NATIONAL ACADEMY of EDUCATION

Teacher Quality

EDUCATION POLICY WHITE PAPER

Good teaching matters. There is persuasive evidence that students benefit from high quality instruction and that these benefits are cumulative for students who have good teachers for several years. Teacher effectiveness matters so much that low-income students lucky enough to have three very good teachers in a row in elementary school earn test scores that, on average, are similar to middle-class children.[1] Conversely, almost all children, regardless of their socio-economic status, will be harmed academically by poor teaching three years running. Nearly 3.8 million teachers work in our schools, but there are simply not enough good ones to go around, especially in the schools and districts serving high-poverty, large-minority student populations.[2] And although one focal point of the No Child Left Behind (NCLB) Act of 2002 was to address this problem, the policies states developed in response to NCLB's call have not achieved this goal.[3]

The quality of teaching is not simply determined by an individual's knowledge or ability, but also by the contexts in which teachers work. Improving teacher quality thus entails policies concerning recruitment, early preparation, retention (including attention to working conditions), as well as professional development. Below we provide recommendations that address each of these domains.

Teacher Quality
Education Policy White Paper

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RECOMMENDATION 1: School districts, states, and the federal government should continue to experiment with various approaches to teacher recruitment, while collecting data that can be used to improve approaches that are promising and end those that are not. Tools should be developed that can reliably establish that these new recruits have the skills they need to be successful from the start.

High-performing educational systems in other countries attract teachers from the top third of college graduates.[4] In this country, however, this is not necessarily the case.[5]

Historically, teaching in the United States provided a career opportunity for some of the nation's most talented female and non-white college graduates. Until the 1970s, professional job opportunities outside of education for these groups were limited and so, ironically, the nation's schoolchildren benefited from societal unfairness. When the Civil Rights Movement and equal protection statutes made teaching opportunities more equitable, there was not a system in place to ensure that teaching continued to be seen as an attractive career choice.

To address this problem, most states have passed higher standards for entry into teaching, such as minimum grade

point averages and tests for entry into and exit from teacher preparation. States have also explored the potential for signing bonuses, loan forgiveness, differential pay, and easing transitions for people from other fields to become teachers as mechanisms to attract more academically skilled people into teaching, especially in such hard-to-staff specialties as special education, mathematics, and science.

Among the most high profile of these strategies has been the use of "alternative routes" into the classroom, with 47 states and the District of Columbia now authorizing such routes. More than a third of the new teachers in California, New Jersey, and Texas enter teaching not from university programs but through alternate route programs offered by universities or districts. Whereas some of these programs provide extended training before entry into the classroom, others allow teachers to enter the classroom by delaying or bypassing many requirements for entry that are part of traditional programs. These programs do, however, require teachers to be college graduates; approximately 80 percent of them also require demonstration of subject matter knowledge by completing coursework, passing an exam, or a combination of the two. Alternative route programs vary widely and include Master of Arts in Teaching (MAT) programs that offer pre-service training, urban teacher residencies—which include a full year of apprentice teaching under the wing of expert teachers while candidates complete coursework—as well as fast-track programs that provide brief preparation before placing teachers in schools as teachers of record. Some of these routes recruit a more diverse teaching workforce.[6]

Perhaps the best known of the recently developed alternative routes is Teach For America (TFA), a pathway that recruits individuals to be "corps members" for two-year stints in schools in rural and urban low-income communities. TFA is highly selective: only 1 in 7 of the 25,000 applicants in 2008 was accepted. Among the applicants were 11 percent of the Yale graduating class, as well as 10 percent of the Georgetown class, and 9 percent of the Harvard graduates. Corps members receive five weeks of intensive summer training before they begin teaching on their own while pursuing a teaching credential by taking coursework from local colleges or participating in an internship program.

School districts also recruit teachers through a variety of programs designed to attract recent college graduates and career changers. The New York City Teaching Fellows (NYCTF) pathway is an example of one model used in several cities through the New Teacher Project.[7] Like TFA, it is selective, admitting only 1 in 7 of the 19,000 applicants in 2008. Those selected receive some upfront coursework and student teaching, then complete their coursework while teaching, earning a master's degree in education, with the cost subsidized by the New York City Board of Education. More than one in four New York City mathematics teachers began their careers as Teaching Fellows.

