Science Teaching as a Profession

Why it isn't. How it could be.

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Foreword

I've always wondered why science education reform efforts didn't stick. Here we are a half-century after Sputnik, decades after thoughtful reports on our challenges and attempts to address them, and yet our students' achievement in science is still substandard. The words of the Glenn Commission Report of 2000, nearly a decade ago, still are relevant: "The state of science and mathematics education in this country is, in a word, unacceptable."

I was a product of the Sputnik times, a junior in high school. Casual family dinnertime conversations shifted to our country's needs and, in my case, career options. After graduating from high school, I headed off to prepare to be a high-school physics teacher. Four years later I had my first teaching appointment. During these first few years, the government was investing heavily in new curricula and, most important to me, in summer enrichment programs for science teachers. My summers were spent looking over new materials, debating with other colleagues about the materials, and preparing for a much better year ahead.

Why didn't that effort stick? Among many reasons, lack of professional support of science teachers and the erosion of the public perception of science teaching as a profession are paramount. Tobias and Baffert argue that this erosion has brought us to our present-day situation of high-stakes testing of factoids, dismal results, and the subsequent blaming of teachers for those results.

Tobias and Baffert address the central issue in science education today. The professional stature of the science teacher—conspicuously absent from current prescriptions for improving science education—is their primary focus. Beginning in 1983 with "A Nation at Risk," numerous reports and studies have collectively covered the waterfront of possible reasons for the failure of science education and efforts to reform it, while neglecting the importance of the professional stature of science teachers. Consequently stakeholders from policy makers to parents have overlooked the profound consequences of the steady decline in the status of science teachers.

While most politicians, parents, and the general public seem to rally around the concept of professionalism, even this general agreement begs the question, "What is it?" How does a group lose it and, most important, regain it? Through a number of conduits, the authors of this book succeed at defining professionalism in the context of science teachers. The major accomplishment of this book is its broad exploration of professionalism in science education.

Foreword

As one example, the authors adroitly point out that professionalism encompasses accountability and responsibility. The authors, and the teachers they talked to, acknowledge that accountability is a reasonable expectation of professional teachers. And they acknowledge their responsibility to seek alternatives to high-stakes, end-of-the-year tests of student improvement. While the No Child Left Behind Act fuels the tendency to hold science teachers accountable for underachieving students, science teachers have been largely absent from the development of tests that measure that achievement. Science teachers must be responsible, at least in part, for turning education away from blindly valuing what it measures and toward measuring what we truly value.

Those values have been clearly articulated by thousands of scientists, science teachers, and university educators in the National Science Education Standards (NSES). But when NSES was released in January 1996, the states selectively chose which sections to use and which to ignore. In addition to the one chapter on content and skills, NSES included four chapters addressing standards in science teaching, professional development for teachers of science, program standards, system standards and assessment standards—all issues that needed to be addressed if science education reform were to succeed. Unfortunately, these recommendations went largely unnoticed, and many states created a process that effectively removed the science teachers from the conversations about assessment and accountability.

This book is a must-read for anybody seriously interested in supporting a reform movement that will stick. It's well written and accessible for both lay and professional audiences. It is a first step in addressing a facet of science education too long ignored. The transformation of science education that we need to produce the next generation of informed citizens will come through the leadership, responsibility and accountability of professional science teachers.

Gerald F. Wheeler
Executive Director Emeritus, National Science Teachers Association

Preface

A Note on Methodology

Science Teaching as a Profession draws from two admittedly biased samples of secondary science teachers. Every effort has been made to seek balance, but in no way should our respondents be considered a representative sample. They are, rather, informants.

The first sample consists of respondents to a series of questions-of-the-month and discussion topics and polls posted on the project website: *www.science-teaching-as-a-profession.com*. Officially launched in September 2007, the website was intended to be an extension of our project, a means of generating data and interest in the upcoming book. In a short time, the website became its own entity, providing science teachers with a much-appreciated forum to discuss the "hot" issues science teachers face today.

Respondents were generated by invitations to particular Listservs, the authors' personal mailing lists, and references by teachers who were enjoying the website and told their colleagues about it. Statistically speaking, the respondents represent a skewed population. They are largely members of the National Science Teachers Association or subscribers to the Advanced Placement Biology, Chemistry, and Physics Listservs. These are the cyberspace hangouts for professional science teachers always looking for ways to hone their craft and to interact with other professionals. So, it is in these waters that we cast our provocative (oftentimes controversial) discussion topics.

Teachers from all 50 states as well as some teachers abroad have sounded off on the discussion topics listed in the table below. The website is building a loyal audience, with some teachers joining in each time a new discussion topic is posted.

Our second sample consists of individual and group interviews with current or former secondary science teachers, administrators, state legislators, and program and policy experts. For the interviews, we employed a protocol based on the chapters in the book intended to probe their experience, insights, and suggestions for change (see Interview Protocols, p. 143).

We recognize that the people who chose to talk to us had strong points of view. Without doing injustice to what they said, there was no way we could impose "balance." Nor could we substantiate their claims. What the reader will find here, which we consider to be invaluable, are teachers' *perceptions*, and it is their perceptions that drive their behavior—the quality of their teaching as well as their longevity in the job.

Discussion Topics and Dates

December 2007	Advancement
January 2008	How has NCLB affected your teaching, work life, and professional status?
February 2008	Can Professional Learning Communities (PLC) help to professionalize the science teaching profession? If you have participated in a PLC, did it enhance your status, increase your autonomy, or give you higher-level access to the decision makers in your school or district?
February 2008	I am considering applying for National Board Certification, but before I do so, I wanted to get some feedback about: The process (How time-consuming is it? Is the process a waste of time, or does it help you develop as a professional?) The benefits (Is it worth the time invested? Are you respected more now that you have the certification?)
March 2008	With your educational background, you are most likely eligible for any number of jobs with more lucrative salary packages and significantly less demand on your time. What keeps you from leaving your science teaching profession?
April 2008	Do you teach (or have you taught) science in a private or charter school?
May 2008	Who controls what you teach? Who controls your curriculum?
May 2008	Should a high-school physics, biology, or chemistry teacher receive the same salary as a kindergarten teacher? What do you think of the traditional salary schedule? What changes could be made in teacher compensation to attract and, perhaps more importantly, retain high-school science teachers? How do you as a science teacher feel about the fact that your salary is equivalent to that of someone teaching a nonscience subject in a lower grade?
June 2008	Is tenure important to you? Would you trade your tenure for a $5,000 pay increase?
June 2008	Do science teachers work only nine months out of the year? What do you do during your summer break?
July 2008	In your school or district are there pay differentials (including signing bonuses) or incentives (like discounted housing) provided for secondary science or math teachers?
July 2008	Teaching in another district or another state often means losing health and retirement benefits as well as accrued experience. Has the lack of reciprocity between states and/or districts affected you? How? Would you favor legislation that would facilitate a teacher's mobility across districts and states?
September 2008	How have the storms around the topic of the teaching of evolution impacted your capability and your autonomy in the classroom? In your answer, please indicate whether your state or school district mandates the teaching of evolution (as recently occurred in Florida) or tells you to teach both evolution and intelligent design.
October 2008	What would be the benefit to science teachers and their students if more principals and superintendents were science teachers? Do you think a science-trained superintendent or principal would make a difference in the policies, funding, and decisions that affect you as a professional? If your superintendent or principal is a science teacher, do you see any benefits to you as a teacher or to your students?
October 2008	Do you teach secondary science outside the United States? Do you know anyone teaching science in another country?
November 2008	What is the highest-ranking position a science teacher holds in your school? Are you interested in ever (maybe not now) becoming a school or district administrator? If not, why not?
December 2008	Do you know a science teacher who wishes to be a district superintendent?

Teacher Interviews and Website Responses

Website responses, together with snippets from teacher interviews, were sorted by topic and are integrated into the argument and analysis of each chapter.

We have long since exceeded our initial goal, which was to capture 100 teachers' voices. We think the reason is teachers need to interact across cyberspace to counter their isolation in the classroom. We are grateful to all our teachers—who remain anonymous in this volume—for making this work possible.

Also, we are grateful to the hundreds of teachers who allowed our team to interview them (and to whom we refer using pseudonyms in this book); also to the more than 1,000 respondents to our website questions and frequent polls. Details as to how these were culled and assessed are available on request from the authors.

Resources Consulted

Once upon a time, to write a book on a subject like this one, we would have scoured the library—particularly a world-class library as we have at the University of Arizona—to find the precise Dewey Decimal code for *teaching as a profession*. But a "hot topic" in today's United States can't be contained within books, either scholarly or popular, that are published even within the past few years. Our major sources of information were up-to-date articles at the intersection of "science teaching" and "teaching" in general, which came to us, or which we found by ourselves on the websites that cater to both communities, as well as the comments that made their way to our website, *www.science-teaching-as-a-profession.com*. However, there are authors, books, and articles, which, even when some of them were dated, provided special guidance and insight. These references are found within the chapters and in Recommended Resources on p. 139.

