accountability for results. Local autonomy is only successful to the extent that local decisions drive enhanced student outcomes.

Disadvantaged schools need directed teacher quality programs.

For a long time, some schools have been very difficult to staff because the jobs and the working conditions are not as good as elsewhere in the district. In city school districts, the most difficult to serve are schools with concentrations of disadvantaged students. Because of frequent contract provisions that give locational preferences



to more senior teachers, the schools serving disadvantaged populations frequently end up with greater concentrations of new teachers (who are still learning the craft of teaching). A significant number of states and localities have tried to deal with this problem by providing bonuses to teachers who voluntarily agree to work in the disadvantaged schools. But typically, these bonuses, while making it easier to staff the schools, have not led to higher achievement—leaving achievement gaps unchanged. This result reflects the fact that the bonus pay does not differentially attract more effective teachers.

Dallas (among other districts) provides a model of an alternative approach that has shown success. Dallas instituted a sophisticated district-wide evaluation system that links salaries to classroom effectiveness. It then builds on this system in staffing its most disadvantaged schools. It showed that providing extra school-specific salary based on prior effectiveness ratings could be used to attract highly effective teachers to the most disadvantaged schools. When instituted, effective teachers responded, and achievement in these disadvantaged schools rose substantially to approach the district average. The details of the evaluation and pay system were worked out within Dallas under the flexibility that Texas gives districts, and as such they cannot be simply legislated on a statewide basis. Some Texas districts emulated this program on their own, based on the Dallas evidence. Moreover, the state can promote such directed programs by, say, offering to pay bonuses to affected teachers going to high-poverty schools for a while when the bonuses are directly related to added teacher value. (A variant of this was the approach of the Texas legislature in spring 2019.)

New Mexico, leveraging a sophisticated evaluation system for teachers developed in 2011, has ensured that highly effective teachers are teaching the most disadvantaged students. In fact, as of 2018, more teachers in the state's top three rating categories were teaching disadvantaged students as opposed to more advantaged students.

These examples illustrate how concerns about achievement gaps can be addressed along with overall achievement issues. Dallas changed its entire pay and promotion structure to emphasize improvements in the achievement of the district's students (something that is happening), and it then used a variant of the pay system to focus on achievement in the most disadvantaged schools.²⁴ Similarly, New Mexico has utilized its evaluation system both for pay purposes and for teacher assignment policies.

A lesson is that *dual objectives (higher overall achievement and more equitable outcomes) require two changes in policies and practices.*

Evaluation systems can be flexible, but they must be used to be effective.

Payments based on teacher effectiveness—whether for teaching in disadvantaged schools, delaying retirement, or other policies—require effective evaluations that can be used for implementing such decisions. These evaluations can vary across local districts while fitting into broad requirements, such as requirements to make substantial use of information about student performance gains.²⁵ *Without a workable evaluation system, none of the policy proposals built on teacher effectiveness are possible.*

Examples of sophisticated evaluation systems can be found in Washington, DC, in its IMPACT program and in Dallas in its Teacher Excellence Initiative and Principal Excellence Initiative. Both of these involve a combination of rigorous observational protocols, student assessment information, and survey data. And these are not the only places with sufficient experience showing positive impacts.²⁶ The NMTEACH evaluation system in New Mexico, for example, has integrated five distinct components that include assessments of student achievement growth, classroom observations, professionalism, student surveys, and teacher attendance. This permits identification of a broad distribution of performance instead of having a system with the vast majority of teachers bunched in the highest performance categories.²⁷ In turn, this allows for a more equitable assignment of highly effective teachers.²⁸

States have already considered many options, some more sophisticated than others.²⁹ The key to the importance of such evaluations is, however, how they are used in making consequential personnel decisions.

A Final Word

No decisions about school policy are more important than personnel decisions. The distribution of teachers and principals across schools determines much about the success of schools in promoting strong achievement and in reducing learning gaps across the population.

The emphasis here on school personnel does not mean that teachers are to be blamed for all of the problems with schools or for the lackluster performance of American students on international tests. There is no dispute about the importance of families for education or about the influence of many factors outside of the schools on student outcomes. Far from being the cause of any school failures, teachers are really the hope—because they have the power to overcome other obstacles to student learning. It is in this spirit that the focus has been on providing the best support for our strong teachers.



Compensation policies are central to guiding school personnel development. While it is difficult if not impossible for states to set detailed statewide compensation policies, states can provide structure, guidance, and incentives to districts to move toward improved personnel policies that incorporate available research findings.

Altering personnel policies and adjusting compensation patterns have historically proved difficult, as considerable inertia exists in schools. But the stakes are enormous. Today's students will determine much about the character and success of the US economy tomorrow.