One consequence of past debates about the quality of alternate routes has been to spur considerable research, which has consistently documented a great deal of variation both between and within alternative certification programs.[8] More recently, research has moved from contrasting "alternative" with "traditional" to focusing on program or pathway features and on staffing of schools in particular labor markets.

Much of the focus of research has been on TFA, looking primarily at student outcomes in mathematics and English Language Arts in grades four through eight. The most persuasive evidence suggests that, on average, students of entering TFA teachers perform at least as well in mathematics as students of other beginning teachers, including those from college-recommending programs. One study of various pathways in New York City found that by their second or third year of teaching, TFA teachers generated student gains that were somewhat higher than non-TFA teachers in middle school mathematics and about the same in reading. However, TFA has substantially higher attrition, which is important because experienced teachers are on average more effective. So, when one considers both the value that experience adds and the greater likelihood of having less experienced teachers with TFA, it is roughly comparable to other pathways. Teaching Fellows perform about as well as other pathways, but slightly less well than TFA teachers.[9]

Both within TFA and the Teaching Fellows pathways, as well as across other alternative routes, there is considerable variation in structure, commitment to ongoing improvement, and commitment to research on program effects. In fact, variations in teacher effectiveness appear as great within pathways as across them,[10] making it difficult to clearly identify specific treatment components or their effects. Thus, debates focused on traditional versus alternative pathways may not be the most productive way to identify differences in program quality.

Another alternative pathway garnering attention is the urban teacher residency, which is being used in cities like Chicago, Boston, and Denver. Residency programs, which are generally run by the school district or an intermediary organization, vary. However, a model used

by several existing programs is to select candidates to work alongside an expert mentor teacher in a year-long residency, followed by two years of additional intensive mentoring as they teach in their own classroom. At the end of the paid residency year, which is accompanied by coursework leading to a credential and a master's degree provided by a partner university, residents commit to teach in that district for a specified period, generally three to five years. Although research on these programs is still relatively limited, reports from the programs generally indicate positive results for retention. Studies have not yet been completed, however, about their ability to produce teachers who increase K-12 student achievement.

States and districts have also experimented with policies concerning pay and signing bonuses as well as higher salaries for teachers in certain fields (such as mathematics and science) or for teachers willing to teach in hard-to-staff schools. Although results are not uniform, a number of studies have found that higher overall salaries can influence teacher quality.[11] Research linking signing bonuses to teacher quality has produced mixed results.[12]

Given the considerable investment these programs represent, evaluations of the relative effectiveness of these various approaches to recruitment would help to provide better evidence for debates on how to attract good teachers. For programs that already exist, the federal government should support the rigorous and systematic study of program effects—including controlled experiments—with special emphasis on whether the teachers recruited become effective and stay in the field.

The federal government should also encourage the development of additional teacher recruitment and training strategies, building on the best available evidence about strategies that appear to enhance teacher quality and retention. One way to do this would be to sponsor a competition for grants among school districts, nonprofits, universities, and state education agencies to create additional models. These new recruitment strategies should also be carefully evaluated, once again based on the effectiveness of their graduates in improving student achievement. Finally, since one function of the federal government is to disseminate trustworthy information, the government should collect and distribute information about various aspects of effective teacher recruitment strategies, their financing, and the state policies that make them possible.

RECOMMENDATION 2: States, school districts, and the federal government should support research on a variety of approaches to teacher preparation. Investments should be made in research and development on the core practices and skills that early career teachers require; preparation programs should then focus on these skills.

The pre-service preparation of teachers once occurred almost exclusively through state-accredited undergraduate programs in colleges and universities. That is no longer the case. A variety of programs at the undergraduate and graduate levels—run by school districts as well as colleges—now prepare teachers for classrooms. More information is needed about which elements of teacher preparation programs, regardless of their institutional characteristics, contribute the most to teacher capacity to produce student learning.