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Chapter 1

An Overview

Belatedly, it will seem to many teachers, efforts to improve K–12 education have put the classroom teacher back on center stage. After decades of innovation in the use of computers, the web, and other pedagogically rich devices, researchers on all sides of the political spectrum are converging on what is really an old-fashioned view: Student achievement depends mainly on the quality of instruction as created and conveyed by the teacher in the classroom.[1]

That's the good news for teachers.

But instead of gaining more autonomy and control over what he or she teaches and how, today's classroom teacher is becoming a prisoner of high-stakes testing of pupils' achievement gains. That's the gist of the revolution launched in 2002 by the No Child Left Behind Act (NCLB). Teacher "quality" is deemed directly responsible for pupils' achievement. And the obverse: Where pupils' gains are subpar, it is the teachers' fault.

In our wide-ranging inquiry into the state of secondary science teaching as a profession, we found job satisfaction diminishing with the loss of autonomy and control. The science teachers we interviewed and heard from on our interactive website fear that measuring teacher performance by student

1. In a pre-presidential election debate on the subject, education consultants Lisa Graham Keegan and Linda Darling-Hammond, working for candidates John McCain and Barack Obama, respectively, agreed on the central argument that "teacher effectiveness" is measured by students' academic progress in that teacher's class. See web seminar, Teachers College, October 20, 2008. *www.edweek.org/ew/section/video-galleries/tc_debate.html*

achievement gains alone could be another step in degrading the teaching profession altogether.

Central to any profession are "barriers to entry," the unique pre-entry training and certification requirements that differentiate the professional specialist from others. Since the late 19th century, those entering the teaching profession (or if not at entry, then very soon thereafter) were required to obtain state certification, which usually involves both a state-approved university-level education major or minor. Currently the state-certification model is witnessing some serious challenges.

In one such proposal to improve student achievement, Robert Gordon, Thomas Kane, and Douglas Staiger would eliminate both specific university training and state certification in favor of a teacher meeting performance criteria on the job:

> Under their proposal, a new teacher would continue to be required to have a four-year undergraduate bachelor's degree and to demonstrate content knowledge. They would allow teachers who met these basic requirements to be deemed "highly qualified" if they also demonstrate effectiveness in the classroom regardless of whether they had met a state's other certification requirements (2006).

Indeed, qualification to teach would cease to be formal and become operational. The authors go on to describe how "selective retention" would take place:

> Any new teacher scoring above the 50th percentile on the scale of "teacher effectiveness" at the end of two years would be deemed "highly qualified" regardless of their certification status or compliance with other state systems (Gordon, Kane, and Staiger 2006).

What should we make of such proposals? How serious a threat is "selective retention" to teaching as a profession? And where does secondary science teaching fit into the mix? On the one hand, it has been the nation's math-science "scorecard" in comparison with other countries that has fueled this decade's concern with educational reform. On the other, science teachers themselves have found fault with some of their training in pedagogy (preservice) and most especially with standard professional development (inservice).

Science teaching as a profession was already under siege when this new century began. Mostly absent from school and school district leadership, secondary science teachers (and in particular science chairs) have looked on helplessly as the ground shifts beneath them. Spokesmen (and women) for science education have been largely scientists. This is not entirely inappro-

priate. After all, science as a profession depends on high-quality recruits. Nor can we do without the science education research community. But science teachers have a unique expertise, and they are not usually invited to the table where decisions that affect their work are made.

Science teachers are not averse to having their own students' achievements factored into the equation. To the contrary, they look forward to having science put back on the front burner from which has been dislodged by math and reading.

Our proposition is simple but revolutionary. Until and unless science teachers are given back substantial control of the subjects they teach, including curriculum content, pedagogy, pacing, and assessment, and successfully recruited into leadership at the school, the district, the state, and the national levels, we won't have robust student achievement.

Recruitment vs. Retention

The need for secondary science teachers, the context of this book, calls urgently for new thinking both about the problem and the solutions. That our nation has to attract more college graduates to secondary science teaching is indisputable:

- Science and mathematics graduation requirements are slated to increase (in response to America's competitiveness agenda), which means schools and school districts will need even more secondary science/math teachers than ever before; and
- Although it is not clear whether science and math teachers leave their jobs at a greater rate than other teachers, the pipeline of qualified math and science teachers entering the field is insufficient to cover the number of teachers leaving the profession (Ingersoll 2000).

So there will be a shortfall. That cannot be denied. But the standard response to that anticipated math/science teacher shortage has been to focus on new recruits. And that may not suffice. Consider this: A much talked-about new national study calls for the recruitment of 10,000 new secondary science/math teachers per year to meet the shortage, starting right now (Committee on Prospering in the Global Economy of the 21st Century 2007). As we see it, this means that the "scramble" for warm bodies just moves up the food chain, from science chairs and school administrators searching for certified teachers for their schools to universities and state colleges of education trying to persuade high-performing science and math undergraduates to select teaching as a career.[2]

2. Recruitment efforts include U-Teach, Exxon-Mobil project, APLE (repay loans).

But is recruitment the only, or the preferred, strategy for meeting the shortfall? What about teacher retention? What would it take to keep the nation's trained and working 187,711 secondary (middle- and high-school) science teachers (5.8% of the total teachers employed in the United States; Rowland 2007) from thinking about leaving their jobs? We decided to ask them. This book grows out of a Listening Project that began in the fall of 2006 and continued through the winter of 2009.

Stage One involved listening to science chairs from 10 Tucson, Arizona, high schools. We asked them to respond to one of the basic premises of the national study, *Rising Above the Gathering Storm* (Committee on Prospering in the Global Economy of the 21st Century 2007) namely, that many (perhaps even most) secondary science teachers teach outside their major. Since our science chairs as a group hire, fire, and supervise 10 teachers each, we figured they would be able to quickly determine how well-trained their teachers are. We made that their first assignment. Of the 100 secondary science teachers in their sample, with one exception, they had either minored in the field they were teaching or had done significant postcollege work to qualify. The one exception was the Arizona state teacher-of-the-year, a biology teacher with a first degree in physical education.

Their second assignment was to prepare, on the basis of interviews with their teachers, a five-minute presentation that would convey to our governor how she could help them do a better job.

The upshot of the second assignment and subsequent conversations with our science chairs was this: Science teaching is rapidly losing its professional status and with it its professional appeal.

In the classroom, our science chairs assured us, their teachers feel like the professionals they consider themselves to be. They are responsible for almost everything that happens and they are in control. But outside the classroom, as a result of state and districtwide reporting requirements—most especially in dealing with fallout from No Child Left Behind—they feel like employees, with little autonomy or control.

Introducing the Science Teacher

To the casual observer, teaching is not so demanding a profession. Many people believe they could be teachers with little to no training.

To an outsider, a high-school teacher's work day starts at 8 a.m. and ends with the final bell at 3 p.m. And, let's not forget the breaks at Christmas and spring and, of course, that long summer vacation.

A closer look provides a much different picture. Teachers, particularly science teachers, must arrive at school before the students and stay hours later to set up and take down labs, restock and order lab equipment, grade papers, plan lessons and participate in school-related (and required) activities. Many science teachers are unable to take care of all their responsibilities during their workweek and return to school over the weekend. Teachers we interviewed and heard from on our interactive website pointed out that quite often the last cars to leave the parking lot belong to science teachers.

What few people outside of the teaching profession realize is that a teacher's hours are very different from, say, an architect's. Simply stated, there is zero downtime. When that classroom door opens, in flood dozens of teenagers with dozens of problems that need solutions. It is estimated that an average high-school teacher makes more than 1,500 decisions each day. Some compare their work to managing triage in a hospital, absent a support team.

Teachers who have left teaching for another profession are amazed by workplace luxuries at their new jobs: being able to check email, return phone calls, or use the bathroom at will throughout the day. Back in their teaching days, these ordinary tasks normally would have to be put off until lunch (unless the teacher had lunch duty) or until the end of the school day.

The pace and stress that teachers work under is much more like that of air-traffic controllers or emergency room personnel they tell us who are given multiple days off between shifts.

Based on what we heard, we decided to take our Listening Project to the web (*www.science-teaching-as-a-profession.com*) and to teachers in their schools via remote interviewers located around the country.[3]

The Power Matrix

We narrowed our original question—how to stem science teacher attrition—to this one: What would it take to return science teaching to the elite, highly respected professional status it once enjoyed (and still does in many other countries)?

We started with a tentative list: working conditions, pay, public support, competition for entry and promotion. But listening to teachers we were soon

3. We are, of course, not the only ones beginning to focus on working conditions rather than pay. See Viadero 2008.

struck by how much their lack of power over curriculum, teaching methods and students' evaluation had eroded their status and their satisfaction. And so we added a power matrix (see page 21) to our inquiries, asking them who (principal, district superintendent, school board, state school officers) makes decisions that affect their teaching. What we learned is that secondary science teachers have little or no say over their own teaching assignments, over budgeting for their lab materials, or—when and if science is added to No Child Left Behind—over the content and pacing of their lesson plans.

