



\$CHOOLS IN CRISIS: MAKING ENDS MEET

Washington State High Schools Pay Less for Math and Science Teachers than for Teachers in Other Subjects

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August 17, 2010

Washington State's leaders have pledged to improve teaching in math and science¹ prompted by findings that:

*"Washington students are falling behind international standards for math and science. Only 51 percent of our high school students passed the most recent test of tenth grade math skills... Not enough Washington students are earning certificates and degrees in fields that require math and science to meet the needs of our workforce... In some areas, like secondary math and science teaching, there are simply not enough students interested in careers in the field."*²

While some of the reforms aim to strengthen the science, technology, engineering, and math (STEM) teaching force, the truth is that relatively little is known about how STEM teachers compare to their non-STEM colleagues. Still, with districts across the state reporting difficulty hiring qualified math and science teachers "because they have few qualified applicants,"³ some have suggested raising pay as a remedy for teachers in the STEM subjects.⁴

As the argument goes, the statewide salary schedule is part of the problem in that it compensates teachers solely on the basis of teaching experience and degrees earned, creating no differential in the shortage subjects of math and science. As Dan Goldhaber, Research Professor at the University of Washington Bothell, points out, the "labor market reality is that teachers have very different opportunity costs and these have profound impact on the ability of schools to recruit and retain teachers."⁵

¹ House Bill 2621, passed unanimously by both the House and Senate and signed into law by Governor Gregoire on March 29, 2010, designates resources to improve the teaching and learning of science, technology, engineering, and mathematics (STEM) in Washington's public schools. See HB 2621: <http://apps.leg.wa.gov/billinfo/summary.aspx?year=2010&bill=2621>.

² Washington Learns, Washington Learns Steering Committee, November 2006, pp 24, 28. Since the release of the report, math and science scores continue to stagnate. In 2009, 45 percent of Washington's high school students passed the tenth grade math skills exam and 39 percent passed the tenth grade science skills exam. See test trends based on the state assessment test: <http://reportcard.ospi.k12.wa.us/waslTrend.aspx>.

³ Washington Learns, p 26.

⁴ Peter Callaghan, "Higher pay for some teachers? The math works," The News Tribune, December 30, 2007.

⁵ Dan Goldhaber, "Teacher Compensation Reform: The Devil You Don't Know May Be Preferable to the One You Do," presentation to the Joint Task Force on Basic Education Finance, November 20, 2007.

Teacher unions balked at the idea of raising pay in the shortage subjects, testifying at a public hearing that:

“Differential pay could demean some teachers... All subjects, whether they be art, social studies, or music, are deemed important. But when others are paid more, what happens to collegiality? It brings emotions out for the teachers.”⁶

The union argues that by not recognizing subject matter, the current compensation is fair.

Is the present salary structure “fair”? Does it promote math and science teaching?

Some, including the union representative quoted above, would suggest that all teachers in Washington State are treated fairly because they are all paid on a schedule that compensates uniformly for years of experience and degrees earned. And yet, without evidence of how the state’s STEM teachers compare to their non-STEM colleagues, one cannot identify what patterns are created by applying the current longevity and degree-based schedule system to teachers with different subject matter expertise, who, by the nature of their expertise, may indeed operate in other labor markets. The idea here is that a French teacher and a chemistry teacher may have different opportunity costs outside teaching that work to make the current salaries more or less attractive to each. In other words, what has not been considered is whether the current salary schedule effectively works to recruit, retain, and pay math and science teachers to the same degree as it does their peers.

This study asks two questions:

1. Is the current salary system working to pay high school math and science teachers at comparable dollar averages as other teachers?
2. Does the current salary system contain incentives that could lead to attracting and retaining math and science teachers at rates lower than teachers in other specialties?

Matching teachers with the subject taught

Washington’s subject-neutral thinking about teachers extends all the way to the state’s data system, which at the time of this analysis does not label teachers, or even teaching assignments, by subject taught. Using state data alone, it is not possible to associate individual teachers with the subjects they teach. This study seeks answers despite the lack of coding in the statewide system, by merging the statewide database with public information available directly from schools and districts on the subjects taught by their high school teachers.⁷

⁶ House Bill 2809, introduced in the 2007–2008 legislative session, would have required the Professional Educator Standards Board (PESB) to “examine and report upon other states’ differential pay programs for teachers in high-demand subject areas such as mathematics and science.” See HB 2809: <http://apps.leg.wa.gov/documents/bill-docs/2007-08/Pdf/Bill%20Reports/House/2809.HBR.pdf>.