The diversification of teacher preparation has increased the level of interest in studying program effectiveness. Although research on teaching and learning suggests that there is a great deal that beginning teachers would benefit from knowing,[13] efforts to identify the most important components of preparation programs (for example, discipline-based courses; courses in teaching, learning, and working with diverse students; or student teaching) have as yet received little empirical study.

This observation has stimulated more ambitious research on teacher preparation. One recent study found that some pre-service teacher education programs produce candidates who appear to be more effective than others. Researchers identified several features associated with these effects, including:[14]

- More courses required for entry or exit in their chosen content area (i.e., mathematics or reading);
- A required capstone project (for example a portfolio of work done in classrooms with students or a research paper);
- Careful oversight of student teaching;
- A focus on providing candidates with practical coursework to learn specific practices;
- The amount of opportunity for candidates to learn about local district curricula; and
- Student teaching experiences that are aligned with later teaching assignments in terms of grade level and subject area.

This new wave of research on teacher preparation should be built on with additional research. Preparation programs should be carefully studied and experiments conducted to identify why some are more effective than others. In particular, research should investigate factors such as their structure, enrollment, and curriculum, including the nature of the opportunities to develop skills of practice.

A core challenge for all teacher preparation programs is to identify the knowledge and skills that are both essential for new teachers and within teachers' reach. These skills should be defined broadly enough to fit with different instructional approaches that are commonly used in teaching, readily mastered by novices, and that provide novices with a professional foundation to equip them to learn more about students and about teaching. Core practices for novice elementary school teachers might, for example, include how to introduce vocabulary as part of reading instruction or modeling a procedure with concrete materials in mathematics. In secondary English, learning to lead a classroom discussion of literature meets this definition of a core practice, as would the practice of providing feedback on student writing. Linking the identification of these core practices to evidence of the effects on student learning will strengthen the connections between professional training and teacher effectiveness.

We recommend that the federal government assemble a panel (perhaps in collaboration with the National Research Council) to identify the program features and core practices associated with effective initial teacher preparation. As a condition of receiving federal Title II funds for teacher training and professional development, states should be required to commit to using the money to create preparation and early career support programs that are consistent with the panel's findings.

RECOMMENDATION 3: States and the federal government should encourage and fund experimentation with a wide range of teacher retention strategies. This should include strategies that target individual teachers, such as financial incentives, as well as strategies that target schools and districts through initiatives to improve school leadership, mentoring, and the provision of high-quality opportunities for professional growth. The federal government should also support the development of robust and valid measures of teacher quality that can be used in identifying which teachers are effective and should be retained.

Although teacher recruitment is important, retention is of even greater concern. Given how much there is to learn to become a skillful practitioner, it should come as no surprise that second-year teachers are generally more effective than first-year teachers and third-year teachers are more successful than second-year teachers.[15] On average, teachers improve steadily for up to five (or more) years, after which time their rate of improvement typically levels off.

However, many new teachers leave after only a year or two—after considerable resources have been used for their preparation and before they have a chance to fully develop professionally. Though some of these teachers do return to teaching, roughly 30 percent will leave the profession permanently within five years of beginning.[16] Losing teachers before they are fully effective is a problem that must be examined and addressed. When effective new teachers leave, the programs that prepared them, the school districts that recruited them, the schools where they worked, and the students they taught all share in the loss. The constant churn of the faculty at schools serving low-achieving students deprives those students of the benefits of the knowledge and skill teachers accumulate in their first years on the job—and that loss of teacher expertise contributes to the income- and race-related achievement gaps.[17] Although much is made of what is said to be a looming teacher shortage, no matter how many teachers are recruited, it will do little good unless they stay in teaching long enough to develop into skilled professionals and then stay to share their expertise throughout their careers. Therefore, the federal government should invest in identifying effective policies for increasing retention of early-career teachers.