So who makes the decisions that affect what goes on in the science classroom? As teachers filled out our online power matrix, a picture emerged of outside ownership. In the near outside is the principal. More distant is the superintendent's office and more distant still the school board and the state's chief school officer.

Which means, and this is the recurrent theme of this book, if secondary science teachers are to win back lost professional status and satisfaction, they must take back control over their workday, their working conditions and their overall status.

We conclude our book with an assertion that the nation's failure to solve the problem of math/science education despite 35 years of effort may rest on policy makers' reluctance to mine the collective experience and insights of an army of experts who are highly educated in science, highly experienced in the classroom, and better than average problem solvers. We don't have to look far for these "educational experts." They are the nation's secondary science teachers. But they are rarely present when and where science education policies are deliberated. In Chapter 9 we outline strategies for teacher empowerment persuading (even obligating) secondary science teachers to participate in all levels of school and district governance by making careers that lead to power and influence more appealing to them:

- empowering science chairs and science supervisors by means of new science teacher councils to take a rightful place at the policy makers' table
- engaging the nation's scientists and science and engineering professionals in ongoing collaborations with science teachers

Their (The Experts') Findings and What Ours Added

With all the attention given to the STEM[4] teacher shortfall and the vast number of teacher surveys and other kinds of studies of the problem, we

4. STEM is the way the government refers to science, technology, engineering, and math education, in one acronym.

were surprised by how little of the existing teacher-attrition data is disaggregated by subject area, even by grade level. (We try to figure out who's leaving science teaching and why in Chapter 2.) We were also surprised by how few researchers go beyond "pay" and bare bones "working conditions" (usually limited to items such as school safety and cleanliness of the school) to concerns about autonomy and control raised by the teachers we consulted.

The most extensive recent review of the empirical literature on teacher recruitment and retention is on the American Educational Research Association website (*www.aera.net;* Guarino, Santibanez, and Daley 2006). It is this review and studies like it that we find woefully lacking in data disaggregated by field and/or teachers' grade level. The National Science Foundation's *Science and Engineering Indicators* (2008) does not do much better. In a section on "teacher salaries, working conditions, and job satisfaction," their conclusion, presumably quoting researchers who have studied science and math teachers, is less than illuminating:

> The research evidence suggests that adequate compensation and safe and supportive school environments serve to attract and retain teachers, whereas low pay and poor working conditions undermine teachers' long-term commitment to their jobs.[5]

We prefer a more nuanced analysis (see Chapter 2).

There are of course the essentials: pay, tenure, and the positive and sometimes negative effects of unions on the profession (Chapter 5). Teachers bring these up all the time in interviews or in their web postings.

But there are also what we call crosscutting issues such as off-the-job (National Board) certification, and on-the-job professional development, and the biggest intruder of all, No Child Left Behind (NCLB, Chapter 4). These are among the attempts at education reform, not specific to science teaching, but inevitably bearing on science teachers' range of freedom inside and outside their classroom.

The relationship between National Board Certification for teachers and the NCLB regime provides an interesting case in point. When it began in 1986, National Board Certification was originally intended to enable teachers to raise their competencies and eventually their status and pay by signing on to a rigorous (and costly) two-year set of advanced training modules.

5. The researchers whose work is referred to include: Boyd et al. 2005; Dolton and Wilbert 1999; Hanushek, Kain, and Rivkin 2004; Ingersoll 2006; Loeb, Darling-Hammond, and Luczak 2005; and Perie and Baker 1997.

But that was before the high-stakes student testing required by NCLB redefined teacher competence. Once NCLB was in place, no longer was teacher competence to be measured in courses taken, experience garnered, lessons learned or formal self-improvement. All of this is being replaced by pupils' performance on standardized tests. Not surprisingly, board certification is currently losing much of its appeal, most particularly in the science community. National Board Certification was not even recommended by a recent National Science Board Study (2007).

More pernicious and only rarely dealt with in other studies is the slow, steady erosion of teachers' professional standing in all the places where it matters: the public at large, building administrators, district superintendents, and state school officers. Even parents are no longer in awe. In Chapter 3 we make an effort to trace the history of that erosion, starting with the way schooling and school teaching began in the United States; how long it took to become "regularized" in training academies and eventually universities; the tension, somewhat fostered by unionization between teacher-as-employee and teacher-as-professional; and, finally, the role of one group of scholars in downgrading teaching, nursing, and social work to the realm of "semiprofessions" (Etzioni 1969).

The Essential Elements of a Profession

There is no question in our minds and in the minds of the teachers contacted over the past two years that teaching is a profession or that it could be one if reforms are implemented. What is our evidence? Teaching involves mastery over complex bodies of knowledge, licensure by a legitimate authority, renewal through continuing education, and responsibility for young, vulnerable minds. Moreover, like doctors and lawyers, teachers are visibly responsible to a wider public, morally committed to public service, and capable of setting and policing standards for practice.

If these are among the essential elements of a profession, which of these are teachers missing? And how can science teachers (in particular) get back the elements of professional work and professional privilege they have lost?

Speaking with science teachers in groups and on our website about the essential elements of professions they hold in high esteem, we developed a list of 12 elements (See pp. 41–43), of which relative independence and autonomy is one; higher-than-average standard of living another; and input into federal, state, and local educational policy a third. These may not be as "basic" as pay and tenure, but they sure matter to teachers!

Ninth on our list (but by no means on theirs) is time: time out of the classroom; time for collaboration, even across schools and school districts; time for research; time for professional development. We spotlight Finland (in Chapter 8) because it is a country that has turned attrition around by investing in teachers' professional privileges. The teacher-as-researcher movement, which began in Great Britain in the 1990s, reached fruition in Finland, where teaching jobs are so competitive today that there are sometimes 10 applicants for every opening.

Because we couldn't visit a significant number of the nation's high school science departments, we chose to focus our attention on a few case studies representing the "best" and the "worst" in terms of our theme: science teacher retention. These are presented as anonymous "Close-Ups" (p. 25) at the end of Chapter 2 so that the teachers and district administrators cannot be identified. But the lesson is the same as Richard Ingersoll draws from his much larger surveys: Secondary science teachers are a hardy bunch. They love what they do, but there are limits to what they will tolerate from poor or indifferent administrators. And, given their value on the job market outside of education, school districts mistreat them at their peril.

Much more could be said. Much more might be recommended. But while there are more and more federal dollars going into America's schools and more and more federal influence upon them, the country remains committed to local control. Thus, we argue throughout this book, meaningful, lasting change in the quality of secondary science is going to depend on what teachers do for themselves. Our book, thanks to the amount of formal and informal input we have had from secondary science teachers themselves, is meant to be a resource for just that self-empowerment.

Avoiding Future Shortfalls:
Attracting and Keeping Gen Y in Teaching

"The existence of the 'lifetime teacher' can no longer be taken for granted," says Susan Moore Johnson, Harvard University professor of education. She finds that "the average teacher today expects to take on differing positions and responsibilities throughout his or her career" (Coggins 2008).

So, we should no longer expect a new teacher to continue for the next 30 years, but how about five years? Nearly half of all new teachers quit during their first five years, and the best and the brightest are often the first to leave. Schools in high poverty areas are particularly hard hit. Many of these are lower-performing schools and are under the gun to raise scores in math and reading or be shut down. They are often forced into exerting more heavy-handed control over what is taught in the classroom, driving new teachers out at an even faster rate (Viadero 2008).

One reason for their attrition is that new teachers are frequently given the most difficult and least desirable teaching assignments. Only two states, North and South Carolina, have policies that specifically reduce the workload for novice teachers in an effort to keep them in teaching (Chronister, Olson, and Bomster 2008). North Carolina allocates $1,000 for the mentoring of each new teacher. As new-teacher mentoring becomes more widely studied, this intervention may need to be expanded, because when districts don't invest in new-teacher programs, they pay later. It costs districts money to replace teachers who leave in their first few years, and students lose as well by not having the benefit of being taught by an experienced teacher.

According to a major study by the consulting firm Deloitte and Touche, recent college graduates, the 76 million members of the so-called Generation Y, are entering the job market with a new and different set of expectations. They want to work in a friendly environment, where they can continually gain new knowledge and skills. They are looking for challenges, and they like to solve problems. Most of all they want a job where they can have an impact—starting on Day One.

We just need to make them aware of how well teaching science fits their needs, and now more than ever we need to make some major changes in our schools to make teaching more attractive to this talented group of 21st-century workers.

One nontraditional approach has received a great deal of attention for its success in attracting a portion of Gen Y to teaching. The program, Teach for America, which began with a cohort of 500 in 1990, targets graduates from top colleges to commit to teach for two years in some of the nation's lowest-performing schools. The program has seen prodigious growth. In fall 2008, 24,700 applied for 3,700 teaching placements.