⁷ While somewhat tedious, the process of matching teachers with their subject by accessing school and district information was highly effective, with positive identification of teacher subjects in 79 percent of high schools in Washington State’s 30 largest districts.

Data collection and analysis focused on the 30 largest school districts, which together educate just over half of all students in the state. Within those 30 districts, we included those high schools for which we could clearly determine whether individuals teach math, science, both, or neither. In all, we included 122 high schools employing 7,151 teachers (of whom 1,792 teach either math or science or both).

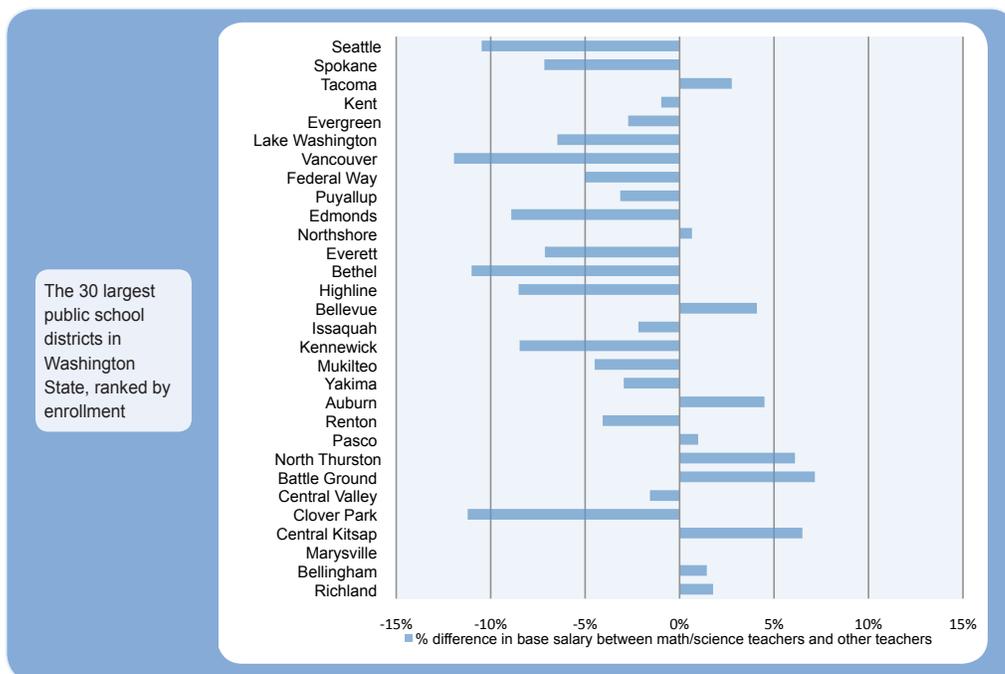
In most large districts, math and science teacher salaries are lower than average

Indeed, we found that in most districts under consideration, math and science teacher salaries average less than those for teachers of other subjects. Figure 1 shows how each of the districts we studied pays math and science teachers, compared to teachers of all other subjects.

For each district, a bar to the left of zero indicates that math and science teachers are paid less than other teachers in that district (and by what percentage). A bar to the right of zero shows that math and science teachers are paid more in that district. A district showing no bar pays its math and science teachers the same as other teachers.

In 19 of the 30 districts under study, the average base pay of math and science teachers lagged that of their peers. The patterns did not extend to all districts (with ten districts exhibiting the opposite pattern, and Marysville revealing no pay difference).