Of course, there are many reasons why teachers leave: some find that they are not interested in pursuing teaching as a career, and others are simply not good teachers. Some researchers have found that teachers who scored higher on standardized tests of achievement more often leave teaching, as do teachers who have stronger qualifications, particularly if they teach in low-achieving schools. Research also suggests that teachers are more likely to stay in schools in which student achievement is higher. Teachers, particularly white teachers, are more apt to remain in schools with higher proportions of white students, which might be related to differential resources for teachers in schools serving low socio-economic communities. All else being equal, the teacher turnover rate is higher in schools with lower salaries and poorer working conditions.[18]

Of course, attrition is not inherently problematic, especially if those who leave are less effective teachers. In several studies, researchers have found that the teachers leaving teaching have lower student achievement gains.[19] However, in one study, the researchers found that those less effective teachers were simply moving to different schools.[20]

We know less about which specific policy interventions can best help to retain effective teachers and improve student achievement. Although many states and a large number of school districts are pursuing pay-related methods to recruit and retain highly qualified teachers, evidence on the effectiveness of these incentives on teacher retention and student learning is mixed. Overall, recent research suggests that higher salaries are associated with lower attrition rates among teachers,[21] but most of the research does not examine the extent to which higher salaries lead to a more effective teacher workforce. As previously noted, several studies suggest that raising teacher salaries might contribute to increased teacher quality,[22] but this is an area that is in need of much more research.

It is also clear that the details of incentives, in addition to the quality of policy implementation, are important. The Massachusetts Signing Bonus Program for New Teachers, which began in 1998, is an example of how financial recruitment policies are unlikely to lead to teacher retention in the desired schools. In this program, which combined a national recruitment campaign, $20,000 in signing bonuses, and a seven-week "fast-track" certification program, 20 percent of the first cohort of bonus recipients left teaching after one year, and more than 50 percent of its second cohort ended up *not* teaching in the 13 state-designated, high-need school districts that policy makers had targeted. In another example, North Carolina began in 2001 to grant annual bonuses of $1,800 to middle and high school mathematics, science, and special education teachers serving low-income or low-performing students. This program slightly increased retention of teachers, although the program suffered from complicated eligibility requirements and implementation problems. Teachers and principals also reported that the bonuses were too small to be significant.[23]

Salaries are only one factor influencing individuals' decisions about whether and where to teach. Non-wage job characteristics, including attributes of students, class size, school culture, facilities, teaching assignments, leadership, and safety also affect teachers' choices, and these characteristics often vary more dramatically across schools than do salaries. Several studies have found that school characteristics play a significant role in explaining teacher movement across schools. Although student characteristics are important by themselves, teachers also choose schools with more high-achieving and wealthy students because these schools often offer other characteristics that teachers prefer, such as supportive school leadership and recognition from school administrators, higher salaries, smaller class sizes, greater resources (e.g., professional development or curricula), increased professionalism among teachers and increased teacher influence over decisions, better facilities, more preparation time, fewer classroom interruptions, and fewer student discipline problems. There is also evidence that professional development, early career support (induction), and mentoring can reduce turnover of new teachers.[24] Thus, improving the working conditions of low-performing schools is critical to attracting and keeping more effective teachers.

School leadership is integral to working conditions. It is central to a school's ability to support high-quality instruction and to teachers in their decision about whether to stay at or leave a school. There is evidence that a combination of strong instructional and inclusive leadership is positively associated with instructional improvement. Further, there are growing indications that improvements in student achievement and other desirable outcomes—especially in high-poverty schools—simply will not happen in the absence of effective leadership.[25] However, there is also evidence that high-poverty, low-performing schools face a considerable challenge in finding and keeping capable principals.[26]

Consistent with those findings, researchers have found that other investments in teaching quality may be weakened in their effects without robust local leadership. For example, multiple studies show that teacher professional development—even high-quality professional development—will yield modest results at best in retaining teachers in the absence of the kinds of school workplace conditions that provide both motivation and resources for implementing what teachers learn.[27]

The factors that influence teachers' decisions are only one side of the story. Schools and school districts also influence attrition by identifying teachers who are more and less effective, and by working to keep the good ones and counsel out the poor performers. Yet, selective dismissal or, similarly, selective promotion, can affect the teacher workforce. In a recent study using data from New York City schools, researchers argue that it is possible to predict a teacher's performance in later years from student achievement scores in the first two years of teaching. On average, a teacher whose students make above average gains is likely to produce such gains in

later years; similarly, a teacher who performs poorly in the first two years is unlikely to improve dramatically.[28]