Like the students of the 1960s who were attracted to the Peace Corps—on which it can be said Teach for America is modeled—these young teachers are fast-tracked into their posts. They have five to six weeks of intensive training—with few of the traditional elements of teacher certification—and are assumed to be better-than-adequate teachers because they are well educated themselves.

On the one hand, Teach for America credits itself for elevating teaching as a profession because it is so selective. According to Jason Forrest, a member of the corps (those accepted into the program are called corps members), "Teach for America brands teaching in a way that makes it socially and professionally acceptable for top college graduates to be teachers." Indeed, for the 2008 corps, the average college GPA was 3.6. But, in reducing preservice training to a five-week intensive course, Teach for America has reaffirmed a common misperception that teaching is something anyone can do, with little or no training. This could be a giant step in devaluing the profession.

What matters to us is that Teach for America doesn't do much to solve the math/science teacher shortage. In 2008, fewer than 20% of the teaching corps came with math/science majors. Trying to rectify this imbalance, NASA, Amgen and other biomedical corporations are offering bonuses to math/science students willing to sign on with Teach for America. Time will tell if that proportion increases.

Even if Teach for America won't ever be a significant source of hard-to-find science and math teachers, exposing 20,000 high-achieving college graduates to classroom teaching has value. Nationwide, there are now 360 school leaders and 16 elected officials who got their start in Teach for America, the most famous of whom are Michelle Rhee, Washington, D.C.'s new chancellor of schools and Mike Feinberg and David Levin who colaunched a chain of 57 inner-city charter schools, collectively called the Knowledge is Power Program (KIPP).

One of the reasons Teach for America graduates may not stay in teaching over the long haul is that after two years, they discover that the system rarely offers the career growth, professional community, or performance-based compensation that they expect from a longer-term job. So, despite their positive experience in Teach for America, many "sit on the fence" regarding the longer-term commitment to teaching. From this perspective, researchers suggest we reframe teacher retention (Coggins 2008).

Reframing the teacher retention problem means defining a growth trajectory for teachers, including instructional leadership, team-based work, and differentiated pay, and one that rewards both longevity and excellence. It's time to find a way for teaching to live up to its potential as a profession that challenges and rewards practitioners. If we do not, our best young teachers will find the growth they seek outside the classroom.

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Chapter 5

The Essentials Under Siege

Most teachers will do a good job without threats, penalties and rigid controls.
(Noddings 2007)

This chapter deals with what the United States has long believed are the essentials with regard to teacher compensation: pay, tenure, and the presence or absence of unions in determining teachers' compensation and working conditions. The chapter also includes some recent efforts to effect change, not because they are widespread but because they are interesting and might herald a trend. But what our respondents have communicated to us over the two years we have been listening to them is that what is essential may not be sufficient to build a steady and renewable supply of secondary science teachers, most particularly as Generation Y makes its way into the workforce. And so we have to go beyond the essentials. But first, the essentials.

Part I: Teacher Pay

How much of a deterrent is teacher pay? How much of a difference does compensation make in recruitment and retention, most particularly of secondary science teachers? Would pay differentials by subject taught increase the appeal of science teaching? Or would it take an overall doubling of teacher pay?[1]

1. Many surveys are finding that working conditions might actually trump pay, but pay remains a factor. See *www.edweek.org/ew/articles/2008/01/10/18conditions.h27.html*.

The average salary for beginning teachers holding master's degrees in the United States is $38,500 for a 40-week contract, with a range of $29,000 (Alabama) to $47,000 (Manhattan). Twenty years later given annual increments, that Alabama teacher will be earning $42,000, the teacher in Manhattan $67,000.

Compare this (as beginning teachers will do) to the starting salary for bachelor's degree holders in the private sector who major in science and engineering. Gerald Wheeler, executive director emeritus of the National Science Teachers Association, observes that a student with a degree in science or engineering can land a job in a science-related industry with a starting salary 50% higher than that of a science teacher and expect regular annual increases (Wheeler 2008).

Recent economic downturns have resulted in some slowing of teacher attrition. Many teachers have been forced to postpone their retirement plans after seeing their nest eggs shrivel. States are reporting an overall easing in teacher shortages for the first time in years. School district officials credit the worsening economy and the growing population of unemployed white-collar workers lining up for teaching jobs with providing a temporary solution to their staffing problems. But, despite the growth of the applicant pool, there still remain critical shortages in hard-to-staff subjects like math and science (Stewart 2009).

To be sure, a 40-week school year (compared with a 50-week year in other jobs) is a positive factor for some workers, most especially parents who like being on the same school schedule as their children. But young people, competing with their peers on measures of earnings and status, pay close attention to starting salary and are put off both by the amount of pay and by the fact that salary increases for teachers are not normally based on merit, but on postgraduate credits and years of service.

Erik Brogt, a Dutch scholar studying U.S. science education, finds any shortfall of secondary science teachers baffling: Given the laws of supply and demand one would expect science teacher compensation would increase.[2] This does not seem to be the case, and the reasons are interesting: For one, it is not customary to pay teachers in one subject more than teachers in another subject. Where such rules pertain, the pay problem is "solved" by redefining teachers' specialties.

Simply put, a state having a shortage of secondary science teachers will opt to have more science subjects covered by nonspecialists and/or rely heav-

2. Erik Brogt, personal communication, unpublished paper.

ily on alternate routes to certification. That will ensure that every classroom is covered but by fewer specialists in physical science, Earth science, biology, and chemistry teaching those subjects (Hudson 1986).

What about other pay-related incentives? Hiring bonuses? Pay for performance? Paid summer internships in industry, universities, and government labs built in to teacher contracts? Retiring (or eliminating the need entirely for) student loans? Some school districts provide housing allowances if teachers will live near their schools. But do these incentives work?

Financial incentives such as forgivable loans are becoming a favored mode of federal and state support for teachers willing and able to teach math and science. Many of these scholarship opportunities are not promoted as well as they might be, but that will come. California is the exception. There, posters that promise free tuition for teachers invite undergraduates to apply for Noyce scholarships on every CSU campus.[3]

Some school districts are trying to lure new math and science teachers with signing bonuses of up to $10,000. New York City, having the nation's largest school district, recently targeted science and math teachers with special housing incentives that included $5,000 for a down payment (Dillon 2007b).

The Principle of Equivalency

Underlying a downward trend in science teachers' pay is the *principle of equivalency*—as we are calling it—based on a widely held view that teaching a subject, any subject, to a class of learners, of any age, at any stage, is equivalent work, requiring equivalent (if not identical) training, and of equivalent value to the school, the school district and the state. Thus, it is possible for a school district in the United States to designate equivalent starting salaries for a new teacher of physics and a new teacher of kindergarten, as long as their degree levels (bachelor's, bachelor's plus 12, master's, master's plus 12) are the same. They are further homogenized, one might say, by having their respective salaries increase by the same increment entirely by year of service.

Unions are said to play a large part in mandating "equivalence" in teacher contracts. The reason for this is most likely that, given the ratio of elementary to secondary teachers in the nation (3 to 1), by far the bulk of union mem-

3. Scholarship programs for prospective science and math teachers are available including:
   1. Noyce Scholarship (National Science Foundation): $10,000 per year for two years' college work in preparation for science/math teaching.
   2. Teacher Loan Forgiveness (Department of Education): $17,500 loan repayment.
   3. Perkins Loans: Teachers of math and science can have up to 100% of loan cancelled.
   4. Transition to Teaching: Provides funds to school districts and colleges to pay financial incentives of up to $5,000 to other professionals interested in teaching in high-needs schools.

bers are, most likely, elementary/middle school teachers themselves. But the salary ladder is part of a tradition in public education in which schools rely on credentials to set pay levels rather than teacher performance, however that is measured. Critics of the traditional framework say, "Paying teachers with the same credentials—and the same number of years of experience—exactly the same salaries devalues their uniqueness and the importance of their being effective in the classrooms" (Toch and Rothman 2008).

Given recent shortages, some school districts have sought means of sidestepping the rules: providing "incentives" in the way of higher salaries (and "off scale" start-up packages) for new teachers. We think it's significant that, in 2008, for the first time, the National Science Teachers Association (NSTA) openly encouraged states, districts, and schools to explore differential pay systems that would encourage "more qualified individuals to enter the science education profession.

Pay for performance and merit pay (see below for the distinction between the two) have not been an easy sell. Nor do union contracts encourage differentiation on any other basis but degree attainment and years on the job. So, until the changes recommended by NSTA are implemented nationwide, secondary science teachers are stuck with equivalency.

Science teachers wishing to increase their take-home pay have few options within teaching: becoming a science chair is one; teaching summer school is another. But for a significant raise, a teacher has no option but to get certification in education administration and become a principal.