Figure 1: Most districts pay high school math and science teachers less than other teachers

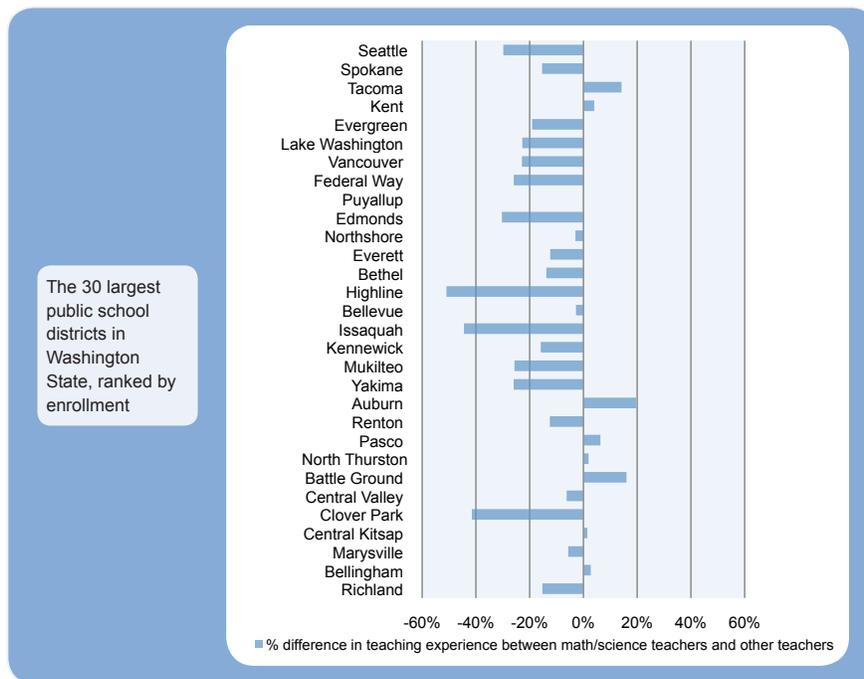


What do lower math and science teacher salaries imply for Washington State? Simply this: the current compensation system invests less in teachers who teach math and science than teachers of other subjects. At a time when policy rhetoric espouses prioritizing STEM subjects, the current salary schedule works to do the opposite. Certainly, there are explanatory factors, like teacher experience levels, and the next sections delve into those factors.

Lower salaries correspond to less experienced math and science teachers

Because teaching experience is one of two key factors used by the statewide salary schedule, it is not surprising that we found that high school math and science teachers are generally less experienced than their colleagues who teach other subjects. As Figure 2 illustrates, in 21 of 30 districts, the average experience of math and science teachers lagged that of their peers.

Figure 2: In most districts studied, math and science teachers have less teaching experience than other teachers

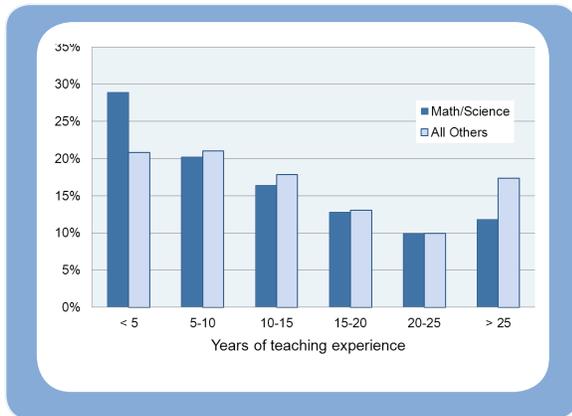


Certainly it is true that teacher experience, while a key component in salary determinations, has not been closely tied to teacher effectiveness. In well-documented research, teacher experience yields positive effects for student outcomes in the first 3-5 years of teaching, but is poorly correlated with student outcomes beyond those initial years.⁸

A useful tool for analysis is an experience profile, a histogram showing the percentage of teachers in various experience ranges. As Figure 3 illustrates, a greater percentage of math and science teachers do indeed have fewer than 5 years' experience than is typical among other subjects (29 percent vs. 21 percent).

⁸ Steve Rivkin, Eric Hanushek, and John Kain, "Teachers, Schools, and Academic Achievement," *Econometrica*, Vol. 73, No. 2 (March 2005), pp 417-458.