Developing objective measures of teacher productivity is key to implementing a retention policy based on teacher effectiveness. Because of the limits of what can be measured with current student assessments, student test scores should be only one of the criteria used to make decisions about teacher quality. Principals' evaluations, performance assessments, and professional judgment should also be taken into account. Ideally, school leaders would know how effective each teacher is, provide supports to help teachers in their weakest areas, and retain only teachers who most benefit students. But, better evaluation methods will be needed for this to occur. The federal government can help make this happen by encouraging and supporting the development of new protocols and research programs to determine the most effective ways to assess teaching quality.

RECOMMENDATION 4: Districts, states, and the federal government should take steps to improve teachers' access to high-quality professional development that is appropriate to the grades, subjects, and students they are teaching. The federal government should invest in research and development to strengthen professional development strategies.

Like their students, good teachers are learners and they need high-quality professional growth opportunities throughout their careers. But unlike other professions, there is no system within education to ensure that teachers continue to hone their craft. Education systems associate formal credentials and degrees with quality. The focus of professional development, on the other hand, should be on helping teachers improve their practice. Although some characteristics seem to be associated with more effective programs, more information is still needed about effective professional development. There are enough different approaches that it is worth experimenting to find out how best to deploy the billions of dollars school districts spend on professional development. The federal government should support the development of better measures of teaching and teachers' performance so as to identify professional development that effectively extends what teachers know and how they teach.

School districts spend an average of 3 percent of their budgets on the professional development of teachers; the range of expenditures varies, but can be as low as 1 percent and as high as almost 7 percent. Most of this money pays for substitute teachers or for experts to come in and offer training.[29] Much of this money is squandered, however, because it is not focused on helping teachers address the specific learning needs of their students. Most basically, teachers need to be deeply knowledgeable about the subjects they are teaching, as well as the pedagogies most effective in teaching those subjects. Research suggests there are some key features of effective professional development for content teaching:[30]

- It focuses on deepening subject matter knowledge specifically for teaching, including understanding how students learn and the specific difficulties they may encounter in mastering key concepts;
- It involves enough time for significant learning (for example, a course or program of 40 or more hours distributed over 12 or more months);[31]
- It is coherently related to what teachers are being asked to do and builds on what teachers already know and are able to do;
- Educators are actively engaged, rather than just listening to a lecture or watching a demonstration; and
- Teams of teachers from the same school participate and learn together, enabling them to support each other in using what they have learned.

Evaluations show that professional development in which teachers learn new content—as well as how to teach it—benefits both students and their teachers. These features, based on analyses of "best practices," a growing body of research, and surveys of teachers, provide a good starting point for further exploration. Although an experimental study of these features showed increased teacher knowledge and desired classroom practice, these effects did not translate into improved student achievement; nor were the practices sustained over time.[32]

More information is needed about effective professional development for teachers. First, we must create the knowledge and resources required for "scaling up" programs and strategies that have been shown to be effective. The professional development programs that have yielded strong effects have generally been modest in scale, reaching a small fraction of the teacher workforce. Thus, the average teacher has a minimal chance of experiencing high-quality professional development targeted to the subjects, grades, and students he or she teaches.

Second, schools and teachers would benefit from professional development research that is more specifically focused on what is perhaps the most pressing challenge for many teachers today: meeting the needs of English-

language learners and responding effectively to the increasing linguistic and cultural diversity of students and their parents in ways that accelerate these students' progress with complex academic outcomes.

Finally, many professional development programs are not fully evaluated and most professional development research is relatively short term, lacking the follow-up data on teacher knowledge, classroom instruction, and student learning that would determine whether effects are robust and enduring. The federal government should collaborate with states and school districts to create and to evaluate models using measures of student and teacher knowledge and teacher performance. These models should be implemented gradually and improved along the way, using data collected from the beginning. Programs that do not demonstrate effectiveness should not be continued.