Pay for Performance

"Long Reviled, Merit Pay Gains Among Teachers," ran a *New York Times* headline in June 2007. Starting with certain districts, state and federal money is making it possible for school districts to offer merit pay as part of "teacher professionalization"[4] (Dillon 2007a, p. 1). The additional money is coming from the U.S. Department of Education's Teacher Incentive Fund, launched in 2006, which has so far awarded $80 million to states for such merit pay.

On what basis is "merit" to be assessed? On this there is little agreement because the law requires only that districts use "objective measures" of student performance as *part* (italics ours) of the award criteria. Details are left up to the locals and there are as of this reckoning, 34 models in play (Sawchuck 2009). Thus, while the merit pay advocates within the federal government (in accordance with No Child Left Behind) want teacher performance tied directly to pupils' performance in a single year, South Carolina mixes student

4. The awards range from a few hundred dollars to $10,000.

achievement (30%) with classroom observation (40%). Others want schoolwide student achievement added to the mix to reward teacher collaboration. Critics point out that the jury is still out as to the effectiveness of teacher pay-for-performance programs. But, as Matthew Springer, director of the National Center on Performance Incentives at Vanderbilt University, readily concedes, that's because there is very little rigorous research on the program's impact on schools (Springer 2009).

Even with the allowance for local control, certain state unions are balking at that single criterion even as they and some teachers embrace (for the first time) the principle of merit pay.

Although "merit pay" and "pay for performance" are often used interchangeably, a Citizens' Commission on Civil Rights document offers the following distinction:

- *Performance pay* is linked to student achievement.
- *Merit pay* is a broader concept that rewards teachers for a variety of improvements. (Taylor and Rosario 2007, p. 4)

Other means of delivering differential pay, such as signing bonuses and higher pay for work in high-needs schools, are also on the table, as are issues such as the "bumping rights" of senior over junior teachers (a privilege of teacher seniority). But so far only the Denver School Board (see the next section) has successfully negotiated a merit pay system.

One way to provide career advancement for teachers—independent of merit or performance pay—is to schedule growth steps, such as has been done in the Rochester, New York, school district over the past 20 years, but is not yet more widely adopted. Rochester teachers enjoy four career development stages: intern, resident, professional, and lead teacher, with progress from one to the other depending on peer review. Normally, the intern stage takes up the entire first year for new teachers; teachers are placed in the resident stage for an additional four years, during which time they are expected to earn certification, a master's degree, and tenure. After achieving these goals, teachers attain the status of "professional teacher" where most remain for the duration of their career. Ten percent go on to serve as mentors and curriculum development specialists, that is, "lead teachers."

Denver's Merit Pay Experiment: ProComp

In 2005, voters in Denver, Colorado, approved a $25 million tax increase to fund a new nine-year merit-based pay system for the city's teachers. Pro-Comp, as

the system is called, was intended to be an alternative to Denver's (typical) lockstep salary schedule for teachers, based on years of service and higher education coursework. As reported by *The Denver Post*, ProComp will tie raises or bonuses for teachers to some or all of the following special conditions:

- Positive professional evaluations
- Setting and then meeting objectives for improving student learning
- Working in hard-to-staff (usually inner-city) schools
- Working in hard-to-staff subjects (such as science)
- Building (new) professionally relevant skills

Note what's missing: the darling of No Child Left Behind, namely tying teachers' raises to pupils' numerical gains on standardized tests.

The effect of a ProComp merit pay increase could be substantial. Teachers with a master's degree and 60 units beyond a bachelor's degree would normally see their salary stall at about $68,000, plus modest cost-of-living adjustments for the last half of their career. Under ProComp, such teachers can keep earning raises until retirement, effectively putting their career-end salary as high as $90,000.

What is making the initiative possible are both the Denver teachers union's willingness to incorporate ProComp into teachers' contracts and Denver voters' willingness to tax themselves for a better pay plan for their teachers in hopes of a better education for their children.

Brad Jupp, the chief union negotiator (himself a teacher), told a *Denver Post* reporter why pay for performance is so difficult to implement in general and why it took so long for Denver teachers to move on the issue. Public schools have a harder time making changes, especially in the way people are paid:

> First, we don't have a history of measuring results and we don't have a results-oriented attitude in our industry [unlike the private sector with its bottom line]…. Furthermore we have configured the debate so that it's a conflict between heavyweight policy contenders like unions and school boards. Finally, we don't have direct control over our revenue. It's easier to change a pay system when there is a rapid change in revenue that can be oriented to new outcomes [again, in contrast to the private sector]. Most school finance systems provide nothing but routine cost of living adjustments. (Mead 2006)

What made the reform possible in Denver, Jupp asserts, was the complete cooperation of the teachers' union. Jupp himself was the chief union negotiator with the school board and was and remains an enthusiast for ProComp. And what makes the new system particularly remarkable is that it

managed to satisfy those who simply want higher pay for teachers and those who want to see increased pay tied to very specific outcomes (Moulthrop, Calegari, and Eggers 2006).

Much has already been learned in the Denver experiment. For one, differentiated pay does not destroy workplace morale. For another, a $1,000 bonus will not be enough to persuade a teacher to leave a middle-class school for an inner-city school. But $1,000 per year can motivate a teacher in a high-poverty school to stay there.

The question is, Will any other states or school districts follow Denver's lead?

What Science Teachers Say About Salary

Teacher interviewees and respondents (admittedly self-selected) to our questions about salary posted on our website were divided about which variables ought to enter into the pay equation. Respondents explored several issues related to secondary science teachers' salaries.

First, many suggested that teacher salaries are not the key issue. For these respondents, the intrinsic rewards of teaching are more important, as are autonomy, job security (see the next section on tenure), and the opportunity to be creative and pursue a calling. For them, these freedoms more than outweigh the disadvantages of lower-than-market-value salary.

Rob is a high-school science chair in one of the largest school districts in Oregon. He has a B.S. in mechanical engineering and worked for several years in fire protection. Both his parents are teachers (his father a physics teacher), and though Rob really enjoyed his engineering career, he was working very long hours that got in the way of starting a family. So he got his master's in teaching and went to one district for a year, then came to his current district, where he's been teaching for 14 years. He has taught freshman physical science, and physics, and is now part of a nationally recognized engineering program. He has also been the science department chair for the past six years.

Rob says that, unlike some of his colleagues, he knew, because of his parents, that teaching would not be easy. Not only does it require classroom management and interpersonal skills, but the teacher also must really understand how to relate to adolescents, not only how they learn. Furthermore, as others in this book have remarked, lab-based courses require a tremendous amount of management and time.

Rob didn't choose to teach for the money, he says. "I was making a lot more as an engineer." So he's not critical of his take-home pay. But he distances himself from what he calls the "union mentality":

> The idea that all teachers are equal and that their pay should be based on years of experience and education level keeps schools from attracting and retaining instructors with technical expertise.... We should be willing to pay market value for teachers in high-need fields.

An important form of "compensation" for Rob, which became obvious as the interview progressed, was that teaching provided him with an opportunity to become a leader. Furthermore, he was able to introduce a new engineering-in-the-schools curriculum and to become and remain science department chair. That, too, is compensation for some.

Will is another émigré. He left research science for secondary science teaching. In Will's case, his compensation as an academic researcher was low because, without a PhD, he would inevitably hit a glass ceiling. Going for the PhD would have been costly in many respects, including time, he reasoned, and so he left for teaching. He now believes it will take him less time and less money to get to the $70,000 top teacher's salary (in his region) than it might have in full pursuit of the role of principal investigator for a major study—a position for which, as he puts it, "many compete and only a few achieve."

There are, however, many secondary science teachers for whom pay is simply insufficient to support a family. Nicole, who teaches in a Northwest suburb, has had to work all but one summer in nine years. Mike one-ups Nicole during their joint interview: "I've had one summer off in 18 years," he says, "If I didn't work in the summers, things would be very difficult for me and my family." So for some teachers, at least, pay is not sufficient to allow summers off.

The issue for policy makers, however, is not just whether higher salaries attract qualified science teachers, but whether the current pay scale will discourage science teachers from staying in the field.

Differential Pay for Science Teachers

Some of our respondents, prompted by our questions on the website about teacher pay, wrote to the issue of pay differential for secondary science. Some argue that secondary science teaching is more time-consuming, and some say, more demanding, with more responsibilities than teaching other high-school subjects. Many specifically mentioned the extra time and responsibility required to set up and tear down labs and to order inventory and maintain equipment—responsibilities teachers in other content areas do not have.

Writes a retired biology teacher from Arizona,

> High-school science teachers should be paid more due to the increased amount of prep time involved in teaching science classes. Moreover, science teachers are responsible for the safety of their students in laboratory exercises that involve experiments that can be dangerous. Teachers of other disciplines have commented to me, after observing my classes, that they were amazed by all of the classroom interactions that I had to supervise and manage, in addition to the actual teaching of the subject.

And writes a chemistry teacher from Colorado, who went through alternative licensure,

> The principle of equivalence was a shock. I honestly couldn't believe that I earned what a physical education teacher earns. We in science do so much more work.