These are not matters that can be put off. The further we go with our current subpar school outcomes, the more we move toward a bad economic result that increasingly becomes irreversible.

There is broad recognition that teacher compensation has slipped, making teaching a less desirable profession for many. Readjusting teacher compensation offers a chance for significantly enhancing the incentive to enter and stay in the field. Research shows the best approach is to increase current salaries, not retirement benefits. This provides a strong incentive to keep our most effective teachers and leaders.

Improved compensation policies provide a way for students, teachers, and society to win. Significantly higher salaries directed at our effective teachers enhances the teaching profession, improves the future of our students, and is affordable. The economic gains to individuals and to society as a whole justify a concerted effort to improve the compensation structure for teachers and leaders.

The outlines of the bargain are clear: significantly enhanced salaries accompanied by a tilt in compensation toward the more effective teachers. Failure in reaching such a bargain will almost certainly result in continuing to underpay teachers and produce uncompetitive student achievement, thus threatening the future of our economy.

NOTES

1 See the papers by Maria D. Fitzpatrick, by Steven Rivkin, Ben Ost, Andrew Morgan, and Minh Nguyen, and by Marguerite Roza.

2 Data on school spending and operations come from web data of the US Department of Education (2019). See https://nces.ed.gov/programs/digest/current_tables.asp.

3 Hanushek, Piopiunik, and Wiederhold (2019a).

4 For a taste of the controversy, contrast the views of Allegretto and Mishel (2019) and Biggs and Richwine (2019). Using a different methodology than discussed here, Allegretto and Mishel (2019) find teachers being underpaid by 21 percent; the critique of the methodology by Biggs and Richwine (2019) disputes whether there is any penalty to teachers. There are significant questions in comparing salaries about how to treat summer vacations, the level of benefits, and potential differences in the length of the workday. Perhaps more important, however, is addressing questions of how to define quality.

5 Salaries over the long term can be found in Hanushek and Rivkin (1997). The competition from other industries for skilled women is documented in Corcoran, Evans, and Schwab (2004), Bacolod (2007), and Hanushek, Piopiunik, and Wiederhold (2019b).

6 Mishel and Rothstein (2002), Hanushek (2003).

7 Rauh (2016).

8 Novy-Marx and Rauh (2014).

9 Hanushek, Peterson, Talpey, and Woessmann (2019).

10 Hanushek, Schwerdt, Wiederhold, and Woessmann (2015).

11 The analysis of Hanushek, Schwerdt, Wiederhold, and Woessmann (2015) indicates that moving from the 50th percentile of the achievement distribution to the 84th percentile (in technical terms, a movement of one standard deviation) would on average equate to 28 percent higher earnings throughout the individual's lifetime.

12 Hanushek, Ruhose, and Woessmann (2016), Hanushek, Peterson, and Woessmann (2013), Hanushek and Woessmann (2015).

13 While there have been some individual professional development programs that show success, there is little evidence of success for any program implemented at scale. Further, some of the best scientific research shows little results for intensive professional development matched with specific teaching needs (see Garet et al. 2008 and Garet et al. 2011).

14 Hanushek (2003).

15 Hanushek and Rivkin (2012), Chetty, Friedman, and Rockoff (2013), Hanushek (2011).

16 Note that no research supports evaluations based solely on student test performance (a characterization of potential policies that became a touchstone of much anti-testing and anti-accountability discussion). Standard accountability tests must be adjusted for nonschool factors in order to be used in evaluations and by themselves only measure a portion of what is expected of teachers. Moreover, relevant student test information is available for just a subset of teachers, making uniform usage impossible.

17 While states were moving toward more tightly specified evaluation approaches in the past, they have more recently backed away from this; see Ross and Walsh (2019).

18 Dee and Wyckoff (2017).

19 On the back-loading of salaries, see Roza (2015). For pensions across the states, see Aldeman and Robson (2017), <https://www.educationnext.org/why-most-teachers-get-bad-deal-pensions-state-plans-winners-losers>.

20 Fitzpatrick and Lovenheim (2014).

21 Fitzpatrick (2015), Johnston (2019), and Biasi (2019).

22 This evidence is clearest in research into Washington State by Goldhaber and Grout (2016); it is less strong from research for Florida by Chingos and West (2015).



- 23 Kershaw and McKean (1962).
- 24 Putman, Ross, and Walsh (2018) and background paper by Rivkin et al.
- 25 Patterns in the current components of evaluation systems can be found in Ross and Walsh (2019).
- 26 Putman, Ross, and Walsh (2018).
- 27 Weisberg, Sexton, Mulhern, and Keeling (2009).
- 28 Putman, Ross, and Walsh (2018).
- 29 National Council on Teacher Quality (2017).

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