States should be required to spend Title II professional development funds on programs deemed to be most effective. But even if professional development programs are deemed to be effective, the teachers who need them the most often fail to participate. States should be required to certify that at least half of their Title II money will be spent on teachers most in need.

Conclusion

Teacher quality has been high on the education policy agenda for more than a decade. There is growing awareness that improving teacher quality requires constellations of mutually reinforcing policies. The growth of alternative teacher preparation and professional development programs, as well as the introduction of innovative policies such as incentives to recruit and retain successful teachers and policies to improve the conditions under which teachers work, provide many opportunities to conduct the kind of research that could provide much-needed guidance about how to improve the recruitment, retention, preparation, and professional development of teachers. In the end, if we want high quality teachers, we will need to accord teaching with a higher status, create policies that attract and keep good teachers in the workforce, enhance school working conditions, and create policies that demand that those teachers continue to learn and to teach their students well. Building a system that can supply skilled teachers to every classroom and develop the schools and professional training needed to support effective instruction in this country is a problem of acute national priority. Although it is pressing that ineffective teachers be either rapidly helped to improve or removed from the classroom, the supply side remains critical. And with a population of almost four million teachers, there is no way around the need to address the problem of initial and ongoing professional education.

Notes

[1] Recent research on the value added of a teacher to student learning includes Nye, B., Konstantopoulus, S., & Hedges, L.V. (2004). How large are teacher effects? *Educational Evaluation and Policy Analysis, 26*(3), 237-257; Rivkin, S.G., Hanushek, E.A., & Kain, J.F. (2005). Teachers, schools, and academic achievement. *Econometrica, 73*(2), 417-458; Rockoff, J. (2004). The impact of individual teachers on student achievement: Evidence from panel data. *American Economic Review, 94*(2), 247-252; Sanders, W.L., & Horn, S.P. (1998). Research findings from the Tennessee Value-Added Assessment System (TVAAS) Database: Implications for educational evaluation and research. *Journal of Personnel Evaluation in Education, 12*(3), 247-256.

[2] In many districts, this system provides sufficient numbers of teachers, but some districts, especially large urban districts, hire significant numbers of teachers who do not meet the stated criteria for teaching. For example, during the 1999-2000 academic year, almost one out of four teachers in New York City's highest poverty schools were not certified.

[3] Le Floch, K.C., Martinez, J.F., O'Day, J., Stecher, B.M., Cook, A., Vernez, G., et al. (2007). *State and local implementation of the No Child Left Behind Act: Vol. III: Accountability under NCLB: Interim Report*, RP-1303. Santa Monica, CA: RAND.

[4] Organisation for Economic Co-operation and Development (OECD). (2005). *Teachers matter: Attracting, developing and retaining effective teachers*. Paris: Author. McKinsey & Company (2007, September). *How the world's best-performing school systems come out on top*. London: Author.

[5] Guarino, C.M., Santibanez, L., & Daley, G.A. (2006). Teacher recruitment and retention: A review of the recent empirical literature. *Review of Educational Research, 76*(2), 173-208.

[6] See Wilson et al. (2001). *Teacher preparation research: Current knowledge, gaps, and recommendations*. Seattle, WA: Center for the Study of Teaching Policy; Boyd, D., Grossman, P., Lankford, H., Loeb, S., & Wyckoff, J. (2006). How changes in entry requirements alter the teacher workforce and affect student achievement. *Education Finance and Policy, 1*(2), 176-216.

[7] The New Teacher Project (TNTP) is a national nonprofit founded in 1997 that partners with school districts and states to address teacher quality issues. Since its founding, it has trained or hired approximately 33,000 teachers. Additional information can be found on the TNTP website: http://www.tntp.org.

[8] Humphrey, D.C., & Wechsler, M.E. (2007). *Insights into alternative certification: Initial findings from a national study*. Menlo Park, CA: Center for Education Policy, SRI International; Mayer, D., Decker, P.T., Glazerman, S., & Silva, T.W. (2003, April). *Identifying alternative certification program for an impact evaluation of teacher preparation* (8940-400). Washington, DC: Mathematica Policy Research, Inc.; Podgursky, M. (2004, February). *Research on alternative certification.* Paper presented at the First Annual Conference of the National Center for Alternative Certification, San Antonio, TX.