Writes a biology teacher from West Virginia,

> Our state requires "50 percent hands-on" [in science], which is more work for the teacher than simply grading worksheets or lecturing. A salary supplement like extra duty pay might be appropriate for science teachers. All of the teachers in my department come early and stay late. They put in many more hours than the coaches.

From a physics teacher from Virginia,

> Typically, for every one-hour [lab or hands-on] activity for the student, there are at least two hours of prep/post time. I do not know of a science teacher who can perform his or her professional tasks and obligations within the contract hours paid for.

And of the special demands of learning science, writes another retired biology teacher from Arizona,

> The knowledge base of science teachers is more demanding than that of many other disciplines. Since we teachers are discipline specific, we must be current in the latest information relevant to our subjects. This requires that we attend workshops, classes, and science conventions on a regular basis so that we can provide our students with information and techniques for labs that are relevant to their needs. Most of this schooling we pay for ourselves.

Not all teachers agree that science teaching should be better paid than other subjects. Writes a biology teacher from North Carolina,

> I am not one penny more important than the English teacher or the band and choral directors. Yes, I have far more specific knowledge than teachers of lower

> grades, but my knowledge is narrow and I spend far less time in contact with my students.

Our teacher respondents were truly divided about whether the supply-and-demand argument alone should lead to matching teacher pay to market value. Some responded negatively to the question, seeing salary as a reflection of the value put on science teaching, rather than a market-driven function. Writes a physics teacher from New York,

> Differential pay for teachers presumes a market-driven education system as an effective means of improving education…. Can you truly say that the value of what physics teachers offer is greater, and more worthy, than the value of what English teachers offer? Are science and math more important than literacy and culture?

Others avoided the values issue altogether, but wanted it acknowledged, as one of our respondents put it, that in certain sections of the country, there are 1.5 to 2 times as many elementary certified teachers for each available job. In science and mathematics there are fewer qualified people than there are openings.

Conclusion

How would one determine appropriate pay differentials if a school district were to permit them? Our respondents offered a variety of suggestions. Most agreed there should be better benchmarks for establishing a pay scale, something that supersedes supply and demand. A Michigan-based chemistry and physics teacher provides us with one possible conclusion to the issue of pay:

> Somewhere along the line, I was told that being a teacher was one of the hardest jobs in the world to do well and one of the easiest jobs in the world to do poorly—and still get paid the same.

What this teacher is suggesting and what underscores the thesis of this book, is that any pay scale has to be evaluated as to the degree to which it promotes professionalism by rewarding not just time in the classroom but also the many facets of quality instruction. Or, as the president of the St. Paul Minnesota Federation of Teachers expressed it, in an *Education Week* "webinar,"

> How do we assume that every dollar spent [on performance pay] doesn't just improve the teacher's salary, but also improves our professional day, attracts and retains high-quality teachers, and makes teaching an enduring career rather than a starter profession? (Ricker 2009)

What About That Vaunted Long Summer Vacation?

During July 2008, we thought it was appropriate to ask our web respondents the following question: *What do you do during your summer break?* The responses we received further illustrate the utmost in professionalism demonstrated by science teachers.

A chemistry teacher from California described summer vacation as,

Comp time to make up for the 70-hour workweek I do for 10 months a year. Teaching is not an 8 a.m. to 3 p.m. job with summers off. I do not know how to do that and stay current, creative, and on top of the game.

A short list of things science teachers tell us they did on their summer vacations includes:

- Writing new curriculum or revamping old curriculum
- Teaching summer school
- Attending workshops to learn new teaching techniques or new technical skills
- Doing research at universities or national science laboratories
- Attending science conferences
- Preparing for the next year's classes
- Attending college classes
- Attending workshops to learn how to implement new teaching methods
- Inventorying, ordering, cleaning, and repairing lab equipment

Even with so much to do in preparation for the coming school year, low salaries force many teachers into taking summer jobs.

An AP biology teacher from California puts it simply: "Every summer I work because my family needs the money."

Another problem teachers face is that during the school year there is virtually no time for doctor and dentist appointments or home repairs. So many teachers use the summer, as one biology teacher explains it, "to catch up with life."

Part II: Tenure

In any discussion of teacher tenure, it is important to realize that there is no such thing as lifetime "tenure" in the public schools. What public school teachers normally receive after some years on probation is a presumption in their favor that they will be rehired for many subsequent one-year terms, unless cause for not hiring them can be demonstrated (National Commission on Teaching & America's Future 1996).

Tenure protection for teachers was born in the state of California in 1921, followed 16 years later by Michigan in 1937. The reason for it was obvious at the time: Principals were firing teachers arbitrarily because of favoritism. Tenure has often been criticized fairly or unfairly. But today it is more seriously under siege. If the teacher evaluations embedded in the No Child Left

Behind Act (see Chapter 4) are ever linked to tenure, tenure might shortly end or be amended to the point of no return.

Currently, in most states, teachers achieve tenure after five years of satisfactory employment (or four, if they come with prior experience). "Satisfactory performance" is normally determined by classroom observations conducted by the principal, a teacher's response to guidance and mentoring, his or her rate of "improvement" where improvement is deemed necessary, and other professional measures. In other words, a teacher is supposed to be "peer reviewed" along peer-determined standards similar to other professions. But the new national focus on pupils' achievement (left to the states to implement) threatens to replace the former standards and even teacher tenure itself.

The first stirrings are already being felt. In 2005 there was a ballot proposition, endorsed by California's governor, called "Put Kids First." Had it passed, Proposition 74 would have altered the current tenure law in California in two ways. First, it would have raised the amount of time, from two years to five years, new teachers would have to wait before they were covered by job protection rules. Second, it would have allowed the school district to dismiss employees after two consecutive "unsatisfactory" performance evaluations.

The reason teachers objected so strongly is that quite often new teachers need more time—especially in the absence of a mentoring program—to realize their potential as teachers.

What's New: Tying Student Performance to Tenure

In 2007 as No Child Left Behind was making its way through the reauthorization process in the U.S. Congress, the New York Legislature weighed in with a mandate for statewide minimum standards for teacher tenure (Saunders 2007). It is one thing to set new tenure standards for new teachers. But if (as may have been intended) the New York state mandate were to apply to all teachers, including those with tenure, it would have meant that student test scores would be used to determine teacher tenure, and possibly even tenured teachers' dismissals.

By spring 2008, the New York Legislature had to back down, actually voting to prohibit the use of student scores in tenure decisions. But the threat is ever on the horizon, especially in districts without as powerful a local teachers union as that in New York (Medina 2008).

The grounds for dismissal of a tenured teacher, according to most state laws, are specific and only apply to very dire situations. Typically, there has to be proof of physical or mental conditions that render the individual unable or unfit to associate with children; immoral conduct; incompetence (not

specifically defined), inefficiency, or insubordination; excessive absences; conviction of a felony or crime of moral turpitude (Missouri State Teachers Association n.d.). Teacher "incompetence" is always a factor, but not normally linked to student performance, either by observation or by tests.

Teachers' concerns go beyond simple job security (though this cannot be ignored). Efforts to tie tenure to pupil performance threaten to take away the right of self-regulation that is so essential to any profession. This explains why teachers, individually, and through their unions and associations, are so protective of tenure. Here's the gist of their argument:

> Teachers don't want incompetents in their profession. Incompetents make the job harder for the good teachers, and diminish the stature of the profession. Tenure doesn't protect incompetent teachers—incompetent school boards and their managers do! (Patchogue-Medford Congress of Teachers n.d.)

Raising the Bar for Tenure

"We're not talking about doing away with tenure. What we're talking about is making tenure a serious hurdle," says Thomas Kane (2007), an economist working with the Project for Policy Innovation at Harvard and a strong proponent for alternate methods of certification, teacher evaluation, and tenure. The plan, outlined in a Brookings Institution report, is intended to make it "harder to promote least effective teachers to tenured positions." Kane and his colleagues want schools to "set a minimum tenure standard" and to deny tenure to teachers below that standard…" (Gordon, Kane, and Staiger 2006, p. 10) and not provide tenure automatically after three or five years.

The Kane plan, a performance-based option, challenges other traditions within teacher certification and evaluation. Barriers to entry would be lowered (to accommodate Teach for America participants, for example). No longer would teachers need a traditional teaching degree or certification. One point of entry would be the traditional one. But another route "would be provided to novice teachers who have only the undergraduate degree and subject knowledge to get hired" (Gordon, Kane, and Staiger 2006, p. 10). Once hired, teachers may have a trial period of a couple of years. If offered tenure, it has to be based on performance. And "performance" is to be assessed on multiple measures, pupils' achievement to be only one of them.

Kane is both an economist and an education policy analyst, and he brings quantitative analysis to the argument for making tenure more "earnable" than is currently the case. For example, he points out that fewer than

1% of public or private school teachers are laid off (presumably for cause) in their first two years, which even if the number is undercounted by a magnitude of 10, means most new teachers who come in fully credentialed are making it to tenure (Gordon, Kane, and Staiger 2006, p. 13).