Figure 3: In 30 largest districts, math and science teachers have fewer years of teaching experience

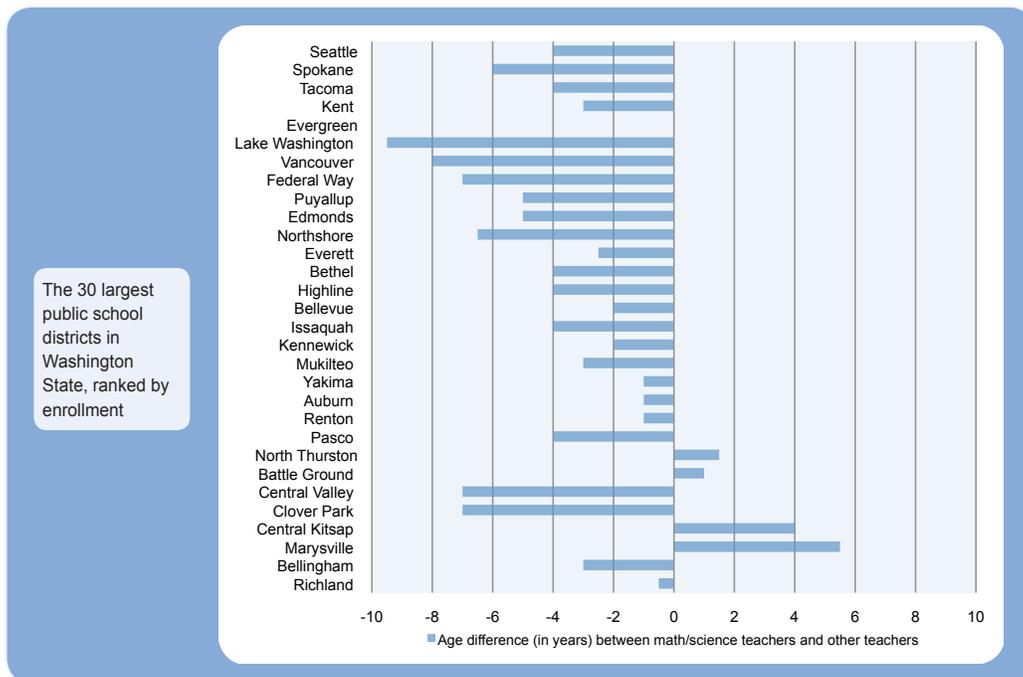


It is fair to note that—except for the preponderance of math and science teachers with fewer than five years in the classroom—the teacher experience disparities may not be important in terms of their effect on student outcomes. That said, the lower teacher experience levels are indicative of greater turnover among the math and science teaching ranks, lending support to the hypothesis that math and science teachers may have access to more compelling non-teaching opportunities than do their peers.

Washington State’s math and science teachers vary in other ways, too

With higher levels of pre-retirement turnover among math and science teachers nationwide⁹, we would expect Washington’s high school math and science teachers to be younger than teachers of other subjects. The state’s database tracks each teacher’s birth year, which allows us to calculate the age differential between groups of teachers teaching different subjects. The results, summarized in Figure 4, do indeed demonstrate the relative youth of math and science teachers in nearly all of the districts we studied (25 of 30).

Figure 4: In most districts under study, math and science teachers are younger than other teachers



⁹ Richard Ingersoll and David Perda, “The Mathematics and Science Teacher Shortage: Fact and Myth,” Consortium for Policy Research in Education, 2009.

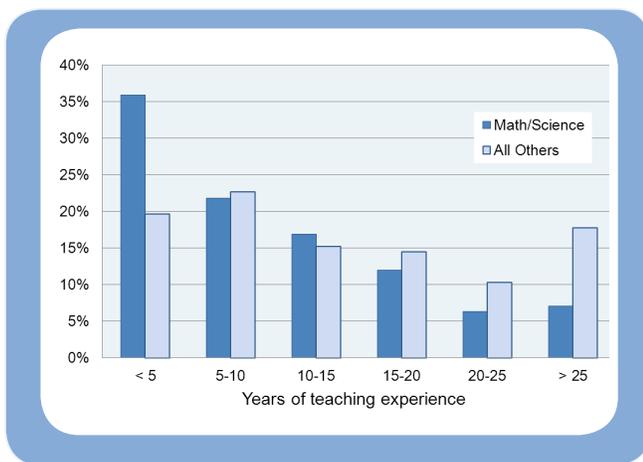
Additionally, the analysis revealed that math and science teachers are more likely (53 percent) than other teachers (43 percent) to be male. Science teachers are more likely (74 percent) to hold a Master’s degree than are math teachers (66 percent) or teachers of other subjects (63 percent). Washington State’s hefty “master’s pay bump”¹⁰ is the likely explanation for our finding that the median base salary for science teachers is somewhat higher (\$50,757) than for math teachers (\$49,916), even though the two groups’ median teaching experience is essentially identical (10 years). By comparison, teachers of other subjects earn a median base salary of \$52,291 and have 12 median years of experience. So science teachers are paid about 2.9 percent less, and math teachers about 4.5 percent less, than other teachers.