[9] See Boyd et al. (2006); Darling-Hammond, L., Holtzman, D.J., Gatlin, S.J., & Heilig, J.V. (2005). Does teacher preparation matter? Evidence about teacher certification, Teach for America,

and teacher effectiveness. *Education Policy Analysis Archives, 13*(42), 1-47; Glazerman, S., Mayer, D.P., & Decker, P.T. (2006). Alternative routes to teaching: The impacts of Teach for America on student achievement and other outcomes. *Journal of Policy Analysis and Management, 25*(1), 75-96; Kane, T.J., Rockoff, J.E., & Staiger, D.O. (2008). What does certification tell us about teacher effectiveness? Evidence from New York City. *Economics of Education Review, 27,* 615-631; Raymond, M., Fletcher, S.H., & Luque, J. (2001) *Teach for America: An evaluation of teacher differences and student outcomes in Houston, Texas*. Stanford, CA: The Hoover Institution, Center for Research on Education Outcomes.

[10] This variation is seen in student achievement growth (see Boyd et al., 2008) and in program features. See Feistritzer, E. (2008). *Building a quality teaching force: Lessons learned from alternate routes.* Upper Saddle River, NJ: Pearson Merrill Prentice Hall; Humphrey, D., Wechsler, M., & Hough, H. (2008). Characteristics of effective alternative teacher certification programs. *Teachers College Record, 110*(1), 1-63.

[11] Ferguson, R. (1991). Paying for public education: New evidence on how and why money matters. *Harvard Journal of Legislation, 28*(summer), 465-498; Figlio, D. (1997, August). Teacher Salaries and Teacher Quality. *Economics Letters*, 267-272; Loeb, S., & Page, M. (2000). Examining the link between teacher wages and student outcomes: The importance of alternative labor market opportunities and non-pecuniary variation. *Review of Economics and Statistics, 82*(3), 393-408. Note, however, that neither Ballou and Podgursky (1997) nor Hanushek (1986, 1997) found evidence for consistent relationships between teacher salaries and student outcomes. See Ballou, D., & Podgursky, M. (1997). Teacher pay and teacher quality. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research; Hanushek, E. (1986). The economics of schooling: Production and efficiency in public schools. *Journal of Economic Literature, 49*(3), 1141-1177; Hanushek, E. (1997). Assessing the effects of school resources on student performance: An Update. *Educational Evaluation and Policy Analysis, 19*(2), 141-164.

[12] Clotfelter, C.T., Glennie, E.J., Ladd, H.F., & Vigdor, J.L. (2008). Teacher bonuses and teacher retention in low-performing schools: Evidence from the North Carolina $1,800 Teacher Bonus Program. *Public Finance Review, 36*(1), 63-87; Liu, E., Johnson, S.M., & Peske, H.G. (2004). New teachers and the Massachusetts signing bonus: The limits of inducements. *Educational Evaluation and Policy Analysis, 26*(3), 217-236.

[13] For an analysis of how research on learning and teaching should inform teacher preparation, see Darling-Hammond, L., & Bransford, J. (Eds.). (2005). *Preparing teachers for a changing world: What teachers should learn and be able to do*. San Francisco: Jossey-Bass. For a summary of the results of research on the effects of teacher preparation, see Cochran-Smith, M., & Zeichner, K. (Eds.). (2005). *Studying teacher education: The report of the AERA Panel on research and teacher education.* Mahwah, NJ: Lawrence Erlbaum Associates.

[14] Boyd, D., Grossman, P., Lankford, H., Loeb, S., & Wyckoff, J. (2008, September). *Teacher preparation and student achievement* (NBER Working Paper No. W14314). Cambridge, MA: National Bureau of Economic Research. Available at: http://ssrn.com/abstract=1264576

[15] See Boyd et al. (2006); Kane et al. (2008); Rice, J.K. (2003). *Teacher quality: Understanding the effectiveness of teacher attributes*. Washington, DC: Economic Policy Institute; Rockoff (2004).

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