Also, he is well aware that a single measure of "teacher effectiveness"—even student achievement—should not suffice. And so his plan calls for new systems for evaluating teacher performance, systems that would include but not be limited to student academic performance. Much of the responsibility for teacher evaluation would fall on principals (who could call on outside and inside evaluators). But Kane is adamant that measures such as licensure, teachers' test scores, or postgraduation credits not be used to measure "excellence."

Kane knows that a rigorous performance-based system has to be perceived as fair by teachers who must live with it, if it is to succeed and to replace semiautomatic tenure (Gordon, Kane, and Staiger 2006, p. 22). Thus his plan calls for public review and public oversight. But his most potent argument, if it proves to be the case, is that high-stakes performance evaluation will improve the standing of teaching as a profession:

> Adoption of our proposal would signal that long-term standing in the teaching profession depends on a more challenging achievement [than mere certification]—success in the classroom. Our proposal would also enable teachers who demonstrate excellence in the most challenging classrooms to earn higher pay. That higher pay could also be coupled with other steps to elevate such high-performing teachers, such as use of master-teacher status.

The bottom-line issue is whether teachers and teacher unions will agree.

Why the Opposition to Teacher Tenure?

Teachers are not alone in expecting tenure after four or five years' probation. Workers in many other fields receive protection from unfair dismissal either through union contract or under civil service law. Teachers' professional work being as public as it is—and their standing in the classroom and the community being as exposed—means that more than many other professionals, teachers need and deserve protection. School boards are elected bodies which might, if they could, fire teachers whose political views they dislike. Finally, and most important, tenure protects teachers' academic freedom. See the recent efforts by the school boards in Topeka, Kansas, and in Dover, Pennsylvania, which succeeded in firing teachers who insisted on teaching Darwinian evolution—until the respective school boards themselves were recalled (Goldberg 2005; Leshner 2008).

Why, then, is there opposition to teacher tenure? The unions, which favor it, complain that school boards want to cut costs by substituting young, inexperienced teachers for those who are older and better paid. So long as tenure is in place, they can't. Some who oppose tenure argue that firing teachers can sometimes cost a school district as much as $200,000 in legal fees because of the constraints of tenure, serving to keep incompetent teachers in place (Small Newspaper Group 2005).

But there's another argument, brought forth by Thomas Kane, who, having found ways (to his satisfaction) to measure teacher effectiveness in grades 4–8, concludes that performance on the job rather than prehire criteria should be used as the basis for long-term teacher selection. Kane criticizes the current tenure system because it rewards "longevity rather than results" (Pettus 2006).

Swapping Tenure for Higher Pay

Another headline, another trend? Members of the Washington, D.C., Teachers Union, at all grades, in all subject areas, were scheduled to vote in September 2008 as to whether they would be willing to swap tenure for substantial increases in pay. Some, depending on field and training, would be able to earn as much as $131,000 after 14 years of teaching; the highest teacher salary at present is $87,000 in the District of Columbia. Along with performance-based pay and tenure changes, the cost of the new contract would be to dismantle the district's seniority system and teachers' guarantee of another classroom if their own school were reduced in size or closed (Sawchuk 2008).[5]

What else do we know about teachers' willingness to swap tenure for increased pay? In a wide-ranging survey of 1,010 K–12 public school teachers, researchers Ann Duffet, Steve Farkas, Andrew Rotherman, and Elena Silva in 2007 found a sizable majority not willing to give up tenure for higher pay. We found a much wider range of opinion when we asked the same question of the secondary science teachers who frequent our website.

We posted a three-part question to our web respondents in the spring of 2008: If you had the choice, would you trade tenure for a $5,000 pay increase? Trade tenure if the pay increase were a lot higher? Or, rather hold on to tenure?

A Michigan science teacher who got a negative performance review from the administration of her school, despite the fact that her students did

5. The vote, as of this writing, never took place. But nonetheless, the district is firing some and upgrading other teachers anyway. Teachers are skeptical.

10–12% better than others on the final exam, writes, "I've taught with and without tenure. If you have a supportive, nurturing administration, then tenure is completely unnecessary."

A New York state physics teacher makes two points. First, the tenure system causes new teachers to stay in one school environment instead of gaining more varied experience in other schools. Second, for himself personally, "Tenure has little value. As a physics teacher I satisfy a niche that is hard to fill."

A Virginia science teacher working in a private school feels differently about tenure. She writes,

> Tenure would be such a happy thought. I teach in a private school and we have one-year contracts for all. Often when teachers are let go, they are asked to give their lesson plans to the new teacher. If they were that good, why were they let go, one wonders.

A science teacher from California writes,

> Tenure is unnecessary until you need it! It is certainly not worth giving up for $5,000. I like tenure because it provides a system of checks and balances between administrators and teachers.

A physics teacher from Texas wonders what might take the place of tenure:

> Many of us teachers never grow beyond the first few years and are doing the same job at year 30 that we did at year five. That's an argument against tenure. But as we move away from a tenure system we will likely move away from a system of pay based on years of service. What will take its place? Maybe pay for value added to the school.

A recently retired science teacher from Illinois sees both sides:

> I have seen both good and bad results of tenure. Most important is the language of the contract. On the one hand, you want to be evaluated fairly. On the other, you don't want only those to get tenure who are just like you.

Let's let a science teacher from California have the last word:

> Tenure allows teachers due process. Without tenure, teachers are easy targets for dismissal, from parents, administrators, or anyone else with a disagreement about content or pedagogy.

Part III: Unions

Union membership muddies the issue of teachers' professional status. On the one hand, teachers, all levels, all subjects, have professional responsibility for the pupils in their classrooms. But they are at the same time employees of a school, which in turn is part of a school district managed by a publicly funded bureaucracy.

That's why unionization gets mixed reviews by the public at large. The public expects teachers to be dedicated, ever at the ready, contributing toward and resting on the public trust. When teachers threaten to, or go out on, strike and children are locked out of school, parents and taxpayers feel betrayed.

Not surprisingly, unionization came late to the American teacher.[6] But today, despite the controversies, the majority of teachers in the United States, including those who work in publicly chartered and private schools, have the right to join a teachers' union, either the National Education Association (NEA) or the American Federation of Teachers (AFT). Exceptions are in right-to-work states where unions are prohibited. Where teachers' unions are allowed, other school employees (teachers' aides, maintenance workers, nurses, and even administrators) may affiliate. Sometimes membership is mandatory. Elsewhere, an agency fee is imposed on every working teacher, member or not, for payment of partial union dues. Most often where the union has a districtwide contract, union dues may be automatically deducted from the paycheck.

Many teachers aren't aware, until they change schools, that the degree to which the "representing organization" or union can bargain for wages and working conditions and process grievances is dependent both on the laws of each state and on the content of individual contracts. That's why teachers meeting teachers from different jurisdictions will have very different experiences of teachers' unions. (See the dialogue later in this chapter between Tom and Mary Anne as an example, p. 81.)

So deep-seated is the notion of teachers' exemption from "ordinary" employee/employer relations that when Albert Shanker, the legendary teachers' union leader, who died in 2007, began his career back in the 1960s, union membership among New York City's teachers was about 5% of their total number. This was not surprising because, at the time, the union couldn't deliver much. Collective bargaining was assumed to be illegal, because, as public employees, teachers couldn't go on strike (another assumption Shanker

6. And to police, fire, and other medical personnel apart from doctors.

successfully challenged). So teachers had nothing to threaten if bargaining didn't go their way. After Shanker led the first successful teachers' strike in New York City's history, membership in his AFT affiliate climbed in six short years (1962–1968) from 5% to 97% (Kahlenberg 2007b).

The AFT has always been a union first, a professional association second. Its origins in 1916 during a decade of brutal repression of unions in other industries is one reason; its affiliation with the CIO (Congress of Industrial Organizations), another. The other teachers' union is the NEA (yes, a union despite its name). The NEA began in 1857, much earlier than the AFT, as an "association of teachers" and, because schools were effectively segregated until the 1960s, its members helped organize a parallel Association of Colored Teachers in 1904. (The two organizations merged in 1966.)

The NEA has worked long and hard for teacher's rights and benefits. In 1912, the NEA won a half-century battle for state pensions for teachers (in place by 1945 in every state), and in 1954 moved teachers' professionalism forward by helping create the National Center for Accreditation of Teacher Education (NCATE) which succeeded in establishing uniform national standards for teacher training.

With its 2.1 million members, the NEA has always registered about twice the number of teachers as the AFT. Together, the two associations would wield enormous influence if they merged. Yet merger talks have not yet succeeded.

The Professionalism Agenda

Unions are not limited to wage-and-hour and benefits issues. Protecting seniority is their lifeblood. And so the subtle and not-so-subtle attacks on teacher tenure that have surfaced in our surveys bear directly on union protection of professionalism. Unions have also been involved with teachers' professional development issues directly, with some larger districts providing professional development in-house. And, in recent decades, unions have participated in the development of curriculum standards. Their most direct engagement resulted in a set of prescriptions introduced in the 1980s for which they are not usually given credit for being the first.