Patterns vary among districts

While we would expect some variation in experience patterns across districts, it is important to recognize the degree of this variation. This analysis did not explore the factors that contribute to the patterns in each district, but it is clear that in Washington State, one size does not fit all.

Figure 5 is an experience profile for Seattle Public Schools, showing the relative inexperience of that district’s math and science teachers compared to teachers of other subjects. As the figure shows, Seattle’s math and science teachers are nearly twice as likely to be rookies with less than five years’ experience as their counterparts teaching other subjects (36 percent versus 19 percent).

Figure 5: More than a third of Seattle’s math and science teachers have less than five years’ teaching experience



Effects of the current state-wide salary schedule

Is a system that yields lower salaries for math and science teachers an appropriate one? This paper suggests that Washington State, despite its earnest commitment to high school math and science teaching, actually ends up spending less per teacher in the two subject areas it wants to emphasize. The data suggest that the current salary schedule results in lower average pay for math and science teachers in most districts. Certainly we can attribute the differences to longevity and degrees. At the same time, however, these determinants are artifacts of the salary schedule, which would undoubtedly yield different patterns among subjects if not so reliant on experience and degrees.

If a salary schedule instead tied wages to some measure of labor market value (say average salary of graduates with similar subject matter expertise), we might expect to find that math and science teachers routinely ended up with higher pay than their peers.

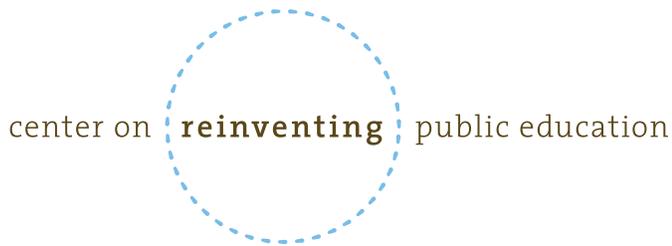
The question, then, is whether or not the current salary schedule does indeed support the espoused emphasis on STEM subjects. Here, the data suggest otherwise. First, since the data do reveal differences between STEM subject teachers and their counterparts, by disregarding all factors except

¹⁰ Marguerite Roza and Raegen Miller, “Separation of Degrees: State-By-State Analysis of Teacher Compensation for Master’s Degrees,” Center on Reinventing Public Education, 2009.

experience and degrees, the statewide salary schedule is responsible for spending differences that effectively channel fewer funds to math and science teachers.

Second, the data call into question the notion of statewide teacher compensation when salary patterns vary substantially among districts. While the statewide schedule does get modified somewhat in most districts, the basic structure and effect of each district's compensation system mirrors that laid out in the state schedule. The patterns among teacher types, however, vary substantially. Where compensation system remedies are sought for salary disparities, it would make sense for each district to examine its own patterns before adopting remedies. The experience profiles presented here could be one tool for understanding and addressing the question of teacher inexperience in these crucial subjects.

Returning to the notion of "fairness" then, policymakers may find that they disagree about what constitutes fairness. For some, fairness may mean staying committed to longevity and degrees as the determinants of salary. For others who would have pay be responsive to labor market value, the current salary schedule may not hold muster for STEM teachers.



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Funding for this work was provided by the Bill & Melinda Gates Foundation and the William and Flora Hewlett Foundation. We thank the foundations for their support, but acknowledge that the findings and conclusions contained here are those of the authors alone and do not necessarily reflect the opinions of the foundations.