Focusing on the idea that a profession ensures the quality of the service it provides to the public by educating and policing itself, the unions called for

- strengthening teacher preparation programs in universities by requiring an academic subject major,
- establishing standards for a National Teaching License,

- setting up peer evaluation/reviews and peer mentoring programs for new teachers, and
- defining career ladders that include positions of "lead" or master teacher. (Casey 2007)

At least as important to teachers' professionalism are the unions' efforts to prevent what they call the "de-skilling" of teaching, which means opposing the certification of lesser-trained school personnel to take on instructional tasks.

Unions as Advocates for Public Education

As a union leader, particularly one who would draw picket lines around classrooms, Shanker was controversial. But as a defender of public education, he and his coequals in the NEA have usually been willing to embrace "reform" as inevitably good for teachers, because it was good for public education, even where teachers resisted it (Kahlenberg 2007a). He argued that teachers' unions would enhance and defend public education, not destroy it. As proof, he was opposed to privatization, vouchers in particular, but charter schools as well, anything that would drain money, students, and parental support from public education. (Today, the AFT and NEA are not so hostile to alternative schools. In fact, some unions sponsor charter schools themselves.)

Albert Shanker himself fought at least as hard to protect teacher tenure, and recently both the NEA and AFT have been actively working to reform the No Child Left Behind Act. On behalf of teachers who believe they are being written out of both curriculum design and the setting of pupils' achievement criteria under NCLB, several AFT and NEA affiliates are filing briefs versus the U.S. Secretary of Education, claiming NCLB "interferes with the states' right to set policies for education" (Connecticut State Association of Teachers 2006).

At least as significant has been the unions' commitment to another vision of school reform. In contrast to those who are pressing for merit pay, charter schools, and alternative teacher certification, teachers' unions want to "raise inner-city pupils' achievement by equalizing educational funding across school districts," in effect guaranteeing those children high-quality facilities and smaller class size (Los Angeles Times 2008). Nevertheless, teachers unions are frequently described as "opposed" to the reform agenda. A recent opinion piece that originated in the *San Diego Union-Tribune* but then circulated in other papers is typical. The writer describes the unions and the teachers they represent as "putting the interests of adults before those of children" and as entities "that instinctively resist change." More

ominously, he concludes, "If Education Secretary-Designate Arne Duncan wants reform, he is going to have to stand up to organized labor in the form of teachers unions" (Navarrette 2008)

In the face of opinions like this, the unions are going to have to work more effectively to persuade policy makers and the general public that they and the teachers they represent are, and have to continue to be, part of the solution.

New Challenges

In 2002 as NCLB was being debated and implemented across the United States, teachers and their union representatives began to fear that teachers' contracts at "failing schools" would be nullified—even where the contracts had been the product of collective bargaining. That, according to press reports, was the view (perhaps even the intention) of then Secretary of Education Rod Paige, who was pressing hard for NCLB (Keller 2006). Paige was not alone in his view that teacher evaluation should be written out of union contracts. Then Governor Mitt Romney (later Republican candidate for president) proposed a bill to the Massachusetts Legislature in 2006 that would have done just that.

> The governor's bill seeks to upend the status quo in teacher pay and evaluation that has been written into collective bargaining agreements across the Commonwealth [of Massachusetts]...it would make teachers in all subjects eligible for a bonus upon receiving an exemplary evaluation. [Thus] the bill would remove teacher evaluation from the collective bargaining process and establish statewide criteria for assessing each teacher's "contribution to student learning." (Hess and West 2006a)

Today, as NCLB is heading for reauthorization, there are still educational researchers and consultants who believe raising pupils' achievement, especially in math, science, and in the inner-city schools, is best done by challenging teachers' contracts and seniority. Here's the argument as laid out by The Heritage Foundation, a Washington think tank that advises Republicans:

According to the report, school officials should pursue six types of changes in teachers' contracts:

1. New compensation systems that base pay on the scarcity and value of teachers' skills, the difficulty of their assignments, the extent of their responsibility, and the caliber of their work
2. Pension and healthcare benefits structured like those offered by other organizations (businesses) seeking to hire mobile, skilled, college-

educated professionals, which would end defined-benefit pension plans and "gold-plated" health insurance
3. Streamlined process for firing ineffective teachers and more flexibility in evaluating teachers
4. Assignment of teachers on the basis of educational need rather than seniority
5. Elimination of provisions related to work rules and governance with the union's role in crafting district policy limited to informal consultation
6. Ambiguous language on "managerial prerogatives" replaced by explicit language maximizing administration's flexibility (Hess and West 2006b)

The implementation of any and certainly all of these changes would negatively affect some teachers' work lives and positively affect others'. Our concern is where secondary science teachers will land if contracts are differentiated by performance as well as field, and this in turn will depend on who measures performance.

Report From the Field

Tom and Mary Anne are both secondary science teachers. Tom has taught middle-school science, as well as high-school biology and Earth science. He is currently a K–12 science supervisor with about 9,000 students in his district. And he lives in a state that not just permits teachers to join a union (the state NEA), but virtually requires them to do so.[7] Tom thinks his state is, in fact, the strongest union state in the country. It's a relatively small state with only 600 school districts, so not surprisingly, governors, senators, and local officials vie for endorsement from the state's NEA.

The NEA can't legally strike, but the teachers' collective political clout gets them the two- to three-year contracts they enjoy. Also, when frustrated, the union can have teachers "work the contract," that is, not do anything extra. The starting salary for teachers at any level in Tom's state—kindergarten or high-school physics—is $42,000 a year.

More than the money, Tom argues, are the "parameters of professionalism" that the union provides: "The union gives people a sense of shared direction and dedication." The downside is that in some districts (though the union will deny this), the union discourages teachers from doing any unpaid work such as Saturday science fairs. And, as far as professional development, outside of workshops provided by the district, Tom says, "You do this on your own time."

7. Thirty-seven states allow teachers to join a union, though none, technically, can require membership as a condition for employment. In some states that allow teachers' unions, a dues equivalent is deducted from the salaries of teachers who do not formally join, on the grounds that the union negotiates for them—so they must be "charged" for the benefits they receive, even if they refuse to join.

Mary Anne comes from a right-to-work state. No unions are permitted to represent teachers, no less to deduct dues from teachers' salaries. "Wages here are a lot lower than elsewhere. We start bachelors at $25,000 a year, but if you last the first year, you get a $1,000 bonus." Mary Anne interviewed the president of a nonunion teachers' organization in her state in preparation for our interview: "The president said she preferred our nonunion environment because she can build alliances that are not antagonistic."

Yet Mary Anne is clearly aware of the downside of not being represented by a union. "The teachers' association has been trying to work with the governor to guarantee teachers a duty-free lunch hour," she says, to take one example. "But my principal ignores that initiative, and the teachers are having lunch duty as before." As for class size, the teachers' association supposedly sets 24 pupils as the limit for a lab science. "But," says Mary Anne, "I can't really handle 24 at one time in a lab." The association's response: "We can't have different standards for science teachers." Twenty-four students it is.

In some states where unions are permitted, class size limits are part of the teachers' agreement. The National Science Teachers Association (NSTA), a membership organization, sets voluntary compliance for lab size, but this cannot be imposed.

With regard to professional development for science teachers, the contrast between union and nonunion states is stark. As science supervisor, Tom has a budget negotiated by the union to send 20 teachers a year to state meetings, covering teachers' overnight travel and meeting registration. But because those meetings are not part of the school calendar, any school principal or districtwide supervisor (including Tom) has the power to allow or refuse a teacher permission to go.

How much can and does the union protect individual teachers from harassment, from being unjustly let go? The union, Tom says, will support a teacher who feels he or she is being harassed. But nontenured teachers may be let go even with union support. The difference is this: "In my union state, you need to have a reason to fire a nontenured teacher," says Tom. "In a nonunion state, you don't even need that."

Conclusion

One of the several contradictions in the organization and management of schools in the United States, which bears directly on teacher-management

relations, is that the teacher is both an employee of the superintendent of schools (represented by the school principal) and has a semiautonomous professional role within the classroom (see Cooper and Sureau 2008).

Contradictions arise because, given their classroom role, a "special work ethic" is attributed to teachers. One sociologist of school teaching in the early 1970s (before teachers' unions became large and active) described classroom teaching as having a "…dedicatory ethic which elevates service motives and denigrates material rewards" (Lortie 1975). Joining a union, then, may weaken the reputation of teachers, and turn teaching into just another job.

One way out of this dilemma is to argue that teachers are filling three roles at once: They are employees of their communities; in most jurisdictions, they are union members; and they are professionals seeking to apply their skills to the benefit of their students and their schools. But what if their school principal, their superintendent, or their school board doesn't agree? What recourse do they have to draw from?

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